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Five Factor Model of Personality in Adults with Autism

A thesis submitted in partial satisfaction of the requirements for the degree Master of Arts in

Education

by

Benjamin Chaim Schwartzman

2014



## ABSTRACT OF THESIS

Five Factor Model of Personality in Adults with Autism

by

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Master of Arts in Education

University of California, Los Angeles, 2014

Professor Jeffrey Wood, Chair

Research suggests studying personalities of individuals with Autism Spectrum Disorder (ASD) could give insight into the heterogeneity that exists within ASD. The present study aimed to: (1) determine the extent to which the Five Factor Model of Personality (FFM) and its facets account for variability in ASD symptomatology (2) verify differences in average FFM personality profiles of adults with and without ASD and (3) to identify distinct behavioral phenotypes that exist within ASD. A sample of 828 adults completed an online survey consisting of an autism diagnostic questionnaire (RAADS-R) and an FFM personality questionnaire (IPIP-NEO-120). Results indicate that IPIP-NEO-120 facet scores account for 70% of the variance in RAADS-R scores. Neuroticism positively correlated with RAADS-R scores, while Extraversion, Openness to experience, Agreeableness, and Conscientiousness negatively correlated with RAADS-R scores. In addition, four distinct FFM personality subtypes emerged within adults with ASD based on *k*-means cluster analysis.

The thesis of Benjamin Chaim Schwartzman is approved.

Alison Bailey

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University of California, Los Angeles

2014

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## **Introduction**

Though the prevalence of Autism Spectrum Disorder (ASD) in adults is unknown, the prevalence rate in children has dramatically risen over the last two decades, and those who were diagnosed at the beginning of this growth period have now reached adulthood (Mazefsky & White, 2014). Affecting as many as 1 out of every 68 children, ASD is a lifelong neurodevelopmental condition characterized by core deficits in social communication and restricted, repetitive patterns of behavior (Centers for Disease Control, 2014). ASD is referred to as a “spectrum disorder” due to the range of severity of symptoms that these individuals experience (Wing, 1997). Some individuals who meet criteria for autism and function intellectually in the average or better range are typically referred to as having high-functioning autism (HFA). However, no consensus on the definition of HFA exists among researchers and clinicians (Eaves et al., 1994; Klin, 2006; Carpenter et al., 2009). Research suggests studying the personalities of individuals with autism could give better insight into the heterogeneity that exists within the autism phenotype (Eaves et al., 1994; Ozonoff et al., 2005; Hepburn & Stone, 2006; Schwartz et al., 2009; Wing, 1997).

Personality research has aimed to answer the question: Why do certain people respond differently to the same situations? Personality traits represent people’s tendencies to manifest particular patterns of cognition, emotion, motivation, and behavior, in response to a variety of eliciting stimuli and situations (Fleeson, 2001). Based on extensive research from a variety of cultures and age groups, there is a well-established consensus among personality researchers that the Five Factor Model of Personality (McCrae & Costa, 1987) provides a robust account of the dimensions of human personality variation and behavior (e.g. Goldberg, 1990; Digman, 1990; De Fruyt et al., 2000; McCrae & John, 1992; Ozer & Benet-Martinez, 2006). The Five Factor Model of Personality has been suggested as a useful framework for studying psychopathology due to the fact that the Big Five solution appears when measures of

abnormal and normal personality traits are factor analyzed together (Markon, Krueger, & Watson, 2005). To date, very little is known about the personality traits associated with Autism Spectrum Disorders, and even less is known regarding how individuals with autism present in terms of the Five Factor Model of Personality specifically (Ozonoff et al., 2005, De Pauw et al., 2011).

The present study aims to assess and compare personality in adults who have been diagnosed with Autism Spectrum Disorder (ASD) and typically developing adults using the Five Factor Model of Personality (FFM) in order to: 1. Determine the extent to which the FFM and its facets account for variability in ASD symptomatology in adults with and without diagnoses of ASD, 2. Verify differences in average FFM personality profiles of adults with and without ASD at both the factor and facet-levels, and 3. Empirically identify distinct behavioral phenotypes that exist within ASD in terms of FFM factors and facet-level variability.

## **Background**

### *The Formulation of the Five Factor Model of Personality*

The Five Factor Model of Personality began as a lexical hypothesis (McCrae & John, 1992). This hypothesis states that if differences between individuals exist in a culture with a natural language, then words must have been created in this language to describe these differences. Thus, language should provide a comprehensive catalog of all personality traits (McCrae & John, 1992). Using this hypothesis, Allport and Odbert (1936) compiled a list of 18,000 personality-related adjectives from the dictionary and further grouped this list into 4,500 terms describing stable traits. Cattell (1943) then took this list of 4,500 adjectives and clustered these adjectives into 171 bipolar scales. After empirically analyzing correlations among these scales, Cattell was able to further group the list of adjectives into 35 clusters of synonyms (Goldberg, 1990; McCrae & John, 1992). Cattell then attached rating scales to these clusters in a variety of studies and after correlations between each of the variables were analyzed orthogonally,



five factors consistently emerged (Goldberg, 1990). These five factors, also known as the “Big Five,” were categorized as 1) Conscientiousness, 2) Extraversion, 3) Agreeableness, 4) Neuroticism, and 5) Openness to Experience, and are most often measured using self-report questionnaires.

Conscientiousness involves the ability to show self-discipline, aim for goals, control impulses, and the tendency carry out plans and tasks (De Pauw et al., 2011; McCrae & John, 1992). Extraversion, also often theorized as sensitivity to reward, can be defined by the tendency to engage in sensation seeking behavior, assertiveness, and energy (De Pauw et al., 2011; McCrae & John, 1992). Agreeableness, sometimes referred to as benevolence, reflects the tendency to be compassionate and engage in cooperative behavior with others (De Pauw et al., 2011; McCrae & John, 1992). Neuroticism, sometimes referred to as emotional stability, can be defined as the tendency to experience unpleasant emotions easily, such as anxiety, depression, or anger (De Pauw et al., 2011; McCrae & John, 1992). Openness to experience, sometimes referred to as intellect, reflects the degree of intellectual curiosity, flexibility, creativity, and preference for novelty and variety. (De Pauw et al., 2011; McCrae & John, 1992).

The FFM has also been supported by neuroscientists who have theorized underlying biological substrates associated with each of the five factors based on neuroimaging studies (DeYoung & Gray, 2009; DeYoung et al., 2010). For conscientiousness, it is theorized that both the serotonin system, due to its involvement in control and restraint as well as the prefrontal cortex, given its role in planning and voluntary control of behavior, are implicated (DeYoung et al., 2010). In regards to extraversion, the dopamine system as well as brain regions such as the medial orbitofrontal cortex, nucleus accumbens, amygdala, and striatum have all been implicated due to their importance in reward and approach behavior circuitry (DeYoung et al., 2010). agreeableness is theorized to be supported by brain systems involved in social information processing, empathy, theory of mind, and the perception of biological

motion and intention, such as the medial prefrontal cortex, superior temporal sulcus, temporal-parietal junction, insula, anterior cingulate and the mirror neuron system, which includes the inferior frontal gyrus and rostral posterior parietal cortex (DeYoung et al., 2010). Also implicated are serotonin, oxytocin, testosterone, and estrogen systems (DeYoung et al., 2010). Various brain regions associated with reactions to threat and punishment, such as the amygdala, insula, and anterior cingulate as well as serotonin, cortisol, and norepinephrine systems are implicated for neuroticism (DeYoung et al., 2010). Openness to experience, the least studied of the five factors, is thus exclusively theorized (as opposed to also being supported empirically) to be associated with brain regions involved with working memory, problem solving abilities, attention, and cognitive and perceptual flexibility, such as the prefrontal cortex and dopamine systems (DeYoung et al., 2010).

Because these five factors seem to be influenced by closely related and, in some cases, overlapping brain regions, it makes sense that the five factors tend to vary together (e.g., talkative people tend to experience less negative affect than quiet people) and even magnify each other to produce specific behavioral outcomes (e.g. fearless individuals unconcerned about the consequences of their actions, who also do not value interpersonal relations, tend to exhibit mean and unconstrained behavior) (DeYoung et al., 2010).

#### *Variance in Psychopathology Explained by the FFM*

Personality theorists claim that FFM factors can be found in nearly all personality instruments (McCrae & John, 1992), which implies that the FFM should not only account for variability in “typical” personality but also “atypical” personality (i.e., psychopathology). Parker and colleagues (2004) conducted a study of the FFM and attention deficit hyperactivity disorder (ADHD) and found extraversion to be a significant predictor of hyperactive impulsive ADHD symptoms, with scores on the NEO-FFI (a 60-item, shortened form of the NEO-PI-R; The Revised Neuroticism-Extroversion-

Openness Personality Inventory, Costa & McCrae, 1992) accounting for 41% of the total variability in ADHD symptoms (Parker et al., 2004).

To fully describe the variability in psychopathology accounted for by the Five Factor Model, specificity at the facet level of personality is often needed (Ross et al., 2009). Each of the five factors contain sub-factors known as facets (e.g., facets of neuroticism include: anxiety, anger, depression, self-consciousness, impulsiveness, vulnerability) and many studies have confirmed that facet level traits are more effective than the larger scale five factors alone in predicting actual behavior (e.g. Mershon & Gorsuch, 1988; Paunonen & Ashton, 2001). A variety of FFM facet-level personality studies have found multiple regression to be useful in delineating FFM facets most indicative of particular personality disorders (e.g., Trull, Widiger, & Burr, 2001; De Clercq & De Fruyt, 2003; Ross et al., 2004). De Clercq and De Fruyt (2003) found that FFM facets accounted for an average of 54% of the variance in personality disorders. Similarly, Ross and colleagues (2004) found that facet scales from the NEO-PI-R (which consists of 6 facets per FFM factor) accounted for 64% of the variance in primary (fearless) psychopathy, and 56% of the variance in secondary (dysregulated) psychopathy.

Using samples of typically developing undergraduates, two studies have explored the relationship between the five factor personality model and an autism specific questionnaire called the Autism Spectrum Quotient (AQ; Baron-Cohen et al., 2001), which is a 50 item questionnaire which is designed to assess autism spectrum traits in the general population (i.e. "Broader Autism Phenotype"). In a sample of 201 typically developing undergraduates, Austin (2005) attempted to characterize the five-factor personality model profile of the broader autism phenotype by correlating the AQ to a 40 item scale of trait-descriptive adjectives (8 adjectives per FFM factor) and found that the FFM traits accounted for 37% of AQ scores. Wakabayashi and colleagues (2006) compared autistic traits with five factor personality traits and facets, using the AQ and the NEO-PI-R, for a sample of 320 typically

developing Japanese undergraduate students and found that the NEO-PI-R predicted 24% of the variability in AQ scores. However, both studies were unable to draw autism-specific conclusions due to the fact that these data were taken from non-clinical samples.

Findings from these studies suggest that psychopathology can be accounted for within the FFM at both the factor and facet levels and can be clearly identified through the use of regression formulas capturing particular patterns of scores on the NEO-PI-R (Ross et al., 2009). Furthermore, the findings from the ASD studies specifically indicate the importance of further exploring facet-level personality traits using a clinical sample of adults with autism.

#### *Differences between Typically and Atypically Developing Individuals as Measured by FFM*

Out of the FFM factors, neuroticism has been found to be the strongest and most consistent predictor of psychopathology (Kotov et al., 2010). In fact, the most common pattern of personality traits associated with mental disorders, as Malouff and colleagues (2005) found, consists of high neuroticism, low conscientiousness, low agreeableness, and low extraversion. Also a variety of studies have found depressive and anxiety disorders to be associated with neuroticism, with depression also being negatively correlated with extraversion (Kotov et al., 2010). Nigg and colleagues (2002) examined the links between personality traits and symptoms of ADHD using the self-report version of the NEO-PI-R (Costa & McCrae, 1992) and found that ADHD symptoms were related to a pattern of low agreeableness, low conscientiousness, high neuroticism, and high extraversion.

A study of personality and autism conducted by Ozonoff and colleagues (2005) used the Minnesota Multiphasic Personality Inventory (MMPI-2; Butcher et al., 2001), a 567-item self-report questionnaire, to measure personality differences between 20 adults with ASD and typically developing adults matched by age and gender. The ASD group scored higher on MMPI-2 subscales reflecting social isolation (i.e. low extraversion), interpersonal difficulties (i.e. low agreeableness), depressed mood (i.e.

high neuroticism), and coping deficits (i.e. low conscientiousness). Austin (2005) found that high scores on neuroticism and low scores on extraversion and agreeableness were associated with high scores on the AQ. And similarly, Wakabayashi and colleagues' (2006) results indicated that individuals with high AQ scores exhibited profiles of high neuroticism, low extraversion, and low conscientiousness. At the facet level, individuals who exhibited high scores on the AQ, showed high depression (neuroticism facet) and low assertiveness and activity (extroversion facets), but did not exhibit differences on all facets of neuroticism, extraversion, and conscientiousness, as compared to individuals exhibiting lower AQ scores (Wakabayashi et al., 2006).

Only two studies have explored the FFM in adults who have actually been diagnosed with ASD: Kanai and colleagues (2011) and Shriber and colleagues (2014). Kanai and colleagues (2011) conducted a study of 64 Japanese adults diagnosed with Asperger's syndrome compared to 65 typically developing adults. In this study, neuroticism scores on the NEO-FFI were significantly higher in adults with Asperger's syndrome than in controls, while extraversion, agreeableness, and conscientiousness scores were significantly lower, and scores on openness to experience did not significantly differ between groups. In regards to facet-level comparisons, because the NEO-FFI is only a 60-item measure, this questionnaire is unable to produce facet-level scores. Shriber and colleagues' (2014) study of 37 adults with ASD and 43 typically developing adults found similar results. According to personality scores on the Big Five Inventory (BFI; John et al., 2008) adults with ASD scored significantly higher on neuroticism, while scoring lower on extraversion, openness to experience, agreeableness, and conscientiousness than typically developing adults. Like the previous study, the BFI is only a 44-item measure and does not produce FFM personality scores at the facet level. Based on existing literature, the characterization of ASD at the FFM factor-level appears to be rather consistent (i.e., high neuroticism

and low extraversion, openness to experience, conscientiousness, and agreeableness). However, it is still unknown what facet-level personality profiles consist of for adults with ASD.

### *FFM Variance within Psychopathology*

Within-disorder differentiation on the FFM has helped elucidate distinct manifestations, or subtypes, of these particular disorders. In regards to the Nigg and colleagues (2002) study of ADHD, data showed that the FFM were differently associated with distinct components of ADHD (Nigg et al., 2002). Attention problems, the most consistent symptom of ADHD, was strongly associated with low conscientiousness, while the hyperactivity-impulsivity domain was strongly associated with low agreeableness and high extraversion.

Ross and colleagues (2009) conducted a study aiming to identify the two distinct underlying constructs of psychopathy (fearless dominance and antisocial impulsivity), which had been shown through previous research to have different diagnostic, demographic, and personality correlates. Using a sample of undergraduate and incarcerated men and women, correlations between a psychopathy questionnaire and the NEO-PI-R were analyzed. Results showed that low agreeableness predicted general psychopathy, but, specifically, the two underlying factors of psychopathy exhibited differential correlates with other dimensions of the FFM. Impulsive antisociality was predicted by high neuroticism, low agreeableness, and low conscientiousness, while fearless dominance was predicted by low neuroticism and high extraversion. At the facet level, within the domain of agreeableness, low compliance best predicted impulsive antisociality, while the best predictor of fearless dominance was low straightforwardness. Within neuroticism, fearless dominance was characterized by low anxiety and low self-consciousness. Further, fearless dominance related positively to the actions facet of openness to experience, as well as to the assertiveness facet of extraversion, implying more of a socially acceptable means of using and manipulating others, whereas impulsive antisociality is characterized at the facet-

level by overt expression of antagonism towards others. These results indicate clear distinctions yielding two different ways in which psychopathy appears to manifest that are well predicted by normal-range personality dimensions at factor and facet levels, as measured by the FFM (Ross et al., 2009).

The way in which potential subtypes of ASD manifest in terms of the FFM is currently unknown. Previous research on children with autism, conducted by Wing and Gould (1979), identified three putative subtypes of children with autism characterized by quality of social interaction: “active-but-odd,” “aloof,” and “passive.” When comparing the groups based on IQ, 28% in the “passive” group experienced severe mental impairment, as compared to 43% in the “active-but-odd” group, and 88% in the “aloof” group, suggesting that cognitive functioning was directly related to autism severity (Wing & Gould, 1979). Research has not shown whether these subtypes are valid and reliable, if they remain stable into adulthood for individuals with ASD, or if other subtypes may exist within ASD. Findings from psychopathology research indicate that the FFM should provide a suitable means to discover the full range of potential subtypes within ASD. In related research on schizophrenia and ADHD, cluster analysis and related procedures have often been used to empirically identify subtypes of individuals with psychopathology based on homogeneous patterns of traits (e.g., Strauss et al., 2013; Robin et al., 2008). Strauss and colleagues (2013) found two distinct negative symptom subtypes of schizophrenia with one group experiencing predominantly avolition-apathy symptoms, while the other experienced predominantly diminished expression symptoms. Likewise, Robin and colleagues’ (2008) findings reported a two-cluster solution for personality styles in ADHD, with one cluster presenting as more introverted, unassertive, and complaining while the other cluster was generally extraverted, assertive, and kind.

### *Current Study*

Extant literature indicates that other types of psychopathology are well accounted for within the FFM. Will the FFM account for ASD variability as well? Given the factor-level findings from the small number of previous studies of the FFM and ASD, combined with what is known regarding the brain regions associated with the FFM and implicated in the manifestation of autism—the Superior Temporal Sulcus being implicated in agreeableness as well as Theory of Mind deficits in ASD (Pelphrey et al., 2010), the Prefrontal Cortex being implicated in conscientiousness and neuroticism as well as executive functioning deficits in ASD (Pelphrey et al., 2010), Cingulate Gyrus and Amygdala hyperactivation being associated with both ASD and high neuroticism (Kana et al., 2007), and reward circuitry impairment being associated with both ASD and low extraversion (Scott-Van Zeeland et al., 2010)—hypothetically, adults with autism participating in this study would most likely exhibit low agreeableness, low conscientiousness, low extraversion, and high neuroticism as compared to adults without ASD. The hypothetical manifestation of these four factors can be directly related to what we know of the biological underpinnings and from previous studies, while extant literature has shown that there has been no general consensus relating openness to experience and mental disorders (Malouff et al., 2005). And, in regards to ASD specifically, as mentioned before, Kanai and colleagues (2011) found no significant differences in openness to experience when comparing typically developing adults to adults with ASD, while Shriber and colleagues (2014) did find significant differences. However, with stereotyped patterns of behavior, restricted interests, and general inflexibility being hallmark characteristics of ASD (Volkmar et al., 2004), it is hypothesized that, in this study, overall openness to experience scores for participants with ASD will be lower than typically developing adults.

Lastly, as in Ross et al., (2009), there should be a variety of ways in which autism presents that are differently explained by distinct five factor personality profiles at both the factor and facet levels. For example, an adult with ASD who may also exhibit symptoms of anxiety, given that comorbid



disorders have been found to occur at much higher rates in individuals with ASD (de Bruin et al., 2007), may have an overall low conscientiousness score at the factor-level, while at the facet-level (facets within conscientiousness include: self-efficacy, orderliness, dutifulness, achievement striving, self-discipline, and cautiousness) this same individual could exhibit high scores on only the cautiousness facet of conscientiousness while exhibiting low scores on all the other facets. Factor-level variability within ASD may (or may not) correspond with the previously proposed subtypes of ASD noted by Wing and Gould (1979), but previously undiscovered subtypes may emerge as well in an empirically driven subtype analysis. In regards to facet-level differences, it would be difficult to attempt to predict each facet that may differ between adults with and without ASD, considering that no previous research has attempted to study this using a clinical sample. This level of detail within the facets would otherwise go unnoticed using only factor-level analysis and could potentially provide important information which could distinguish a variety of distinct behavioral phenotypes of ASD.

In sum, the current study aims to: (1) determine the extent to which the FFM and its facets account for variability in Autism Spectrum Disorder (ASD) symptomatology in adults with and without diagnoses of ASD (2) verify differences in average FFM personality profiles of adults with and without ASD at both the factor and facet-levels and (3) to empirically identify distinct behavioral phenotypes that exist within ASD in terms of FFM factor and facet-level variability.

## **Method**

### *Participants*

Participants were recruited via flyers (electronic and paper-based), listserv emails, and postings on blogs, forums, online classified pages (Craigslist, Backpage, and Oodle) and social networking sites (Facebook, Twitter, Tumblr, and Meetup). In order to specifically target adults with ASD, flyers and

messages were posted on autism-related websites, forums, blogs, social networking pages and emails were sent to autism support groups and centers all over the world.

Participants included 828 adults with and without ASD aged 18 to 87 years with a mean age of 36 years ( $SD = 13.5$ ). Of these participants, 152 reported having been formally diagnosed with ASD and 226 participants considered themselves to be on the autism spectrum with an additional 122 participants indicating that they did not know if they considered themselves to be on the autism spectrum. Of the 828 participants, 73% were female, 24% were male, and 3% chose “other.” Education ranged from “Less than high school” to “Professional degree (JD or MD)” with 92% of the sample ( $n = 755$ ) having completed at least “Some college” and 60% ( $n = 491$ ) graduating with at least a 4-year college degree. In regards to ethnicity, 80% were Caucasian, 5% were Asian, 4.5% were Hispanic, 2% were of African descent, 2% were Middle Eastern, and 5% were multi-ethnic (with 1.5% preferring not to answer). Questionnaire responses came in from 31 different countries—Australia, Canada, Ecuador, Egypt, England, Finland, France, Germany, Ireland, Israel, Japan, Malaysia, New Zealand, Norway, Pakistan, Panama, Peru, Philippines, Puerto Rico, Romania, Russia, Scotland, Singapore, South Africa, South Korea, Spain, St. Martin, Syria, Thailand, Turkey, and United States—with 84% of the participants from the United States, 4% from Canada, 4% coming from the United Kingdom, 2.5% from Europe outside of the U.K., 2% from Australia and New Zealand, and 1% or less from each of the other countries listed above. Participants in the ASD group and participants not in the ASD group, based on RAADS-R cut off scores, are compared below in Table 1. For analyses, the adults that score above 65 were considered to be in the ASD range, while those scoring lower than 65 were considered to be in the non-ASD range.

Table 1

*Group Comparisons*

	ASD Group (Above RAADS-R Cutoff)	Non-ASD Group (Below RAADS-R Cutoff)
N	364	464
Formally diagnosed with ASD	Yes: 140; No: 224	Yes: 12; No: 452
Consider self to be autistic	Yes: 211; No: 78; Don't Know: 74	Yes: 15; No: 401; Don't Know: 48
RAADS-R Mean (Range)	113.5 (66-203)	31.6 (0-65)
Gender	64% Female	79.5% Female
Average Age (Range of Ages)	35.7 Years Old (18-78 Years Old)	36.7 Years Old (18-87 Years Old)
Ethnicity	83% Caucasian	79% Caucasian
Country of Origin	81% American	87% American
Education (Completed 4-Year Degree)	50%	67%
Currently Employed	61%	73%
Satisfaction with Employment (Moderately or Very Satisfied)	42% Satisfied	64% Satisfied
Currently in Romantic Relationship	49%	63%
Self-reported Happiness (Somewhat or Very Happy)	50%	77%
General Satisfaction with Life (Somewhat or Very Satisfied)	47%	75%

*Measures*

The International Personality Item Pool Representation of the NEO-PI-R (IPIP-NEO-120; <http://ipip.ori.org>) is an online, public domain tool for personality measurement which reports the individual level of personality under each of the five domains in the Five-Factor Model. The shortened

120-item version of the IPIP-NEO was created by Dr. John A. Johnson. Each factor is further broken down into six sub-factors for personality description, known as facets. The IPIP-NEO-120 consists of 24 items per factor and 4 items per facet for a total of 120 items (for example, Conscientiousness facets include: Self-Efficacy, Orderliness, Dutifulness, Achievement Striving, Self-Discipline, and Cautiousness. Each of these 6 facets will have 4 items specific to that facet, making up 24 items for that particular factor). Responses are given based on Likert scale degrees of agreement, “1”=completely disagree, to “5”=agree completely. The IPIP-NEO-120 was chosen as the best option for assessing personality in this study because it was the shortest instrument available which could reliably measure a substantial amount of facets within each of the five personality factors. The IPIP-NEO-120 has been used in a variety of studies and has been found to be a valid and reliable measure of the Big Five (Chen et al., 2011; Lo et al., 2005; McDonald & Donnellan, 2012; McBride, 2001).

The Ritvo Autism Asperger’s Diagnostic Scale Revised (RAADS-R; Ritvo et al., 2010) is an 80-item self-rated diagnostic scale for measuring autism based on the DSM-IV and ICD-10 diagnostic criteria. In the present study, the RAADS-R was used to confirm diagnosis of autism and was adapted from having “yes” and “no” checkbox answers to having the same Likert scale (1 to 5) as the IPIP-NEO-120. Diagnoses were confirmed using the previously established cut-off score of 65, in order to distinguish participants with autism from participants without autism. The RAADS-R is one of only two self-report diagnostic measures of autism currently available (Stoesz et al., 2011). The authors of the RAADS-R recommend that clinicians administer the instrument as part of the diagnostic process and not as a complete diagnostic system. A variety of studies have used the RAADS-R and determined it to be a reliable and valid measure of autism in adults (Andersen et al., 2011; Enticott et al., 2012; Ritvo et al., 2011).

As mentioned before there is a demographics portion of the questionnaire consisting of questions addressing gender, relationship status, employment status, ethnicity, level of education, living situation (i.e., living on own, with roommates, at home with parents, with other relatives, etc.), and a few questions addressing life satisfaction and happiness.

### *Procedures*

After obtaining ethical approval from UCLA's institutional review board, an online questionnaire was posted on <http://www.Qualtrics.com>. The first page of the online questionnaire consisted of an informed consent form which participants had to complete before advancing to the rest of the questionnaire. Participants were not provided compensation for completing the questionnaires. The internet has proven to be a viable means of reaching rare populations and is quickly becoming a popular way of administering self-report measures (Luce et al., 2007; Carlbring et al., 2007). Internet-based measures have also proven to be effective in reaching populations of individuals with autism (Kapp et al., 2013). Kapp and colleagues (2013) used an internet-based questionnaire to assess individuals' perceptions of their own autism and identity, and was able to obtain responses from over 200 adults with autism diagnoses.

Recruitment flyers and advertisements directed participants to the questionnaire via this unique web address ([http://uclaed.us.qualtrics.com/SE/?SID=SV\\_2tpPLtP2dKYjvg1](http://uclaed.us.qualtrics.com/SE/?SID=SV_2tpPLtP2dKYjvg1)). Once at the web address, participants were given the online informed consent page. After completing the informed consent, participants began with the RAADS-R, which was followed by the IPIP-NEO-120, and then lastly, the demographics questions. Participants were not informed when one questionnaire began and another ended, as there were no separate titles for each of the questionnaires. The questionnaires were merged but remained in the same order within each questionnaire (i.e., questions 1-80 are the 80 items of the RAADS-R, then questions 81-200 are the 120 items of the IPIP-NEO-120, etc.). Given that this

questionnaire consisted of over 200 items, an option was included for participants to “Save and Continue” at any point during the questionnaire. Because the Qualtrics software did not have the capabilities to instantly give participants their scores immediately following completion of the questionnaire, participants who were interested in seeing their results on the IPIP-NEO-120 were given the option to provide their email addresses to be sent their personality profiles and a brief description of how to interpret it.

### *Data Analysis*

Before analyzing any of the IPIP-NEO-120 data, raw scores were converted into T-scores using reference sample means and standard deviations (provided by Dr. Johnson) based on age and gender. For this reference sample, no claim of population representation is made by the authors of the IPIP-NEO-120. This reference sample is assumed to be largely representative of a typically developing population of adults that use the internet.

*Aim 1.* To determine the extent to which the FFM and its facets account for variability in ASD symptomatology in adults with and without diagnoses of ASD (i.e., variability in RAADS-R scores that can be accounted for by scores on the IPIP-NEO-120), factor and facet-level scores were analyzed in terms of percent of RAADS-R variance explained by personality traits considered together using multiple regression analysis. After accounting for gender and age, all regression coefficients were then evaluated against a critical alpha of .05 in order to determine the best IPIP-NEO-120 factor and facet-level predictors of RAADS-R scores.

*Aim 2.* To verify differences in average FFM personality profiles of adults with and without ASD at both the factor and facet-levels, RAADS-R scores were correlated with factor and facet-level IPIP-NEO-120 scores. All correlations were evaluated against a critical alpha of .05. Significant differences

between groups (i.e., those who scored above the RAADS-R cut off and those who scored below the RAADS-R cut off) and between clusters were determined using post-hoc T-tests.

*Aim 3.* To empirically identify distinct behavioral phenotypes that exist within ASD in terms of FFM factor and facet-level variability, cluster analyses were performed on the IPIP-NEO-120 factors within the ASD group. Cluster analysis is a widely used type of data analysis used for sorting cases into groups, or clusters, so that associations are strong within members of the same cluster and weak between members of different clusters (Eaves et al., 1994). Specifically, in the current study, *k*-means cluster analysis, a method which sorts cases based on their relative distance from cluster means using an algorithm, were employed (Cannon & Weems, 2006). Cluster analysis has been used in a variety of psychopathology studies aiming to identify sub-groups within disorders. Cannon and Weems (2006) utilized cluster analysis to distinguish individuals with anxiety from individuals with depression. In addition, cluster analysis has been used to identify distinct behavioral phenotypes within autism in a study conducted by Eaves and colleagues (1994), and should prove to be a suitable for similar use in the current study.

Participants were never asked to provide their names. Due to the fact that some participants provided their email addresses to receive their results on the questionnaires, and email addresses often contain first and/or last names or initials, the data were coded and participants were each given a number to further preserve confidentiality.

## **Results**

A total of 828 participants completed the RAADS-R, with scores ranging from 0 to 203, and an average score of 67.6 ( $SD=48.1$ ). When dividing the groups based upon the RAADS-R cutoff score of 65, 364 participants in the ASD group (the group that scored 66 or above) scored an average of 113.5 ( $SD=33.1$ ) with scores ranging from 66 to 203. 464 participants in the non-ASD group (the group that

scored 65 or below) scored an average of 31.6 ( $SD=17.9$ ) with scores ranging from 0 to 65. Also, in the current study, 36 adults above the age of 55 (with ages ranging from 55-78 years old) scored above the RAADS-R ASD cutoff. A total of 828 participants completed the IPIP-NEO-120. Means and Standard Deviations of average T-scores for the ASD and non-ASD groups are shown in Table 4.

*The extent to which the FFM and its facets account for variability in ASD symptomatology*

The multiple regression tests were conducted first, including only the 5 factor-level scores in the model, then only the 30 facet-level scores in the model, after checking for multicollinearity. The factor-level model indicated that four of the IPIP-NEO-120 FFM factors (Neuroticism, Extraversion, Conscientiousness, and Agreeableness) significantly predicted RAADS-R scores at  $p < .05$ . Together, the FFM factors, as measured by the IPIP-NEO-120, accounted for 47.6% of the variability in amount of autism symptoms, as measured by the RAADS-R.

Multiple regression analysis at the facet-level indicated that the Anxiety and Vulnerability facets of Neuroticism; the Friendliness, Gregariousness, Activity Level, and Cheerfulness facets of Extraversion; the Imagination, Emotionality, and Adventurousness facets of Openness to Experience; the Trust and Altruism facets of Agreeableness; and the Self-Efficacy, Dutifulness, Achievement-Striving, and Cautiousness facets of Conscientiousness significantly predicted RAADS-R scores at  $p < .05$  even when controlling for the effect of all other facets simultaneously. The FFM facets, as measured by the IPIP-NEO-120, accounted for 70% of the variability in the amount of autism symptoms, as measured by the RAADS-R.

For Conscientiousness in the factor-level regression model and for Activity Level, Cheerfulness, Achievement-Striving and Dutifulness facets in the facet-level regression model, signs flip from non-significant or significant positive correlations to significant negative correlations (or vice versa). This means that when controlling for all other factors or facets (depending on which model), higher (or



lower) levels of Conscientiousness as well as the aforementioned facets were associated with higher levels of ASD symptomatology, even though the association was nonsignificant or opposite in the simple correlations. Post-hoc analysis of potential contributors to these suppressor effects revealed that when Agreeableness scores were removed from the factor-level regression model, Conscientiousness scores had a nonsignificant association with RAADS-R scores. Similarly, for Activity Level and Cheerfulness in the facet-level regression models, removing all other Extraversion facets from the model caused Activity Level and Cheerfulness scores to have nonsignificant associations with RAADS-R scores. For Achievement Striving scores to have a nonsignificant association with RAADS-R scores, all Agreeableness and Conscientiousness facet scores were removed from the regression model. Lastly, removing all other Conscientiousness facet scores from the regression model caused Dutifulness scores to have a nonsignificant association with RAADS-R scores as well.

Table 2

*IPIP-NEO Factor Score Correlations and Regression Weights for Predicting RAADS-R Scores*

IPIP-NEO-120 Factors	RAADS-R	
	Correlations	Standardized Regression Weights
Neuroticism	.593**	.364**
Extraversion	-.545**	-.273**
Openness to Experience	-.232**	-.000
Agreeableness	-.461**	-.280**
Conscientiousness	-.310**	.058*
Constant	-	90.262**
R <sup>2</sup>	-	.476

Note: For all analyses,  $n = 828$ . For each total RAADS-R score correlation with IPIP-NEO-120 factor scores, the effects of participant gender and age were partialled out.

\*\*Significant at the 0.01 level (2-tailed).

\*Significant at the 0.05 level (2-tailed).

Table 3

*IPIP-NEO Facet Score Correlations and Regression Weights for Predicting RAADS-R Scores*

IPIP-NEO-120 Facets	RAADS-R	
	Correlations	Standardized Regression Weights
Neuroticism		
Anxiety	.496**	.070*
Anger	.405**	.025
Depression	.424**	.012
Self-Consciousness	.580**	.015
Immoderation	.090**	-.024
Vulnerability	.561**	.199**
Extraversion		
Friendliness	-.710**	-.255**
Gregariousness	-.574**	-.182**
Assertiveness	-.304**	.004
Activity Level	-.024	.099
Excitement-Seeking	-.189**	-.045
Cheerfulness	-.398**	.116
Openness to Experience		
Imagination	.287**	.178**
Artistic Interests	-.113**	.018
Emotionality	-.425**	-.213**
Adventurousness	-.462**	-.082**
Intellect	-.162**	.005
Liberalism	-.055	-.016
Conscientiousness		
Self-Efficacy	-.319**	-.095**
Orderliness	-.220**	-.032
Dutifulness	-.105*	.090
Achievement-Striving	-.128**	.054
Self-Discipline	-.261**	.045
Cautiousness	-.220**	-.128**
Agreeableness		
Trust	-.485**	-.052*
Morality	-.228**	.018
Altruism	-.464**	-.097**
Cooperation	-.304**	-.045
Modesty	.016	-.029
Sympathy	-.330**	-.007
Constant	-	149.713**
R <sup>2</sup>		.701

Note: For all analyses,  $n = 828$ . For each total RAADS-R score correlation with IPIP-NEO-120 facet scores, the effects of participant gender and age were partialled out.

\*\*Significant at the 0.01 level (2-tailed).

\*Significant at the 0.05 level (2-tailed).

*Differences in average FFM personality profiles of adults with and without ASD*

Pearson  $r$  correlations for the relationships between RAADS-R scores and IPIP-NEO-120 FFM factors are shown in Table 2. RAADS-R scores were positively correlated with Neuroticism ( $r = .59, p < .01$ ) and negatively correlated with Extraversion ( $r = -.54, p < .01$ ), Openness to Experience ( $r = -.23, p < .01$ ), Agreeableness ( $r = -.46, p < .01$ ), and Conscientiousness ( $r = -.31, p < .01$ ).

Pearson  $r$  correlations for the relationships between RAADS-R scores and IPIP-NEO-120 facets are shown in Table 3. RAADS-R scores were positively correlated with all six facets of Neuroticism at  $p < .01$  and the Openness to Experience facet of Imagination at  $p < .01$ . RAADS-R scores were negatively correlated with five of the six Extraversion facets at  $p < .01$ , four of the six Openness to Experience facets at  $p < .01$ , five of the six Agreeableness facets at  $p < .01$ , and all six facets of Conscientiousness at  $p < .05$ . The Activity Level facet of Extraversion, Liberalism facet of Openness to Experience, and Modesty facet of Agreeableness did not correlate with RAADS-R scores at a significant level.

In comparing IPIP-NEO-120 score means between groups, ASD and non-ASD groups significantly differed on all five factors and facets except for Activity Level facet of Extraversion, Liberalism facet of Openness, Modesty facet of Agreeableness, and Dutifulness facet of Conscientiousness at  $p < .05$  (as shown in Table 4 below). Significant group mean differences were determined using Independent Samples T-tests to compare average T-scores between groups.

Table 4

*Group Mean IPIP-NEO 120 Differences between ASD and non-ASD Groups*

IPIP-NEO-120 Factors and Facets	ASD Group T-scores	Non-ASD Group T-scores
	<i>M (SD)</i>	<i>M (SD)</i>
<b>Neuroticism</b>	59.6 (9.1)**	48.2 (9.5)**
Anxiety	61.3 (9.4)**	52.3 (9.9)**
Anger	54.6 (10)**	48.1 (9.4)**
Depression	56.4 (9.8)**	48.5 (9.3)**
Self-Consciousness	59.5 (7.3)**	48.7 (9)**
Immoderation	52 (10.7)*	50.5 (9.7)*
Vulnerability	63.7 (10.6)**	52.3 (10.3)**
<b>Extraversion</b>	39.5 (9.1)**	49.8 (9.6)**
Friendliness	37.9 (9.4)**	52.3 (9.3)**
Gregariousness	46 (6.8)**	54.4 (7.6)**
Assertiveness	42.6 (11.2)**	48.2 (10.5)**
Activity Level	48.1 (11)	48.9 (10.2)
Excitement-Seeking	42.3 (10.7)**	45.9 (9.5)**
Cheerfulness	42.2 (10.9)**	50.7 (10.3)**
<b>Openness to Experience</b>	49.4 (10.4)**	52.9 (9.9)**
Imagination	51.2 (10.3)**	45.8 (11.1)**
Artistic Interests	49.8 (10.2)**	51.6 (9.3)**
Emotionality	46.2 (11.9)**	53.4 (8.8)**
Adventurousness	42.3 (10.3)**	50.8 (9.2)**
Intellect	47.1 (11.6)**	50 (10)**
Liberalism	54.5 (9.5)	55.7 (9.6)
<b>Conscientiousness</b>	45.1 (10.8)**	50.7 (9.9)**
Self-Efficacy	43.2 (13.7)**	50.6 (11.3)**
Orderliness	46.5 (10.1)**	50.3 (9.7)**
Dutifulness	48.3 (11.6)	49.8 (10.2)
Achievement-Striving	48.3 (11.5)**	50.4 (9.7)**
Self-Discipline	44.9 (9.9)**	49.4 (9.7)**
Cautiousness	48 (11.7)**	52.4 (9.9)**
<b>Agreeableness</b>	45.4 (11)**	52.9 (8.4)**
Trust	45.3 (10.8)**	53.7 (9.3)**
Morality	48.8 (10.6)**	52.2 (8.8)**
Altruism	48.2 (11.3)**	55.8 (8.7)**
Cooperation	49 (9.7)**	53.7 (8.6)**
Modesty	52.6 (11.2)	51.8 (9.3)
Sympathy	51.1 (11.4)**	56.7 (8.2)**

Note: For all analyses,  $n = 828$ . Groups were determined based on RAADS-R score cut-off of 65. Those scoring above cutoff were placed in ASD group, while those scoring below were placed in non-ASD group. Standard deviations are in parentheses.

\*\*Significant at the 0.01 level (2-tailed).

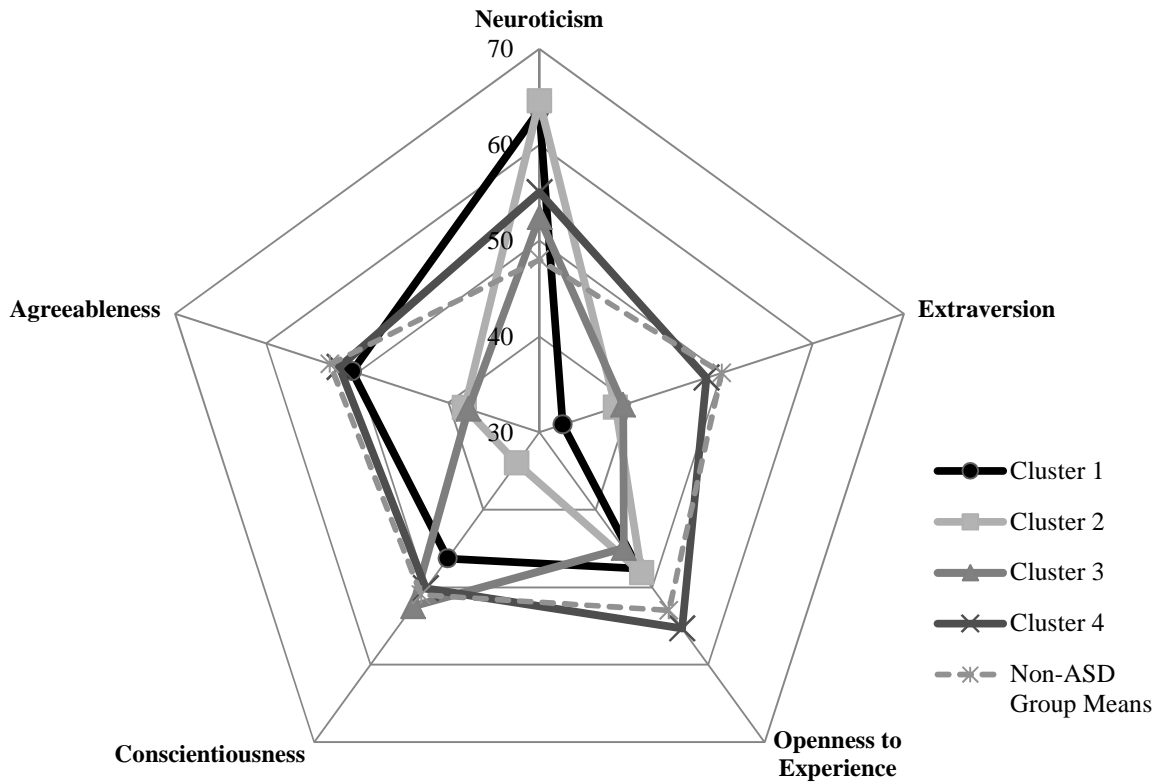
\*Significant at the 0.05 level (2-tailed).

### *Distinct behavioral phenotypes that exist within ASD*

*K*-means cluster analysis was conducted for the group of participants that scored above the cutoff on the RAADS-R in order to determine potential ASD subgroups based on IPIP-NEO-120 personality scores. The four cluster solution emerged as the best solution after reiterating the *k*-means cluster analyses using between 3 and 10 group solutions with both the IPIP-NEO-120 factors and facets. After comparing the variety of group solutions to one another via ANOVA and post-hoc significance tests, the 4-group solution emerged as having the most distinct and consistent differences across a range of criteria for ASD status (e.g., RAADS score > 65; formal ASD diagnosis; self-diagnosis). After comparing the 4-group solution using the five factor-based clusters with the 4-group solution using facet-based clusters, similarities across both models emerged: the N distribution between the 4 clusters were almost identical, as were the differing elevations on the indicators of the five factors, and both the factor-based and facet-based clusters contained a group that was within the normal limits (within one standard deviation) on all FFM factors and facets. Given that in the regression analysis, the facets accounted for 70% of the variance, the facets were used in this paper to generate the clusters. The 4 distinct personality clusters that emerged are illustrated and further characterized in Figure 1, Figure 2, Table 5, and Table 6.

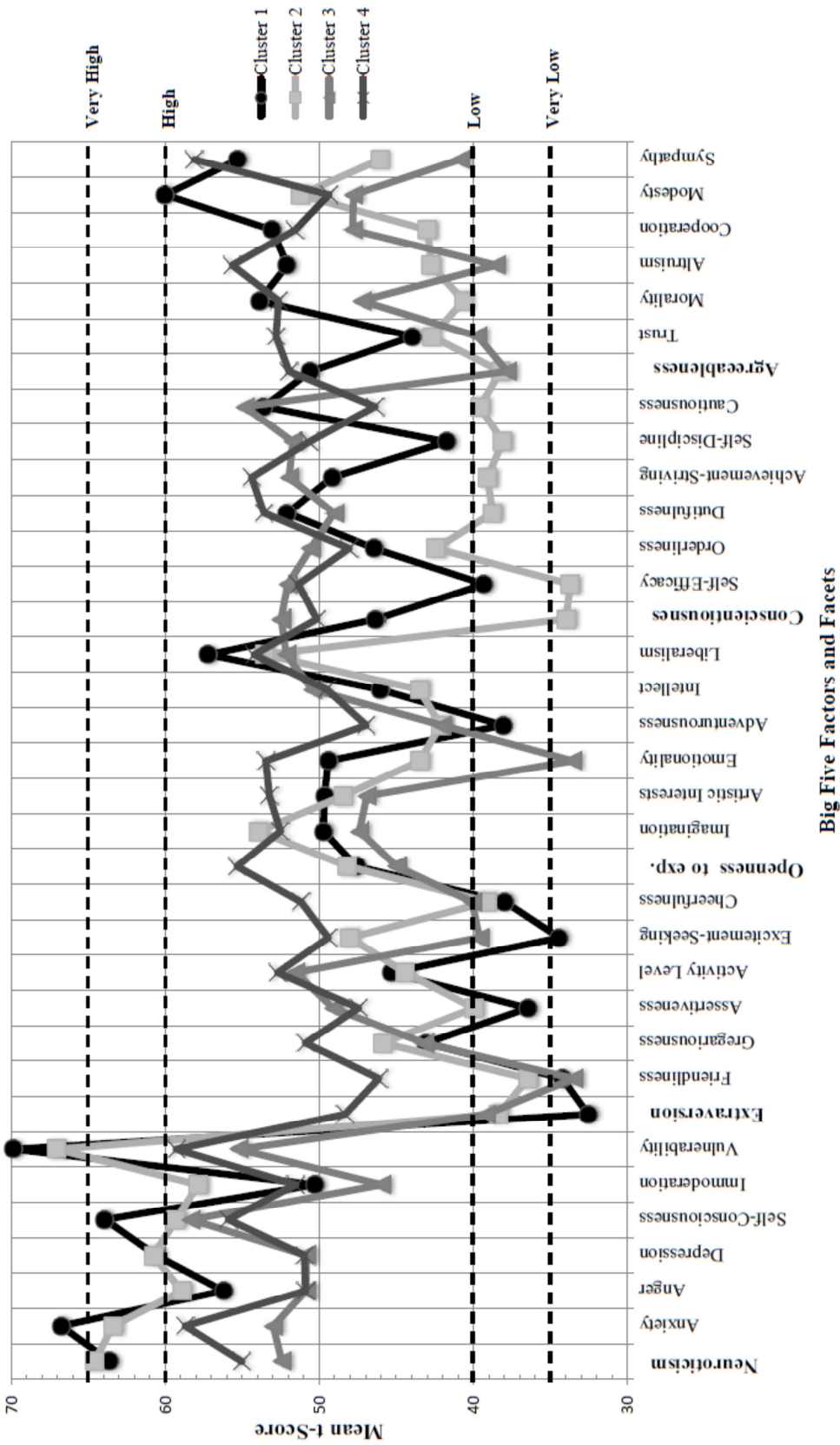
Figure 1

*FFM Profile Shape for Each ASD Group Cluster (T-Scores)*



Note: Shapes determined by T-scores on each FFM factor. T-score > 65 is considered “Very High.” T-score > 60 is considered “High.” T-score > 58.5 is considered “Borderline High.” T-score > 41.5 and < 58.5 is considered “Average.” T-score < 41.5 is considered “Borderline Low.” T-score < 40 is considered “Low.” T-score < 35 is considered “Very Low.”

Figure 2  
*Big Five Personality Profiles for Each ASD Group Cluster*



Note: Data points determined by T-scores on each FFM factor and facet. T-score > 65 is considered “Very High.” T-score > 60 is considered “High.” T-score > 58.5 is considered “Borderline High.” T-score > 41.5 and < 58.5 is considered “Average.” T-score < 41.5 is considered “Borderline Low.” T-score < 40 is considered “Low.” T-score < 35 is considered “Very Low.”

Table 5

## Characteristics of ASD Personality Clusters

Cluster Characteristics	Personality Cluster (for ASD Group)			
	Cluster 1	Cluster 2	Cluster 3	Cluster 4
# of Individuals in Cluster ( <i>n</i> )	104	99	62	99
Average RAADS-R Score	120 <sup>A</sup>	121 <sup>B</sup>	116 <sup>C</sup>	98 <sup>ABC</sup>
Average Age	34	37	39	35
Gender	71% Female <sup>A</sup>	69% Female	61% Female	55% Female <sup>A</sup>
Formally Diagnosed with ASD	Yes: 51; No: 53 <sup>A</sup>	Yes: 28; No: 71 <sup>A</sup>	Yes: 25; No: 37	Yes: 36; No: 63
Consider Self to Be Autistic or on the Autism Spectrum	Yes: 71; No: 15; Don't know: 18 <sup>A</sup>	Yes: 50; No: 19; Don't know: 30 <sup>A</sup>	Yes: 36; No: 12; Don't know: 14	Yes: 55; No: 32; Don't know: 12
In Romantic Relationship	54%	45%	45%	37%
Living Independently	76%	73%	77%	69%
Currently Employed	54%	55%	66%	71%
Satisfied with Employment (Somewhat or Very Satisfied)	37.5% <sup>A</sup>	30% <sup>BC</sup>	55% <sup>AB</sup>	51.5% <sup>C</sup>
Education: Completed Four Year College Degree	47%	38% <sup>A</sup>	63% <sup>A</sup>	57%
Self-Reported Happiness (Somewhat or Very Happy)	38%	33% <sup>A</sup>	61%	71% <sup>A</sup>
Satisfied with Life (Somewhat or Very Happy)	36.5% <sup>AB</sup>	27% <sup>CD</sup>	66% <sup>*AC</sup>	66% <sup>*BD</sup>

Note: Means and percentages with the same superscript differ significantly from each other at the 0.05 level (2-tailed).



Table 6

*FFM Facet Summary for Each ASD Personality Cluster*

	<b>Neuroticism</b>	<b>Extraversion</b>	<b>Openness to Experience</b>	<b>Conscientiousness</b>	<b>Agreeableness</b>
<b>Cluster 1</b>	<p>Very High Anxiety <math>M_T=66.8, SD=6.1</math></p> <p>High Depression <math>M_T=60.6, SD=8.4</math></p> <p>High Self-Consciousness <math>M_T=63.9, SD=5.7</math></p> <p>Very High Vulnerability <math>M_T=69.8, SD=6.8</math></p>	<p>Very Low Friendliness <math>M_T=34.2, SD=6.3</math></p> <p>Low Assertiveness <math>M_T=36.5, SD=9.7</math></p> <p>Very Low Excitement-Seeking <math>M_T=34.4, SD=7.7</math></p> <p>Low Cheerfulness <math>M_T=38.0, SD=8.3</math></p>	<p>Low Adventurousness <math>M_T=38.1, SD=8.3</math></p>	<p>Low Self-Efficacy <math>M_T=39.3, SD=12.0</math></p>	<p>High Modesty <math>M_T=60.0, SD=8.1</math></p>
<b>Cluster 2</b>	<p>High Anxiety <math>M_T=63.4, SD=7.1</math></p> <p>Borderline High Anger <math>M_T=58.9, SD=7.8</math></p> <p>High Depression <math>M_T=60.8, SD=7.1</math></p> <p>Borderline High Self-Consciousness <math>M_T=59.3, SD=6.1</math></p> <p>Very High Vulnerability <math>M_T=67.0, SD=8.0</math></p>	<p>Low Friendliness <math>M_T=36.5, SD=7.8</math></p> <p>Low Assertiveness <math>M_T=40.0, SD=10.6</math></p> <p>Low Cheerfulness <math>M_T=39.1, SD=10.2</math></p>		<p>Very Low Self-Efficacy <math>M_T=33.7, SD=13.5</math></p> <p>Low Dutifulness <math>M_T=38.8, SD=11.1</math></p> <p>Low Achievement-Striving <math>M_T=39.1, SD=11.9</math></p> <p>Low Self-Discipline <math>M_T=38.1, SD=8.2</math></p> <p>Low Cautiousness <math>M_T=39.6, SD=8.7</math></p>	<p>Borderline Low Morality <math>M_T=40.6, SD=10.5</math></p>
<b>Cluster 3</b>	<p>Borderline High Self-Consciousness <math>M_T=58.3, SD=7.0</math></p>	<p>Very Low Friendliness <math>M_T=33.5, SD=7.4</math></p> <p>Low Excitement-Seeking <math>M_T=39.6, SD=10.0</math></p> <p>Borderline Low Cheerfulness <math>M_T=40.0, SD=9.8</math></p>	<p>Very Low Emotionality <math>M_T=33.6, SD=9.6</math></p>		<p>Low Trust <math>M_T=39.7, SD=9.6</math></p> <p>Low Altruism <math>M_T=38.5, SD=9.9</math></p> <p>Borderline Low Sympathy <math>M_T=40.9, SD=9.8</math></p>

<b>Cluster 4</b>	Borderline High Anxiety $M_T=58.7, SD=9.1$				
	Borderline High Vulnerability $M_T=59.3, SD=10.7$				

For reporting of results, designations of “Very Low,” “Low,” “Borderline-Low,” “Average,” “Borderline High,” “High,” and “Very High” were used according to standard deviation from the IPIP-NEO-120 reference means as follows: “Very Low” refers to a mean T-score greater than or equal to 1.5 standard deviations below 50, “Low” refers to a mean T-score between 1 and 1.5 standard deviations below 50, “Borderline Low” refers to a mean T-score between .85 and 1 standard deviation below 50, “Average” refers to a mean T-score between .85 standard deviations above or below 50, “Borderline High” refers to a mean T-score between .85 and 1 standard deviation above 50, “High” refers to a mean T-score between 1 and 1.5 standard deviations above 50, and “Very High” refers to a mean T-score greater than or equal to 1.5 standard deviations above 50.

As shown in the tables and figures above, numerous significant differences (at  $p<.05$ ) emerged between clusters. Cluster 1 exhibited “High” scores in Neuroticism at the factor level ( $M=63.59, SD=7.06$ ) which included both “Very High” Anxiety and Vulnerability, in addition to both “High” Depression and Self-Consciousness at the facet level. For Extraversion, Cluster 1 exhibited “Very Low” scores ( $M=32.55, SD=5.80$ ) including “Very Low” Friendliness and Excitement-Seeking in addition to “Low” Assertiveness and Cheerfulness at the facet level. For Openness to Experience ( $M=47.59, SD=8.93$ ), Conscientiousness ( $M=46.31, SD=8.04$ ), and Agreeableness ( $M=50.57, SD=8.09$ ), Cluster 1 exhibited scores in the “Average” range, including “Low” scores for Self-Efficacy and “High” scores for Modesty at the facet level.

Cluster 2 exhibited the highest scores for Neuroticism at the factor level ( $M=64.57$ ,  $SD=6.25$ ) which included “Very High” Vulnerability, “High” Anxiety and Depression, and “Borderline High” Anger and Self-Consciousness. For Extraversion, at the factor level, Cluster 2 exhibited “Low” scores which included “Low” Friendliness, Assertiveness, and Cheerfulness. For Openness to Experience, Cluster 2 exhibited scores in the “Average” range at the factor ( $M=48.16$ ,  $SD=9.87$ ) and facet levels. For Conscientiousness, at the factor level, Cluster 2 exhibited “Very Low” scores ( $M=34.00$ ,  $SD=7.06$ ), in addition to significantly lower scores than the other three clusters on all six facets, at  $p<.01$ . Cluster 2 also exhibited “Low” scores for Agreeableness at the factor level ( $M=38.23$ ,  $SD=10.49$ ).

Cluster 3 presented with “Average” factor-level Neuroticism ( $M=52.43$ ,  $SD=8.80$ ). For Extraversion, Cluster 3 scored in the “Low” range ( $M=39.18$ ,  $SD=6.61$ ) which included “Very Low” Friendliness and “Low” Excitement-Seeking at the facet level. For Openness to Experience, Cluster 3 exhibited scores in the “Average” range ( $M=44.97$ ,  $SD=9.28$ ) including scores in the “Average” range on all facets except for Emotionality, for which Cluster 3 exhibited scores in the “Very Low” range. For Conscientiousness, all scores were within the “Average” range at both the factor and facet levels. For Agreeableness, Cluster 3 exhibited “Low” scores ( $M=37.82$ ,  $SD=9.15$ ) which included “Low” Trust, “Low” Altruism, and “Borderline Low” Sympathy at the facet level.

Cluster 4 exhibited factor-level Neuroticism scores within the “Average” range ( $M=55.04$ ,  $SD=8.32$ ) which included “Borderline High” Anxiety and Vulnerability at the facet level. For Extraversion, at the factor level, Cluster 4 exhibited significantly higher scores than the other clusters at  $p<.01$  and was the only cluster that exhibited scores within the “Average” range ( $M=48.33$ ,  $SD=7.12$ ). At the facet level, Cluster 4 exhibited the significantly highest scores for Friendliness ( $M=46.14$ ,  $SD=9.65$ ), Gregariousness ( $M=50.89$ ,  $SD=7.28$ ), and Cheerfulness ( $M=51.18$ ,  $SD=9.49$ ) at  $p<.01$ . For Openness to Experience, Cluster 4 exhibited the significantly highest factor-level scores ( $M=55.34$ ,

SD=10.77) at  $p<.01$  and scored significantly higher scores than all other clusters for Emotionality (M=53.47, SD=9.76) and Adventurousness (M=46.95, SD=11.21) at  $p<.01$ . For Conscientiousness, at the factor level, Cluster 4 exhibited scores within the “Average” range (M=50.16, SD=8.45) including scores within the “Average” range on all Conscientiousness facets. For Agreeableness, Cluster 4 exhibited scores within the “Average” range at the factor level (M=51.96, SD=7.61) as well as for all facets.

Lastly, three facets emerged for which all four clusters differed significantly from one another: Anxiety facet of Neuroticism (at  $p<.05$ ), Emotionality facet of Openness to Experience (at  $p<.05$ ), and Altruism facet of Agreeableness (at  $p<.05$ ).

## **Discussion**

In this study, we were able to determine that variability in ASD symptomatology appears to be well accounted for by the FFM. Also, in accordance with previous studies investigating FFM personality and ASD, Neuroticism was positively correlated with ASD symptomatology, while Extraversion, Openness to Experience, Conscientiousness, and Agreeableness were negatively correlated with ASD symptomatology, findings which suggest that adults with ASD present with significantly different personality profiles than adults without ASD. A great deal of variability also emerged within ASD, as four different clusters of FFM personality types were determined based on our results, indicating that there is not just one “autistic personality” type.

### *Percent of Variance in ASD Symptomatology Accounted for by FFM*

The first goal of the current study was to estimate the amount of variability in ASD symptomatology that could be explained by personality factors and facets. By way of regression analysis, we were able to estimate that 70% of ASD symptom variance could be explained by the FFM facets. To put this estimate in perspective, the previous studies that have analyzed manifestation of

autistic traits as predicted by personality profiles have found significantly lower percentages. As mentioned earlier, both Austin (2005) and Wakabayashi and colleagues (2006) found NEO-PI-R FFM scores to be only mostly predictive of AQ scores, with  $R^2$  of .37 and .24 respectively, concluding that their results suggest that autistic traits could be an independent personality dimension, or sixth factor of personality. However, given that the AQ has 50 items consisting of a fairly narrow sample of autistic behaviors (Bishop & Seltzer, 2012), in addition to having poor internal consistency (Hurst et al., 2007), and that only the FFM factors as opposed to facets were used in these studies, the discrepancies between these previous studies' findings and our current study's findings can be considered in context. Similarly to Austin (2005) and Wakabayashi and colleagues (2006), Schriber and colleagues (2014) found, via discriminant function analysis, that FFM factor scores accounted for 30.3% of ASD vs. typically-developing group variance as measured by the Autism Diagnostic Observation Schedule-Generic (ADOS-G; Lord et al., 2000). Like the previous studies, this study also only used the FFM factors and did not include FFM facets in their analyses. As indicated in Table 2, with a factor-level  $R^2$  of .476, the present results would have been in closer agreement with these previous studies had we only included factor-level scores in the analyses.

Findings from extant FFM and psychopathy research further emphasize the importance of facet-level specificity (Ross et al., 2009). Ross and colleagues (2004) determined that NEO-PI-R FFM facets were predictive of 64% of the variance in primary psychopathy symptomatology, and 56% percent of the variance in secondary psychopathy, with lower  $R^2$  at the factor-level for each. Ross and colleagues' (2009) study found similar results in terms of facet-level specificity with NEO-PI-R facets explaining 72% of the variance on the Psychopathic Personality Inventory (PPI) Fearless Dominance scale, 71% of the variance on the PPI Impulsive Antisociality scale, and 56% of the variance on the PPI

Coldheartedness scale, while NEO-PI-R factors explained only 50%, 62%, and 32% of the variances, respectively.

In the current study, multiple regression analyses indicated that increased Neuroticism and decreased Extraversion and Agreeableness to be the most predictive of ASD symptomatology at the factor level. These findings are in line with previous FFM and ASD research, however Conscientiousness and Openness to Experience were not able to significantly predict ASD. Openness to Experience in previous research does not have a consistent relationship with ASD symptomatology, with Schriber and colleagues (2014) finding adults with ASD to have lower Openness to Experience on average as compared to adults without ASD, while Kanai and colleagues (2011) found no differences. Conscientiousness, however, according to previous research, has been found to have a consistent negative relationship with ASD (Wakabayashi et al., 2006; Kanai et al., 2011; Schriber et al., 2014).

Further emphasizing what most distinguishes ASD from typical development in terms of the FFM, 11 different FFM facet-level predictors of ASD symptomatology emerged. For Neuroticism, increased Anxiety and Vulnerability were the facets that best predicted ASD; expected findings given that ASD and anxiety are highly comorbid and individuals with ASD are often unable to cope with their anxiety, which may lead to feelings of vulnerability (Groden et al., 2006). Results from a number of studies indicate 20-57% of children and adolescents with high functioning ASD exhibit clinical levels of social anxiety, as compared to the 1-5% of typically developing youth that experience symptoms of social anxiety (e.g., Kuusikko et al., 2008; Muris et al., 1998; Simonoff et al., 2008). In previous FFM and personality disorder research, dependency has been found to be positively predicted by anxiety and vulnerability facets of neuroticism (Mongrain, 1993). When comparing the two disorders, it appears that individuals with ASD and individuals with dependent personality disorder, though the two disorders are vastly different, may share some characteristics in common (e.g., individuals with both disorders often

view the world as complex and dangerous, often look to others to take the lead, and often maintain youthful or naïve impressions of people and situations) (Millon & Davis, 1996).

For Extraversion, decreased Friendliness and Gregariousness were the facets that best predicted ASD. Individuals who score low in Friendliness are often reserved and do not eagerly reach out to others; and individuals who score low in Gregariousness are generally overwhelmed by situations involving large crowds and prefer to spend time alone (Goldberg et al., 2006). The current study's findings support what is known about social difficulties associated with ASD; given the challenges most adults with ASD experience in both developing friendships (Orsmond et al., 2004) and with large crowds or groups (Ashwin et al., 2006). In previous FFM facet-level research, the concepts of friendliness and gregariousness have been associated with the tendency to experience positive emotions in response to anticipation or enjoyment of socially rewarding situations (i.e., being included by a group, receiving a smile from another person, etc.) (DeYoung et al., 2007). It has been hypothesized that individuals with autism, as compared to individuals without autism, exhibit a decreased responsivity to social reward; this theory is referred to as the "Social Motivation Hypothesis" of ASD (Dawson et al., 1998b; Scott-Van Zeeland et al., 2010). In regards to social reward related learning in children with ASD, Scott-Van Zeeland et al. (2010) found differences in processing strategies between typically developing and children with ASD, in that typically developing children show activity in implicit learning and reward regions such as ventral striatum, dorsal striatum, and prefrontal cortex, whereas ASD children primarily utilize visual processing regions without showing activity in reward-related regions such as the ventral striatum. The differences in friendliness and gregariousness found in adults with ASD as compared to those without ASD in the current study may be a result of these social reward processing differences present in childhood. In addition, increased friendliness and gregariousness have been found to significantly correlate with increased life satisfaction (Schimmack et al., 2004). Results

from the current study support these findings, as a substantially higher percentage of individuals in the non-ASD group reported higher life satisfaction in addition to having significantly higher Gregariousness scores.

Three openness to experience facets also significantly predicted ASD: increased imagination, decreased emotionality, and decreased adventurousness. Individuals with above average imagination are described as using fantasy to make the world around them more interesting (Grossman et al., 2006). Increased imagination as a predictor of ASD in this study does not have as much support in extant literature and will be further discussed in the following section regarding the correlation analyses. Individuals with decreased emotionality are described as being not aware of their own emotions in conjunction with being unable to openly express their feelings (Grossman et al., 2006). Results from the current study are in accordance with previous ASD research in that individuals with ASD often have difficulty with awareness and expression of their own emotions (Silani et al., 2008). Individuals low in adventurousness prefer familiarity and routine (Grossman et al., 2006), which has been found in previous ASD research to be true of individuals on the spectrum in that they are often insistent upon sticking to routine and resistant to novelty (Wood & Schwartzman, 2013; Schriber et al., 2014). In previous facet-level openness to experience research, imagination, emotionality, and adventurousness are the facets most related to sensation-seeking behaviors, with imagination and emotionality representing internal types of experience seeking, while adventurousness represents external types of experience seeking (Aluja et al., 2003). Given these results, it appears that individuals with ASD may be more capable or more interested in seeking sensations of which they themselves are in control (e.g., their own imaginations), while understanding and appreciating sensations out of their control (e.g., emotions and adventure) may be more difficult and take more practice.



For conscientiousness, decreased self-efficacy and cautiousness were significant predictors of ASD symptomatology. Individuals with low self-efficacy are described as feeling incompetent and not in control their own lives (Goldberg et al., 2006). In previous FFM research, self-efficacy, also referred to as competence, has been directly related to increased neuroticism, specifically increased vulnerability and anxiety, in that the negative affect associated with feeling vulnerable and anxious would most likely cause an individual to feel less capable (i.e., less self-efficacious) (Reed et al., 2004). As in the current study, Wakabayashi and colleagues' (2006) study comparing autism symptomatology scores using the AQ to FFM scores using the NEO-PI-R, also found that higher autism symptomatology scores significantly correlated with lower competence scores (i.e., the NEO-PI-R equivalent of self-efficacy).

Individuals with low cautiousness are described as often acting impulsively and act without concern for consequences (Goldberg et al., 2006). Cautiousness, also referred to as deliberation in previous FFM research, is considered to be the best and most widely represented facet-level measure of impulsivity (Whiteside & Lynam, 2001). Wakabayashi and colleagues' (2006) study similarly found high AQ scores to be associated with low scores in deliberation. The impulsivity found in the aforementioned study, as well as what was found in the present study, is in concordance with what is currently known about ASD—in that individuals on the spectrum often have difficulties with self-regulation and inhibitory control (Hill, 2004; Solomon et al., 2009). Individuals with ASD often are unable to control outbursts and feelings of irritability and are commonly prescribed medication such as risperidone to treat these symptoms (Myers & Johnson, 2007).

Lastly, decreased trust and altruism were the best predictors of ASD symptomatology for Agreeableness. Previous FFM research on trust, sometimes referred to as “the propensity to trust,” has found that low scorers in this facet assume others to be dangerous and dishonest, and experience decreased satisfaction with romantic relationships (Mooradian et al., 2006). Altruism, from an

evolutionary psychology perspective, is one of the most critical social behaviors in regards to increasing chances of survival and successful reproduction (Ashton et al., 1998). However, the most successful altruistic relationships are “tit-for-tat,” meaning one should only engage in altruistic behavior with another person when that other person is also engaging in altruistic behavior; a cooperative arrangement that involves trust. Previous FFM research on altruism indicates that individuals with increased neuroticism more often feel exploited by others and thus are less likely to engage in altruistic behavior (Ashton et al., 1998). Findings from the current study support this research given that participants with elevated vulnerability and anxiety, who also exhibited decreased propensity for trust, presented with decreased altruism. Wakabayashi and colleagues (2006) also found decreased trust and altruism to be associated with increased autism symptomatology scores. Due to altruism and trust being such fundamental aspects of forming relationships with others, our results directly relate to deficits in social communication characteristic of ASD; in that, it is understandable that individuals with ASD would be less trusting and altruistic towards others, given that these individuals most likely had difficulties understanding social cues, engaging in reciprocal social interaction, and forming close friendships during childhood (Dawson et al., 2004). To these individuals others may often seem confusing and unpredictable, and thus difficult to trust.

Because the current study is the only of its kind to evaluate personality profiles of adults with ASD at the FFM facet-level, future studies will be necessary to determine whether the significantly predictive facets in the current study are consistently predictive of ASD symptomatology in other samples. Extant FFM literature overwhelmingly supports the use of facet-level measures, as opposed to measures which only determine factor-level scores, when predicting behavior (Paunonen & Ashton, 2001; Ross et al., 2009).

It is rather striking that variations in FFM facets were able to account for such a substantial amount of variance in ASD symptomatology. Previous research on FFM and depression has hypothesized that depression may be a product of different personality styles, or where individuals stand simultaneously on different FFM factors (i.e., “gloomy pessimists” are individuals with high Neuroticism and low Extraversion scores, while “undercontrolled” individuals score high on Neuroticism and low on Conscientiousness) (Weiss et al., 2009). Likewise, ASD for some individuals may be well-described as a specific convergence of personality traits (i.e., average to high scores for Neuroticism and all of its facets, combined with average to low scores for Extraversion, Openness to Experience, Conscientiousness, and Agreeableness and all of their respective facets). This combination of FFM personality traits reflects in many ways the combination of behaviors that are well-known characteristics of many individuals on the autism spectrum (e.g., the prevalence of comorbid anxiety coupled with low reward sensitivity, inflexibility, poor emotion regulation, and difficulties with socialization). A hypothetically intriguing though as yet untested possibility stemming from this overlap of personality configurations and ASD is that in seeking the origins and determinants of ASD in some individuals, the convergence of specific neurologically-based traits that are at least semi-independent of one another (e.g., overreactive amygdalae producing broad features of neuroticism coupled with inefficient front lobe processing producing relatively weak planning, organization, and allocation of attention skills and underreactive reward processing neural circuitry) could potentially produce an overall phenotype that often resembles ASD, depending on learning history, context, and mitigating factors. Converging with genetics research suggesting that single gene explanations of ASD are unlikely (Geschwind, 2008), and that contributing individual genes may each confer only a small amount to variance in ASD, the present findings suggest that an additive or interactive combination of (presumably neurally mediated) traits may offer a model of the autism phenotype worthy of further study.

### *FFM Differences between Adults with and without ASD*

The second goal of the current study was to determine what FFM factors and facets correlated with ASD symptomatology in order to determine FFM profile differences between adults with and without ASD. In regards to the FFM factors, as predicted, similar to results from previous studies (Austin, 2005; Wakabayashi et al., 2006; Kanai et al., 2011; Schriber et al., 2014), a significant positive correlation emerged between IPIP-NEO-120 Neuroticism and RAADS-R ASD symptomatology scores, while a significant negative correlation emerged between Extraversion and ASD symptomatology scores. And, replicating the findings of Schriber and colleagues' (2014) study, significant negative correlations emerged between Agreeableness (also found in Austin, 2005 and Kanai et al., 2011; but not Wakabayashi et al., 2006), Conscientiousness (also found in Wakabayashi et al., 2006 and Kanai et al., 2011; but not Austin, 2005), and Openness to Experience and ASD symptomatology scores. It is likely that the results differed between each of these studies due to each study's participants—Schriber and colleagues (2014) and Kanai and colleagues (2011) compared individuals with actual ASD diagnoses to individuals without diagnoses, while Austin (2005) and Wakabayashi and colleagues (2006) only studied individuals without diagnoses. Thus, more differences and significant correlations may arise when comparing a clinical sample to a non-clinical sample.

In regards to the FFM facets, almost all of the IPIP-NEO-120 facets significantly correlated in the same direction as their respective factors, as expected. Interestingly, there were a select few that did not: the Imagination facet of Openness to Experience had a significantly positive correlation with RAADS-R scores, while the Liberalism facet of Openness to Experience, Activity Level facet of Extraversion, and Modesty facet of Agreeableness did not significantly correlate with RAADS-R scores. These results potentially explain the aforementioned divergent Openness to Experience findings from previous studies of the FFM and ASD. As shown in Table 3 and Table 4, in between-group level

analyses, Openness to Experience was the only factor to have two facets go “against the grain” of the other facets (i.e., Imagination exhibited a significant positive correlation with ASD symptoms and was higher in adults with ASD, and Liberalism did not significantly differ, while the other four facets were significantly lower in adults with ASD and significantly negatively correlated with ASD symptoms).

Extant literature regarding imagination in adults with ASD is inconclusive, as the majority of studies have reported on pretend play and creative thinking deficits in children with ASD (Baird et al., 2000; Craig & Baron-Cohen, 1999; Craig et al., 2001). However, Kasari and colleagues (2011) have found that children with ASD, when prompted, can engage in pretend play as capably as their typically developing peers; thus, suggesting that these pretend play deficits lie in performance, not competence (Kasari et al., 2011). Roth (2008) goes on to theorize that the idiosyncratic thought and language that is characteristic of ASD allows for these individuals’ more physical, reality-based imagination skills (i.e., the ability to imagine real objects and events that have occurred) to be very much intact, while the imaginative deficits in ASD lie in socially-based imagination skills (i.e., using imagination to engage in pretend play with peers, inferring the emotions and thoughts of others, etc.). The IPIP-NEO-120 questions that mapped on to the facet of Imagination in the current study do not distinguish between socially-based and object-based imagination (see: Appendix 1, for full list of questionnaire items), thus, Roth’s theory appears to be in concordance with our results.

Lastly, as found in Schriber and colleagues’ (2014) study, personality traits correlated with ASD were stable across gender. Given the high percentage of female responses in the current study, and the paucity of research on adult females with ASD, it is important to note that this study is the largest of its kind to report on FFM personality profiles of adult females with ASD. Women with ASD having a higher response rate than men with ASD in the current study may seem initially peculiar given the significantly higher rate in which males are diagnosed than females. However, previous online studies

have found similar levels of female representation (Kapp et al., 2013; Gilmour, Schalomon, & Smith, 2012), which, as Kapp and colleagues (2013) theorized, may be due to the fact that females with ASD actively seek out social support from online communities more so than males.

### *Personality Subtypes for Adults with ASD*

The final goal of the current study was to determine whether there is one uniform autistic personality profile, or if different personality profiles exist within ASD. The *k*-means cluster analyses revealed 4 distinct groups based on IPIP-NEO-120 facet clusters. A vast array of demographic, ASD symptomatology, and personality differences arose when comparing these 4 clusters to one another, further illustrating the variability that exists within ASD.

Demographically, it appears we have obtained a sample of adults with ASD who have in some cases experienced “optimal outcomes” according to the criteria of previous research (Levy & Perry, 2011). In regards to employment data for adults with autism, an agreed upon statistic does not yet exist. However, data reported from a variety of studies suggest that this percentage ranges from 25-55% (Holwerda et al., 2012; Shattuck et al., 2012). Our sample was employed at a higher rate. Similarly, our clusters reported higher likelihood of being in romantic relationships than is reported in current literature, which suggests that between 0-38% of adults with autism are in long-term relationships or marriages (Howlin & Moss, 2012). Independent living data from our study was also elevated as compared to what has been reported in extant literature, which suggests that only 40-50% of adults with autism live independently (Levy & Perry, 2011). These findings are not surprising given that we were asking our participants to complete a 250-item online questionnaire. Additionally, the current study was remarkable in that it was able to reach a broad age range, as very little research has been conducted on older adults with ASD (Howlin & Moss, 2012).

Cluster 1 presented with an FFM personality profile, at the factor level, in line with previous FFM and social phobia research which found that social phobia positively correlated with Neuroticism, while negatively correlating with Extraversion (Kotov et al., 2010). Cluster 1's facet results also suggest this particular group to have either low social motivation or a socially anxious temperament or some combination of the two. Cluster 1's combination of elevated Anxiety, Self-Consciousness, Vulnerability, and Modesty with below average Assertiveness and Self-Efficacy is indicative of social anxiety, while Cluster 1's combination of elevated Depression, with below average Friendliness, Excitement-Seeking, Cheerfulness, and Adventurousness indicates low social motivation.

Like Cluster 1, Cluster 2 also exhibited elevated neuroticism and particularly low extraversion, but differed in that below average conscientiousness was also present. This particular profile at the FFM factor level has been associated with depression (Rosselini & Brown, 2011). Cluster 2's depressed profile is further evidenced by elevated depression and vulnerability, combined with below average cheerfulness, friendliness, and particularly low scores on five out of six conscientiousness facets. Cluster 2 also presented with some anti-social personality components with above average anger, below average agreeableness including particularly low morality, all traits which were not present in Cluster 1. Cluster 2 emerged as the cluster with the most challenges; this group was characterized by the lowest employment satisfaction, education, life satisfaction, and happiness of any of the four clusters. Previous FFM research indicates that this exact standing (high neuroticism, in conjunction with low extraversion, conscientiousness, and agreeableness) is most predictive of problematic outcomes (Ozer & Benet-Martinez, 2006). In addition, Cluster 2 also had the highest RAADS-R autism symptomatology scores coupled with the most undiagnosed individuals, and the most individuals that did not know whether they considered themselves to be on the autism spectrum.

Also, our results coincide with intellect being the facet most closely linked to intelligence, as well as a concept DeYoung and colleagues (2014) refer to as “cognitive exploration,” given that the Clusters 1 and 2 had the lowest Intellect scores and levels of education, as shown in Figure 2 and Table 5. Conscientiousness has been found to be the FFM personality factor most predictive of job performance, as well as GPA (grade point average) (Ozer & Benet-Martinez, 2006). Our results are in agreement with this given that Clusters 1 and 2 had the lowest Conscientiousness scores in addition to the lowest levels of employment and education.

Cluster 3 was similar to Cluster 2 in that it was the only other cluster with especially low agreeableness at the factor level, while also presenting with lower than average extraversion. However, Cluster 3 sets itself apart from Cluster 2 by presenting with average levels of Neuroticism and Conscientiousness. Cluster 3’s average neuroticism and conscientiousness (as opposed to above average in the former and below average in the latter) seems to serve as somewhat of a protective factor against this cluster’s socially disengaged traits of particularly low extraversion and agreeableness. Cluster 3 appears to experience fewer challenges than Cluster 2 based on Cluster 3 having higher levels of employment, satisfaction with employment, level of education, and happiness as shown in Table 5.

Cluster 4 emerged as the most well-adjusted group in that the average FFM factor and facet scores for this cluster were all within one standard deviation of the reference group mean, and this cluster also reported the highest levels of employment, life satisfaction, and happiness. Cluster 4 exhibited the highest extraversion and agreeableness and was the only cluster within 1 SD of the reference group mean on every facet of both Extraversion and Agreeableness. Cluster 4’s happiness and satisfaction data parallels previous studies of the general population in that more extraverted people tend to report higher life satisfaction (Luhmann et al., 2013).



In contrast to Clusters 1 and 2, Clusters 3 and 4 exhibited lower scores on every facet of neuroticism except immoderation, and Clusters 3 and 4 were within normal limits on every neuroticism facet. This finding also coincides with Cluster 3 and 4's significantly greater satisfaction with life, satisfaction with employment, and happiness. Previous research indicates that people with high neuroticism have the tendency to interpret their world as more difficult and threatening than those who are less neurotic (Luhmann et al., 2013).

Because agreeableness results varied so much between clusters, a finding did not emerge in Table 5 that is consistent with extant literature. Previous studies regarding romantic relationships and FFM personality factors indicate that high neuroticism and low agreeableness are consistently predictive of negative relationship outcomes (Ozer & Benet-Martinez, 2006). While this appears to be the case for Cluster 2, Cluster 4 contradicts this finding, as this cluster reported the fewest romantic relationships but exhibited relatively normative neuroticism and agreeableness scores.

In the entire set of IPIP-NEO-120 factor and facet means for all clusters, none of the clusters exhibited average personality profiles elevated in what is traditionally considered to be a "positive" direction (i.e., T scores below 40 for Neuroticism or any of its facets, or above 60 for Extraversion, Openness to Experience, Agreeableness, and Conscientiousness or for any of their corresponding facets).

According to our factor-level results, above average neuroticism and below average extraversion appear to be key components of ASD in adults, as they were common across all four clusters (not one cluster exhibited mean T scores less than 50 on Neuroticism, or above 50 on Extraversion; while there were clusters which exhibited T scores greater than 50 on Openness to Experience, Agreeableness, and Conscientiousness). Cluster 4, the only cluster with T scores within one standard deviation of the reference group mean on both Neuroticism and Extraversion, recorded significantly lower ASD

symptomatology scores than all other clusters on the RAADS-R. Our conclusion that above average neuroticism and below average extraversion are common elements characteristic of adults with ASD, regardless of other personality traits, extends previous FFM research in adults with ASD illustrating that these traits are elevated and low, respectively, at the factor level in people with ASD (Kanai et al., 2011).

In sum, cluster analyses within the ASD group revealed vastly differing personality profiles. Hu and colleagues' (2011) study provides an interesting parallel bio-behavioral set of findings on within-ASD personality clusters in that they identified specific single nucleotide polymorphisms (SNPs; i.e., DNA sequence variation) which were common to 2 or more ASD subgroups as well as SNPs unique to specific subgroups (e.g., the "Mild" ASD subgroup shared 3 specific SNPs with the "Language Impaired" ASD subgroup, while there were also 3 additional SNPs unique to the "Language Impaired" ASD subgroup). These findings offer a different level of evidence for the hypothesis that multiple meaningful ASD phenotypes may exist, and that these phenotypes may stem from combinations or patterns of individual differences (e.g., genetically influenced behavioral traits such as sensitivity to social reward and high fear-proneness) (Veatch et al., 2014).

The cluster results of the current study assist in better describing and defining the spectrum nature of autism in that there appear to be meaningful individual differences which seem to be related to differing levels of adaptive functioning and quality of life. These findings further emphasize the need and value of individualized intervention that can target specific challenges an individual with ASD may have (e.g., some individuals may need more help with overcoming fear; other individuals may need more help with organization and self-discipline; others may need help with empathy and interpreting the emotions of others; etc.) And these individuals' needs will not be met with a "one size fits all" approach; a spectrum disorder requires a spectrum of interventions.

## **Limitations**

All data in the current study were obtained from self-report measures. As in other solely self-report questionnaire-based studies, it is likely that correlations between measures and constructs could have been inflated due to mono-method bias (Ross et al., 2009). Also, the sample of participants recruited was a sample of convenience, given that in order to participate in the study participants needed access to a computer with internet, and had to be willing to complete an extensive questionnaire; factors which likely contributed to biasing the sample towards higher developmental and socioeconomic status (Kapp et al., 2013). Therefore, it is likely this sample is not representative of a proportion of adults with ASD, which is especially evident due to the high proportion of female participants even though ASD is reportedly more prevalent among males (Kim et al., 2011). As Kapp and colleagues (2013) suggest, a potential reason for the disproportionate representation in studies using internet-based recruitment could be the possibility that females with ASD present with subtler symptoms due to having developed coping skills that inadvertently mask autistic behaviors, and thus, they do not present as specifically autistic in behavior-based diagnostic assessments (Lai et al., 2011). Further, as reported in previous internet-based studies of ASD (e.g., Gilmour et al., 2012; Kapp et al., 2013, adult females with ASD may be overrepresented online in pursuit of social support due to difficulties being recognized or diagnosed as being on the autism spectrum (Jack, 2011). Therefore, to account for the gender and age variability in the current sample, gender and age-referenced scores for cluster analyses were utilized. Also, in order to define the ASD group in the current study (since there were conflicting sources of diagnosis information between having received a formal diagnosis, self-diagnosis, and using the RAADS-R diagnostic cut-off score), the RAADS-R cut-off score approach was determined to be the most empirically sound, after having checked results for each analysis against the most restrictive sample (those who reported having received a formal ASD diagnosis) and finding mostly strong convergence on analyses comparing the

most and the least restrictive (RAADS-R cut off) ASD samples. Lastly, in order to maximize the variability of ASD symptomatology scores, a combined sample of individuals with and without ASD was used in correlation and regression analyses; a similar strategy was employed by Ross and colleagues' (2009) study of FFM personality and psychopathy.

### **Conclusion**

The current study extended the findings of previous research in FFM personality and ASD. By confirming previous research regarding ASD within the FFM factor framework and expanding what is known about ASD into the FFM facet framework, we can better relate and connect ASD to other psychopathological constructs and outcomes that have been associated with the FFM (Schriber et al., 2014). Previous studies of personality in ASD, which focused on the FFM at the factor-level, have suggested a moderate link between FFM personality factors and ASD severity, with some suggestions that ASD spectrum behaviors may reflect a sixth factor of personality. The current study, however, suggests a rather strong connection between established personality traits and ASD when delving deeper into FFM facet-level analyses.

Adults with ASD, regardless of level of functioning, often demonstrate generally poor prognoses (Howlin, 2003). Though there are studies documenting these poor outcomes, based on current research, factors predictive of outcome for these individuals are not well understood (Ozonoff et al., 2005). Because the majority of adults with ASD remain highly dependent on support, irrespective of IQ, there must be an environmental mismatch for the majority of these individuals who often have employable skills and can be very intelligent, but experience challenges that hinder employment, independent living, social relations, day to day decision making, and problem solving abilities. Taking a closer, more detailed look at the personality profiles of adults with ASD may provide those who work with these individuals (practitioners, therapists, job coaches, etc.) more in-depth knowledge of these individuals'

strengths and weaknesses in an attempt to better understand why each individual may experience such difficulties in adulthood. In addition, the personality profiles of adults with ASD who have achieved positive outcomes (i.e., who report being happily employed, living on their own, etc.) may provide valuable information regarding what environments and situations seem to be the best fit for particular personality types (i.e., an individual with ASD with high Neuroticism, low Extraversion, and low Agreeableness might struggle in jobs involving customer service, but excel in jobs in information technology). Information gained from this study sheds light on the intricacies of the autism spectrum, by describing individuals based on a continuum of combinations of personality traits, a true spectrum, as opposed to being characterized solely based on being “low” or “high” functioning.

### **Appendix I: IPIP-NEO-120 Facet Items**

#### **Neuroticism**

##### **ANXIETY**

- 1. Worry about things.
- 31. Fear for the worst.
- 61. Am afraid of many things.
- 91. Get stressed out easily.

##### **ANGER**

- 6. Get angry easily.
- 36. Get irritated easily.
- 66. Lose my temper.
- 96. Am not easily annoyed.

##### **DEPRESSION**

- 11. Often feel blue.
- 41. Dislike myself.
- 71. Am often down in the dumps.
- 101. Feel comfortable with myself.

##### **SELF-CONSCIOUSNESS**

- 16. Find it difficult to approach others.
- 46. Am afraid to draw attention to myself.
- 76. Only feel comfortable with friends.
- 106. Am not bothered by difficult social situations.

##### **IMMODERATION**

- 21. Go on binges.
- 51. Rarely overindulge.
- 81. Easily resist temptations.
- 111. Able to control my cravings.

#### VULNERABILITY

- 26. Panic easily.
- 56. Become overwhelmed by events.
- 86. Feel that I'm unable to deal with things.
- 116. Remain calm under pressure.

### **Extraversion**

#### FRIENDLINESS

- 2. Make friends easily.
- 32. Feel comfortable around people.
- 62. Avoid contacts with others.
- 92. Keep others at a distance.

#### GREGARIOUSNESS

- 7. Love large parties.
- 37. Talk to a lot of different people at parties.
- 67. Prefer to be alone.
- 97. Avoid crowds.

#### ASSERTIVENESS

- 12. Take charge.
- 42. Try to lead others.
- 72. Take control of things.
- 102. Wait for others to lead the way.

#### ACTIVITY LEVEL

- 17. Am always busy.
- 47. Am always on the go.
- 77. Do a lot in my spare time.
- 107. Like to take it easy.

#### EXCITEMENT-SEEKING

- 22. Love excitement.
- 52. Seek adventure.
- 82. Enjoy being reckless.
- 112. Act wild and crazy.

#### CHEERFULNESS

- 27. Radiate joy.
- 57. Have a lot of fun.
- 87. Love life.
- 117. Look at the bright side of life.

### **Openness to Experience**

#### **IMAGINATION**

- 3. Have a vivid imagination.
- 33. Enjoy wild flights of fantasy.
- 63. Love to daydream.
- 93. Like to get lost in thought.

#### **ARTISTIC INTERESTS**

- 8. Believe in the importance of art.
- 38. See beauty in things that others might not notice.
- 68. Do not like poetry.
- 98. Do not enjoy going to art museums.

#### **EMOTIONALITY**

- 13. Experience my emotions intensely.
- 43. Feel others' emotions.
- 73. Rarely notice my emotional reactions.
- 103. Don't understand people who get emotional.

#### **ADVENTUROUSNESS**

- 18. Prefer variety to routine.
- 48. Prefer to stick with things that I know.
- 78. Dislike changes.
- 108. Am attached to conventional ways.

#### **INTELLECT**

- 23. Love to read challenging material.
- 53. Avoid philosophical discussions.
- 83. Have difficulty understanding abstract ideas.
- 113. Am not interested in theoretical discussions.

#### **LIBERALISM**

- 28. Tend to vote for liberal political candidates.
- 58. Believe that there is no absolute right or wrong.
- 88. Tend to vote for conservative political candidates.
- 118. Believe that we should be tough on crime.

### **Agreeableness**

#### **TRUST**

- 4. Trust others.
- 34. Believe that others have good intentions.
- 64. Trust what people say.
- 94. Distrust people.

#### MORALITY

- 9. Use others for my own ends.
- 39. Cheat to get ahead.
- 69. Take advantage of others.
- 99. Obstruct others' plans.

#### ALTRUISM

- 14. Love to help others.
- 44. Am concerned about others.
- 74. Am indifferent to the feelings of others.
- 104. Take no time for others.

#### COOPERATION

- 19. Love a good fight.
- 49. Yell at people.
- 79. Insult people.
- 109. Get back at others.

#### MODESTY

- 24. Believe that I am better than others.
- 54. Think highly of myself.
- 84. Have a high opinion of myself.
- 114. Boast about my virtues.

#### SYMPATHY

- 29. Sympathize with the homeless.
- 59. Feel sympathy for those who are worse off than myself.
- 89. Am not interested in other people's problems.
- 119. Try not to think about the needy.

#### **Conscientiousness**

#### SELF-EFFICACY

- 5. Complete tasks successfully.
- 35. Excel in what I do.
- 65. Handle tasks smoothly.
- 95. Know how to get things done.

#### ORDERLINESS



- 10. Like to tidy up.
- 40. Often forget to put things back in their proper place.
- 70. Leave a mess in my room.
- 100. Leave my belongings around.

#### DUTIFULNESS

- 15. Keep my promises.
- 45. Tell the truth.
- 75. Break rules.
- 105. Break my promises

#### ACHIEVEMENT-STRIVING

- 20. Work hard.
- 50. Do more than what's expected of me.
- 80. Do just enough work to get by.
- 110. Put little time and effort into my work.

#### SELF-DISCIPLINE

- 25. Am always prepared.
- 55. Carry out my plans.
- 85. Waste my time.
- 115. Have difficulty starting tasks.

#### CAUTIOUSNESS

- 30. Jump into things without thinking.
- 60. Make rash decisions.
- 90. Rush into things.
- 120. Act without thinking.

## **Appendix II: Description of IPIP-NEO-120 Factors and Facets**

(Originally written by Dr. John A. Johnson)

### **Neuroticism**

Freud originally used the term *neurosis* to describe a condition marked by mental distress, emotional suffering, and an inability to cope effectively with the normal demands of life. He suggested that everyone shows some signs of neurosis, but that we differ in our degree of suffering and our specific symptoms of distress. Today neuroticism refers to the tendency to experience negative feelings. Those who score high on Neuroticism may experience primarily one specific negative feeling such as anxiety, anger, or depression, but are likely to experience several of these emotions. People high in neuroticism are emotionally reactive. They respond emotionally to events that would not affect most people, and their reactions tend to be more intense than normal. 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 a neurotic's ability 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; frequency of positive emotions is a component of the Extraversion domain.

### Neuroticism Facets

- *Anxiety*. The "fight-or-flight" system of the brain of anxious individuals is too easily and too often engaged. Therefore, people who are high in anxiety often feel like something dangerous is about to happen. They may be afraid of specific situations or be just generally fearful. They feel tense, jittery, and nervous. Persons low in Anxiety are generally calm and fearless.
- *Anger*. Persons who score high in Anger feel enraged when things do not go their way. They are sensitive about being treated fairly and feel resentful and bitter when they feel they are being cheated. This scale measures the tendency to *feel* angry; whether or not the person *expresses* annoyance and hostility depends on the individual's level on Agreeableness. Low scorers do not get angry often or easily.
- *Depression*. This scale measures the tendency to feel sad, dejected, and discouraged. High scorers lack energy and have difficult initiating activities. Low scorers tend to be free from these depressive feelings.
- *Self-Consciousness*. Self-conscious individuals are sensitive about what others think of them. Their concern about rejection and ridicule cause them to feel shy and uncomfortable around others. They are easily embarrassed and often feel ashamed. Their fears that others will criticize or make fun of them are exaggerated and unrealistic, but their awkwardness and discomfort may make these fears a self-fulfilling prophecy. Low scorers, in contrast, do not suffer from the mistaken impression that everyone is watching and judging them. They do not feel nervous in social situations.
- *Immoderation*. Immoderate individuals feel strong cravings and urges that they have difficulty resisting. They tend to be oriented toward short-term pleasures and rewards rather than long-term consequences. Low scorers do not experience strong, irresistible cravings and consequently do not find themselves tempted to overindulge.
- *Vulnerability*. High scorers on Vulnerability experience panic, confusion, and helplessness when under pressure or stress. Low scorers feel more poised, confident, and clear-thinking when stressed.

### Extraversion

Extraversion is marked by pronounced engagement with the external world. Extraverts enjoy being with people, are full of energy, and often experience positive emotions. 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 exuberance, energy, and activity levels of extraverts. They tend to be quiet, low-key, deliberate, and disengaged from the social world. Their lack of social involvement should not be interpreted as shyness or depression; the introvert simply needs less stimulation than an extravert and prefers to be alone. The independence and reserve of the introvert is sometimes mistaken as unfriendliness or arrogance. In reality, an introvert who scores high on the agreeableness dimension will not seek others out but will be quite pleasant when approached.

### **Extraversion Facets**

- *Friendliness.* Friendly people genuinely like other people and openly demonstrate positive feelings toward others. They make friends quickly and it is easy for them to form close, intimate relationships. Low scorers on Friendliness are not necessarily cold and hostile, but they do not reach out to others and are perceived as distant and reserved.
- *Gregariousness.* Gregarious people find the company of others pleasantly stimulating and rewarding. They enjoy the excitement of crowds. Low scorers tend to feel overwhelmed by, and therefore actively avoid, large crowds. They do not necessarily dislike being with people sometimes, but their need for privacy and time to themselves is much greater than for individuals who score high on this scale.
- *Assertiveness.* High scorers Assertiveness like to speak out, take charge, and direct the activities of others. They tend to be leaders in groups. Low scorers tend not to talk much and let others control the activities of groups.
- *Activity Level.* Active individuals lead fast-paced, busy lives. They move about quickly, energetically, and vigorously, and they are involved in many activities. People who score low on this scale follow a slower and more leisurely, relaxed pace.
- *Excitement-Seeking.* High scorers on this scale are easily bored without high levels of stimulation. They love bright lights and hustle and bustle. They are likely to take risks and seek thrills. Low scorers are overwhelmed by noise and commotion and are adverse to thrill-seeking.
- *Cheerfulness.* This scale measures positive mood and feelings, not negative emotions (which are a part of the Neuroticism domain). Persons who score high on this scale typically experience a range of positive feelings, including happiness, enthusiasm, optimism, and joy. Low scorers are not as prone to such energetic, high spirits.

### **Openness to Experience**

Openness to Experience describes a dimension of cognitive style that distinguishes imaginative, creative people from down-to-earth, conventional people. Open people are intellectually curious, appreciative of art, and sensitive to beauty. They tend to be, compared to closed people, more aware of their feelings. They tend to think and act in individualistic and nonconforming ways. Intellectuals typically score high on Openness to Experience; consequently, this factor has also been called *Culture* or *Intellect*. Nonetheless, Intellect is probably best regarded as one aspect of openness to experience. Scores on Openness to Experience are only modestly related to years of education and scores on standard intelligent tests.

Another characteristic of the open cognitive style is a facility for thinking in symbols and abstractions far removed from concrete experience. Depending on the individual's specific intellectual abilities, this symbolic cognition may take the form of mathematical, logical, or geometric thinking, artistic and

metaphorical use of language, music composition or performance, or one of the many visual or performing arts. People with low scores on openness to experience tend to have narrow, common interests. They prefer the plain, straightforward, and obvious over the complex, ambiguous, and subtle. They may regard the arts and sciences with suspicion, regarding these endeavors as abstruse or of no practical use. Closed people prefer familiarity over novelty; they are conservative and resistant to change.

Openness is often presented as healthier or more mature by psychologists, who are often themselves open to experience. However, open and closed styles of thinking are useful in different environments. The intellectual style of the open person may serve a professor well, but research has shown that closed thinking is related to superior job performance in police work, sales, and a number of service occupations.

### Openness Facets

- *Imagination.* To imaginative individuals, the real world is often too plain and ordinary. High scorers on this scale use fantasy as a way of creating a richer, more interesting world. Low scorers are on this scale are more oriented to facts than fantasy.
- *Artistic Interests.* High scorers on this scale love beauty, both in art and in nature. They become easily involved and absorbed in artistic and natural events. They are not necessarily artistically trained nor talented, although many will be. The defining features of this scale are *interest in*, and *appreciation of* natural and artificial beauty. Low scorers lack aesthetic sensitivity and interest in the arts.
- *Emotionality.* Persons high on Emotionality have good access to and awareness of their own feelings. Low scorers are less aware of their feelings and tend not to express their emotions openly.
- *Adventurousness.* High scorers on adventurousness are eager to try new activities, travel to foreign lands, and experience different things. They find familiarity and routine boring, and will take a new route home just because it is different. Low scorers tend to feel uncomfortable with change and prefer familiar routines.
- *Intellect.* Intellect and artistic interests are the two most important, central aspects of openness to experience. High scorers on Intellect love to play with ideas. They are open-minded to new and unusual ideas, and like to debate intellectual issues. They enjoy riddles, puzzles, and brain teasers. Low scorers on Intellect prefer dealing with either people or things rather than ideas. They regard intellectual exercises as a waste of time. Intellect should not be equated with intelligence. Intellect is an intellectual style, not an intellectual ability, although high scorers on Intellect score slightly higher than low-Intellect individuals on standardized intelligence tests.
- *Liberalism.* Psychological liberalism refers to a readiness to challenge authority, convention, and traditional values. In its most extreme form, psychological liberalism can even represent outright hostility toward rules, sympathy for law-breakers, and love of ambiguity, chaos, and disorder. Psychological conservatives prefer the security and stability brought by conformity to tradition. Psychological liberalism and conservatism are not identical to political affiliation, but certainly incline individuals toward certain political parties.

### Agreeableness

Agreeableness reflects individual differences in concern with cooperation and social harmony. Agreeable individuals value getting along with others. They are therefore 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 therefore are unlikely to extend themselves for other people. Sometimes their skepticism about others' motives causes them to be suspicious, unfriendly, and uncooperative.

Agreeableness is obviously advantageous for attaining and maintaining popularity. Agreeable people are better liked than disagreeable people. On the other hand, agreeableness is not useful in situations that require tough or absolute objective decisions. Disagreeable people can make excellent scientists, critics, or soldiers.

### Agreeableness Facets

- *Trust*. A person with high trust assumes that most people are fair, honest, and have good intentions. Persons low in trust see others as selfish, devious, and potentially dangerous.
- *Morality*. High scorers on this scale see no need for pretense or manipulation when dealing with others and are therefore candid, frank, and sincere. Low scorers believe that a certain amount of deception in social relationships is necessary. People find it relatively easy to relate to the straightforward high-scorers on this scale. They generally find it more difficult to relate to the unstraightforward low-scorers on this scale. It should be made clear that low scorers are not unprincipled or immoral; they are simply more guarded and less willing to openly reveal the whole truth.
- *Altruism*. Altruistic people find helping other people genuinely rewarding. Consequently, they are generally willing to assist those who are in need. Altruistic people find that doing things for others is a form of self-fulfillment rather than self-sacrifice. Low scorers on this scale do not particularly like helping those in need. Requests for help feel like an imposition rather than an opportunity for self-fulfillment.
- *Cooperation*. Individuals who score high on this scale dislike confrontations. They are perfectly willing to compromise or to deny their own needs in order to get along with others. Those who score low on this scale are more likely to intimidate others to get their way.
- *Modesty*. High scorers on this scale do not like to claim that they are better than other people. In some cases this attitude may derive from low self-confidence or self-esteem. Nonetheless, some people with high self-esteem find immodesty unseemly. Those who are willing to describe themselves as superior tend to be seen as disagreeably arrogant by other people.
- *Sympathy*. People who score high on this scale are tenderhearted and compassionate. They feel the pain of others vicariously and are easily moved to pity. Low scorers are not affected strongly by human suffering. They pride themselves on making objective judgments based on reason. They are more concerned with truth and impartial justice than with mercy.

### Conscientiousness

Conscientiousness concerns the way in which we control, regulate, and direct our impulses. Impulses are not inherently bad; occasionally time constraints require a snap decision, and acting on our first impulse can be an effective response. Also, in times of play rather than work, acting spontaneously and impulsively can be fun. Impulsive individuals can be seen by others as colorful, fun-to-be-with, and zany.

Nonetheless, acting on impulse can lead to trouble in a number of ways. Some impulses are antisocial. Uncontrolled antisocial acts not only harm other members of society, but also can result in retribution toward the perpetrator of such impulsive acts. Another problem with impulsive acts is that they often produce immediate rewards but undesirable, long-term consequences. Examples include excessive socializing that leads to being fired from one's job, hurling an insult that causes the breakup of an important relationship, or using pleasure-inducing drugs that eventually destroy one's health.

Impulsive behavior, even when not seriously destructive, diminishes a person's effectiveness in significant ways. Acting impulsively disallows contemplating alternative courses of action, some of which would have been wiser than the impulsive choice. Impulsivity also sidetracks people during projects that require organized sequences of steps or stages. Accomplishments of an impulsive person are therefore small, scattered, and inconsistent.

A hallmark of intelligence, what potentially separates human beings from earlier life forms, is the ability to think about future consequences before acting on an impulse. Intelligent activity involves contemplation of long-range goals, organizing and planning routes to these goals, and persisting toward one's goals in the face of short-lived impulses to the contrary. The idea that intelligence involves impulse control is nicely captured by the term prudence, an alternative label for the Conscientiousness domain. Prudent means both wise and cautious. Persons who score high on the Conscientiousness scale are, in fact, perceived by others as intelligent.

The benefits of high conscientiousness are obvious. Conscientious individuals avoid trouble and achieve high levels of success through purposeful planning and persistence. They are also positively regarded by others as intelligent and reliable. On the negative side, they can be compulsive perfectionists and workaholics. Furthermore, extremely conscientious individuals might be regarded as stuffy and boring. Unconscientious people may be criticized for their unreliability, lack of ambition, and failure to stay within the lines, but they will experience many short-lived pleasures and they will never be called stuffy.

### **Conscientiousness Facets**

- *Self-Efficacy*. Self-Efficacy describes confidence in one's ability to accomplish things. High scorers believe they have the intelligence (common sense), drive, and self-control necessary for achieving success. Low scorers do not feel effective, and may have a sense that they are not in control of their lives.
- *Orderliness*. Persons with high scores on orderliness are well-organized. They like to live according to routines and schedules. They keep lists and make plans. Low scorers tend to be disorganized and scattered.
- *Dutifulness*. This scale reflects the strength of a person's sense of duty and obligation. Those who score high on this scale have a strong sense of moral obligation. Low scorers find contracts,

rules, and regulations overly confining. They are likely to be seen as unreliable or even irresponsible.

- *Achievement-Striving*. Individuals who score high on this scale strive hard to achieve excellence. Their drive to be recognized as successful keeps them on track toward their lofty goals. They often have a strong sense of direction in life, but extremely high scores may be too single-minded and obsessed with their work. Low scorers are content to get by with a minimal amount of work, and might be seen by others as lazy.
- *Self-Discipline*. Self-discipline-what many people call will-power-refers to the ability to persist at difficult or unpleasant tasks until they are completed. People who possess high self-discipline are able to overcome reluctance to begin tasks and stay on track despite distractions. Those with low self-discipline procrastinate and show poor follow-through, often failing to complete tasks-even tasks they want very much to complete.
- *Cautiousness*. Cautiousness describes the disposition to think through possibilities before acting. High scorers on the Cautiousness scale take their time when making decisions. Low scorers often say or do first thing that comes to mind without deliberating alternatives and the probable consequences of those alternatives.

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