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ADHD symptoms and personality: relationships with the five-factor model

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Abstract

This study examined the relationship between ADHD symptoms and basic personality in a large sample of adults (122 men and 465 women). Participants completed the DSM-IV ADHD Scales from the Conners Adult ADHD Rating Scale (CAARS) as well as the NEO Five-Factor Inventory (NEO-FFI). Collectively, the five scales on the NEO-FFI accounted for substantial amounts of variability in ADHD symptoms. Although previous research on personality and ADHD has focused primarily on extraversion and neuroticism, the present study found that agreeableness and conscientiousness were stronger predictors. This pattern of results is consistent with the clinical literature on adults with ADHD.

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1. Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is one of the most frequently diagnosed disorders in childhood. According to the DSM-IV (American Psychiatric Association, 1994), the core feature of this disorder is a persistent pattern of hyperactivity–impulsivity and/or inattention that is developmentally inappropriate. Presently, an estimated 3–5% of school age children are diagnosed with ADHD (Barkley, 1997; White, 1999). Children with ADHD are also at risk for and often diagnosed with comorbid psychiatric disorders such as, conduct disorder, oppositional disorder, major depression, and learning disabilities (Biederman, Faraone, & Lapey, 1992; Weiss

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& Hechtman, 1993). Further, research has revealed that ADHD is not only confined to childhood, but is a condition which persists in 50–80% of cases in adolescence and in 30–50% of cases in adulthood (Barkley, 1997; Murphy & Barkley, 1996).

Given the persistence of ADHD symptoms from childhood to adulthood in many individuals, it is not surprising that there is a growing interest in the relationship between basic personality and ADHD (White, 1999). The study of the link between personality and ADHD has the potential of increasing our understanding of the diatheses and structure of this clinical disorder (Watson, Clark, & Harkness, 1994). To date, most of the research on personality and ADHD has focused on a very narrow range of personality constructs. In particular, much of this work has explored the link between extraversion and ADHD (Nigg, 2000), especially the sensation seeking facet of this basic personality dimension (White, 1999). An influential model developed by Barkley (1997), which builds on the older work of a number of different researchers (for detailed historical reviews, see Barkley, 1998; Nigg, 2000), suggests that ADHD is a deficit in behavioral inhibition in four executive neuropsychological functions: self-regulation of affect-motivation arousal, internalization of speech, working memory, and behavioral analysis. It is believed that individuals with ADHD, as a consequence of these deficits, seek external stimulation through increased activity and sensory experiences (White, 1999). In a study with young adults, Shaw and Giambra (1993) found that individuals diagnosed with ADHD as children had higher levels of sensation seeking than non-ADHD controls. Braaten and Rosen (1997), also studying young adults, found that a measure of general ADHD symptomatology was positively associated with extraversion. John, Caspi, Robins, Moffitt, and Stouthamer-Loeber (1994) reported a moderate association between teacher ratings of “externalizing” problem behaviors (behaviors that overlap with a number of core ADHD symptoms) in a sample of adolescents identified as at high risk for “delinquency”.

The presence of emotional lability or emotional “hyperresponsiveness” is a common clinical feature in ADHD (Barkley, 1997, 1998). Not surprisingly, neuroticism is another personality dimension that has received attention in the ADHD literature (Nigg, 2000; White, 1999). Prone-ness to the experience of negative emotions and emotional lability are key components in most of the influential models that have been proposed for the neuroticism construct (Costa & McCrae, 1992; Eysenck & Eysenck, 1985; Goldberg, 1990). Shea and Fisher (1996) found moderate associations between several measures of emotional lability and impulsivity symptoms in a non-clinical sample of boys (8–11 years of age); moderate associations were found between the same emotional lability measures and hyperactivity symptoms in girls. Braaten and Rosen (1997), in their study with young adults, found that a measure of general ADHD symptomatology was positively associated with neuroticism.

Other basic personality dimensions (such as openness to experience, agreeableness and conscientiousness) have received very little research attention (Nigg, 2000; White, 1999). Graziano, Jensen-Campbell and Finch (1997) report a moderate association between teacher ratings of disruptive classroom behavior (a frequent behavior in children who receive a diagnosis of ADHD) and agreeableness in a sample of adolescents. Huey and Weisz (1997) found that a variety of externalizing problem behaviors associated with ADHD (e.g., disruptive classroom behavior, argues with classmates, or fails to carry out assigned tasks) were negatively associated with both agreeableness and conscientiousness.

The general lack of research on personality dimensions like agreeableness and conscientiousness is unfortunate, since the clinical literature on adult ADHD is quite suggestive about an important

connection (Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1993; Nadeau, 1995). After the transition from adolescence to young adulthood, success in post-secondary and full-time work environments often depend on a number of important interpersonal abilities associated with the agreeableness and conscientiousness personality dimensions (Jensen-Campbell & Graziano, 2001; Judge, Martocchio, & Thoresen, 1997; Laursen, Pulkkinen, & Adams, 2002; Salgado, 1997). Academic and vocational achievement often depends on the quality of an individual's time-management and multi-tasking skills, particularly when relevant behaviors are "inner-directed" (as opposed to being "other-directed" by family, teachers, or employers). These types of skills are particularly problematic for adults with ADHD (Barkley, 1998; Mannuzza et al., 1993; Nadeau, 1995; Schwiebert, Sealander, & Dennison, 2002).

To summarize the recent literature, although there is evidence that some basic dimensions of personality are associated with ADHD, much of the previous research on this topic has methodological limitations. Research has focused on a very narrow range of personality dimensions; extraversion and neuroticism are typically studied, while other basic dimensions like openness, conscientiousness and agreeableness have been ignored (Nigg, 2000; White, 1999). It should also be noted that ADHD is typically conceptualized as a unidimensional construct, although the diagnostic model used with the disorder explicitly identifies separate attention and hyperactivity/impulsivity dimensions (APA, 1994).

The aim of the present study was to examine the relationship between ADHD symptomatology and basic personality in a large sample of adults. In accordance with the lack of research specific to adult ADHD, there has been much controversy regarding the validity of the current diagnostic criteria. One of the more controversial issues in the ADHD area has been the relevance of the diagnostic criteria for adults. Although the prevalence of the disorder appears to decrease with age (Barkley, Fischer, Edelbrock, & Smallish, 1990; Barkley, Fischer, Smallish, & Fletcher, 2002; Smith, & Johnson, 1998), it is unclear at the present time how much change occurs between early adulthood and later adulthood. In an effort to minimize the potential impact of age related effects, the present study focused on ADHD symptomatology in a homogenous group of young adults. Furthermore, in an effort to overcome some of the previous limitations in the literature that has focused on a narrow range of personality dimensions, we used a measure of basic personality that assesses the dimensions associated with the Five-Factor Model of personality (Costa & McCrae, 1992; Goldberg, 1990). In addition, we used a measure of ADHD symptomatology that allowed us to examine the link between basic personality and separate dimensions of inattention and hyperactivity/impulsivity symptomatology.

2. Method

2.1. Subjects

The sample consisted of 587 adults (122 men and 465 women) attending a small Ontario university (where the majority of students are women). The mean age of the sample was 19.51 years (*S.D.* = 0.86). Eighty-nine percent of the participants identified themselves as White, 1.5% as Black, 3.6% as Asian, 2.2% as Native American, and 3.6% did not indicate their race.

2.2. Measures and procedure

Participants were recruited from two large psychology classes and asked if they would volunteer to participate in a study on “emotion and personality”. In September, at the start of the academic year, participants completed the Conners Adult ADHD Rating Scale (CAARS; Conners, Erhardt, Epstein, Parker, Sitarenios, & Sparrow, 1999; Conners, Erhardt, & Sparrow, 1999; Erhardt, Epstein, Conners, Parker, & Sitarenios, 1999) at the end of a regularly scheduled class. Four weeks later, participants completed the NEO Five-Factor Inventory (NEO-FFI; Costa & McCrae, 1992) also at the end of a regularly scheduled class.

The CAARS consists of 66 items, which use a four-point Likert scale (ranging from “0” for “not at all true” to “3” for “very much true”), designed to assess symptoms and behaviors related to ADHD in adults. The CAARS includes three DSM-IV symptom scales (inattention, hyperactivity/impulsivity, and combined) that assess ADHD symptoms according to criteria listed in the DSM-IV (APA, 1994). The instrument takes about 15 min to complete and has demonstrated adequate reliability and validity (Conners, Erhardt, Epstein et al., 1999; Erhardt et al., 1999). The CAARS manual (Conners, Erhardt, & Sparrow, 1999) also provides cut-off scores for the DSM-IV ADHD scales that can be used to identify individuals currently experiencing clinically elevated levels of ADHD symptomatology.

The NEO-FFI (Costa & McCrae, 1992) is the short version of the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992) and yields scores on the five major domains of personality: neuroticism, extraversion, openness, agreeableness, and conscientiousness. The NEO-FFI consists of 60 items that use five-point Likert scales (ranging from “0” for “strongly disagree” to “4” for “strongly agree”) each of the personality dimensions. Each of the five scales consists of 12 items. The NEO-FFI takes about 10–15 min to complete and has demonstrated adequate reliability and validity (e.g. Costa & McCrae, 1992; Holden & Fekken, 1994).

In an effort to compare personality dimensions in individuals with extreme levels of ADHD symptomatology, respondents were categorized into three non-overlapping groups (inattentive ADHD type, hyperactivity/impulsive ADHD type, and non-ADHD controls) on the basis of cut-off scores on the DSM-IV ADHD Scales from the CAARS (Conners, Erhardt, & Sparrow, 1999b).¹ Respondents with clinically elevated scores on the inattentive scale constituted the high inattentive ADHD group; respondents with clinically elevated scores on the Hyperactivity/Impulsivity Scale constituted the high hyperactivity/impulsivity group; respondents with standard scores of 100 (50th percentile) or less were classified as non-ADHD controls. The high inattentive group consisted of 44 adults (34 women and 10 men); the high hyperactivity/impulsivity ADHD group consisted of 38 adults (32 women and 6 men); the non-ADHD controls consisted of 189 adults (160 women and 29 men).

3. Results

3.1. Total sample

Table 1 presents the means and standard deviations for the CAARS and NEO-FFI variables, as well as the Pearson product moment correlations among all variables for the total sample. To

¹ Although the DSM-IV includes a subtype of combined hyperactivity/impulsivity and inattention, only seven respondents fell into this category.

Table 1

Means, standard deviations, and intercorrelations for the CAARS and NEO-FFI variables ($n=587$)

Measure	1	2	3	4	5	6	7	8
1 DSM Inattention	–							
2 DSM Hyper	0.38*	–						
3 DSM Total	0.87*	0.79*	–					
4 Neuroticism	0.42*	0.30*	0.44*	–				
5 Extraversion	–0.19*	0.06	–0.10*	–0.41*	–			
6 Openness	–0.05	–0.05	–0.06	–0.03	–0.05	–		
7 Agreeableness	–0.21*	–0.36*	–0.33*	–0.28*	0.30*	–0.04	–	
8 Conscientious	–0.59*	–0.25*	–0.52*	–0.32*	0.26*	–0.11*	0.26*	–
Mean	8.76	8.57	17.33	34.61	41.18	41.52	44.61	43.13
S.D.	4.14	3.35	6.24	9.06	6.89	6.59	6.44	7.68

test for possible gender differences in the pattern of intercorrelations among CAARS and NEO-FFI Scales, the equality of the covariance matrices for men and women was tested using Statistica 5.1 (Statsoft, 1995). As recommended by Cole (1987), multiple criteria were used to assess the equality of the matrices. The criteria for equivalence was a Steiger–Lind RMSEA index (RMSEA; Steiger & Browne, 1984) < 0.10 , a population gamma index (PGI; Tanaka & Huba, 1989) greater than 0.90, and an adjusted PGI (APGI; Statsoft, 1995) greater than 0.80. The results indicate that the pattern of intercorrelations for men and women were virtually identical: RMSEA = 0.031, PGI = 0.997, and APGI = 0.992. Therefore, all results will be presented for men and women combined.

Three separate standard multiple regression analyses were performed with each of the CAARS inattention, hyperactivity/impulsivity, or combined scales as the predicted variables and the five personality dimensions from the NEO-FFI (neuroticism, extraversion, openness, agreeableness, and conscientiousness) as predictor variables. Table 2 presents the results from the standard multiple regression analyses.

The NEO-FFI scales predicted 41% of the variability in inattention symptomatology, with neuroticism and conscientiousness individually predicting 5 and 23%, respectively, of this variability. For hyperactivity/impulsivity symptomatology, the NEO-FFI scales predicted less variability (26%), with neuroticism (6%), extraversion (7%) and agreeableness (10%) the best predictors. For total ADHD symptoms, the NEO-FFI accounted for 41% of the variability. Although all five personality scales were significant predictors, neuroticism (8%) and conscientiousness (16%) were the strongest predictors.

3.2. Elevated vs. non-ADHD controls

Table 3 presents the means and standard deviations on the five NEO-FFI Scales for the two high ADHD groups as well as for the non-ADHD controls. A series of one-way ANOVAs were conducted with group as the independent variable (inattentive, hyperactivity/impulsivity, vs. control) and each of the NEO-FFI scales as the dependent variable.

The main effect for the neuroticism scale was found to be significant [$F(2, 268) = 36.03$, $P < 0.001$, $\eta^2 = 0.21$]. Multiple comparisons (Student–Newman–Keuls procedure) found that the

Table 2

Standard multiple regression results (NEO-FFI Scales predicting ADHD scores)

Criterion	Predictors	SE	β	sr	t	P
Inattentive	Neuroticism	0.036	0.269	0.23	7.38	<.001
	Extraversion	0.036	0.054	0.05	1.52	0.129
	Openness	0.032	−0.094	−0.09	2.93	0.004
	Agreeableness	0.034	−0.015	−0.01	0.45	0.655
	Conscientiousness	0.035	−0.522	0.48	15.13	<.000
	Overall $F(5, 581) = 82.85$, $P < 0.001$, $R^2 = 0.416$, adjusted $R^2 = 0.411$					
Hyperactive/Impulsive	Neuroticism	0.041	0.280	0.24	6.85	<.001
	Extraversion	0.040	0.309	0.27	7.70	<.001
	Openness	0.036	−0.052	−0.05	1.45	0.147
	Agreeableness	0.038	−0.333	−0.31	8.65	<.001
	Conscientiousness	0.039	−0.161	−0.15	4.17	<.000
	Overall $F(5, 581) = 41.788$, $P < 0.001$, $R^2 = 0.264$, adjusted $R^2 = 0.258$					
Total ADHD	Neuroticism	0.036	0.328	0.29	9.04	<.001
	Extraversion	0.036	0.202	0.18	5.66	<.001
	Openness	0.032	−0.090	−0.09	2.82	0.005
	Agreeableness	0.034	−0.188	−0.18	5.52	<.001
	Conscientiousness	0.034	−0.432	−0.40	12.56	<.000
	Overall $F(5, 581) = 83.69$, $P < 0.001$, $R^2 = 0.419$, adjusted $R^2 = 0.414$					

SE = standard error; β = standardized regression coefficients; sr = semi-partial correlations.

Table 3

Means and standard deviations on the NEO-FFI Scales for the inattentive, hyperactive, and non-ADHD groups

Scale	Inattentive		Hyper/Imp.		Controls	
	Mean (<i>n</i> = 44)	S.D.	Mean (<i>n</i> = 38)	S.D.	Mean (<i>n</i> = 189)	S.D.
Neuroticism	42.36	8.72a,b	37.42	9.78c	30.82	8.40
Extraversion	37.29	7.82a,b	42.58	7.57	41.67	6.90
Openness	39.84	6.76	39.02	7.94	41.76	5.95
Agreeableness	42.00	5.75b	40.26	5.90c	47.00	6.09
Conscientiousness	35.34	6.06a,b	42.55	8.17c	48.28	6.11

a, inattentive group \neq hyperactivity/impulsivity group; b, inattentive group \neq control group; c, hyperactivity/impulsivity group \neq control group.

inattentive group scored significantly higher than the other two groups on neuroticism, while the hyperactivity/impulsive group scored significantly higher than non-ADHD controls.

The main effect for the Extraversion Scale was also found to be significant [$F(2, 268) = 7.65$, $P < 0.001$, $\eta^2 = 0.05$]. Multiple comparisons found that the inattentive group scored significantly lower than the other two groups on extraversion.

The main effect for the Openness Scale was significant [$F(2, 268) = 3.86$, $P < 0.001$, $\eta^2 = 0.03$], however none of the multiple comparisons were significant ($P > 0.05$).

The main effect for the Agreeableness Scale was significant [$F(2, 268) = 27.54$, $P < 0.001$, $\eta^2 = 0.17$]. Multiple comparisons found that non-ADHD controls scored significantly higher than the two high ADHD groups on agreeableness.

The main effect for the Conscientiousness Scale was also significant [$F(2, 268) = 76.54$, $P < 0.001$, $\eta^2 = 0.36$]. Multiple comparisons found that the non-ADHD controls scored significantly higher than the two high ADHD groups on conscientiousness, while the hyperactivity/impulsivity group scored significantly higher than the inattentive group.

4. Discussion

The present study examined the relationship between adult ADHD symptomatology and the personality dimensions associated with the Five-Factor Model of personality. Regardless of whether the ADHD dimensions of inattention and hyperactivity/impulsivity were operationalized as continuous or categorical variables, the associations with specific personality variables were very consistent. Collectively, the five scales on the NEO-FFI accounted for substantial amounts of variability in ADHD symptomatology: 41% of the variability in inattention scores, 26% for hyperactivity/impulsivity scores, and 41% for total ADHD scores. The relationship between personality and ADHD symptomatology was similar for men and women. Although the prevalence of ADHD is higher in males and females when assessing children or adolescents, a gender difference is much less apparent in adults (DuPaul et al., 2001). When the analysis focused on personality scores across the high ADHD and control groups, significant differences were found across all personality dimensions (with effect sizes ranging from 0.03 to 0.36).

Much of the previous research on the relationship between ADHD and the basic personality has focused on extraversion (Antrop, Roeyers, Van Oost, & Buysse, 2000; Hines & Shaw, 1993; Shaw & Giambra, 1993). The general assumption behind this interest is the belief that the ADHD individual lacks internal stimulation, thus, their disruptive behavior patterns are viewed as a means by which the individual compensates for low levels of arousal. Consistent with previous research, the present study found that extraversion was a significant predictor of hyperactive/impulsive ADHD symptoms. It is important to note, however, that inattentive symptomatology was not related to this personality dimension. Extraversion was not a significant predictor of inattentive symptoms in the regression analysis; as well, the inattentive group did not score significantly different from the non-ADHD controls on extraversion. This differential pattern of results underscores the importance of separate analyses for inattention and hyperactivity/impulsivity symptoms (something rarely done in previous research on ADHD and personality).

Unlike results with extraversion, the present study found neuroticism to be a significant predictor of both inattention and hyperactivity/impulsivity symptomatology. The semi-partial

correlation was virtually identical in both regression analyses (and slightly higher for total ADHD symptoms). Both the inattentive group and the hyperactivity/impulsivity group also scored significantly higher than the non-ADHD control group on neuroticism (with the inattentive group also scoring significantly higher than the other ADHD group on this personality variable). These results are quite consistent with previous research on ADHD and personality, where the relationship with neuroticism has figured prominently (Lufi & Parish-Plass, 1995; Perrin & Last, 1996). Individuals with ADHD share a number of features with individuals scoring high on measures of neuroticism, particularly emotional “hyperresponsiveness”, a common clinical feature in ADHD (Barkley, 1997).

Although extraversion and neuroticism were found to be significant predictors of ADHD symptomatology, it needs to be emphasized that these two variables accounted for less overall variability than from other scales on the NEO-FFI (for inattentive scores, extraversion and neuroticism accounted for only 6% of the variability, while the adjusted R^2 was 0.41; for the hyperactivity/impulsivity scores, these two personality variables accounted for 13% of the variability, while the adjusted R^2 was 0.26). It is also worth noting that the personality dimensions assessed by the other NEO-FFI Scales have received little attention in the ADHD literature (White, 1999). The present study found conscientiousness to be the most powerful predictor for inattention scores. More than half of the explained variability in inattention scores was accounted for by conscientiousness. The inattention group also scored significantly lower than the other two groups on conscientiousness (the mean conscientiousness scores were over two standard deviations below the mean for non-ADHD controls). Although not as strong a predictor as it was for inattention scores, conscientiousness was also a significant predictor of hyperactivity/impulsivity scores and total ADHD scores.

Agreeableness was found in the present study to be the most powerful predictor for hyperactivity/impulsivity scores (higher than either neuroticism or extraversion). Both the inattention and hyperactivity/impulsivity groups scored significantly lower than the non-ADHD control group on agreeableness. The findings for agreeableness and conscientiousness underscore the importance of considering a broader range of personality factors than previously investigated. The link between ADHD symptomatology and the personality dimensions of agreeableness and conscientiousness is probably not surprising when one examines some of the previous literature on these personality variables. Previous research has found both personality variables to be associated with a diverse range of variables, including: occupational performance, academic success, and driving offenses (Arthur & Doverspike, 2001; Arthur & Graziano, 1996; Caldwell & Burger, 1998; Dunn, Mount, Barrick & Ones, 1995; Hochwarter, Kacmar & Witt, 2000; Judge et al., 1997; LePine & VanDyne, 2001). ADHD has been found to be negatively associated with occupational performance (Murphy & Barkley, 1996) and academic success (Faraone et al., 1993), and positively associated with traffic offenses (Nada-Raja, Langley, McGee, Williams, Begg & Reeder, 1997).

One of the limitations of the present study was the use of a large homogenous sample of young, “well-adjusted” adults who had recently graduated from high school and been admitted to university. Adolescents with ADHD are less likely to graduate from high-school than their non-ADHD peers and are thus less likely to be represented in undergraduate populations (Barkley et al., 1990). It would be useful to see if the results of the present study can be replicated in a sample of adults with an educational background more representative of the general

population, as well as in a sample of adults who had met DSM-IV (APA, 1994) criteria for ADHD as children or adolescents. Important questions remain to be answered about the prevalence of ADHD symptoms in older adults (Barkley et al., 2002; Smith, & Johnson, 1998), therefore it would also be interesting to see if the results of the present study could be replicated in a sample of adults with a broad range of ages.

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