Psychiatry Research 198 (2012) 130–134

Contents lists available at SciVerse ScienceDirect

Psychiatry Research

journal homepage: www.elsevier.com/locate/psychres

Personality profile of adult ADHD: The alternative five factor model

Sergi Valero [a,*], Antoni Ramos-Quiroga [a,b], Montserrat Gomà-i-Freixanet [c], Rosa Bosch [a], Nuria Gómez-Barros [a], Mariana Nogueira [a], Gloria Palomar [a], Montse Corrales [a], Miquel Casas [a,b]

[a] Department of Psychiatry, Hospital Universitari Vall d'Hebron, CIBERSAM, Universitat Autònoma de Barcelona, Barcelona, Catalonia, Spain
[b] Department of Psychiatry and Legal Medicine, Universitat Autònoma de Barcelona, Bellaterra, Catalonia, Spain
[c] Department of Health Psychology, Universitat Autònoma de Barcelona, Bellaterra, Catalonia, Spain

ARTICLE INFO

Article history:
Received 23 June 2011
Received in revised form 8 November 2011
Accepted 12 November 2011

Keywords:
ADHD
ZKPQ
AFFM
Personality
Adults

ABSTRACT

Attention-deficit/hyperactivity disorder (ADHD) is one of the most frequently diagnosed disorders in childhood affecting around 3% to 5% of adults worldwide. Most of the studies have been carried out using the Five Factor Model (FFM). Given the value and importance of describing adult ADHD in terms of general personality structure for a better conceptualization of this disorder, this study contributes adding new data on an Alternative Five Factor Model (AFFM) of personality. The aim of the present study is twofold: To assess the personality profile of adults with ADHD under the AFFM perspective, and to test the discriminant validity of the Zuckerman–Kuhlman Personality Questionnaire (ZKPQ) in differentiating ADHD subjects *vs.* normal range controls. A sample of 217 adults (64% male) meeting ADHD diagnosis (DSM-IV) was paired by age and sex with 434 normal-range controls. Logistic regression analysis showed that high scores on Neuroticism-Anxiety, Impulsivity and General Activity, and low on Work Activity were the most powerful predictors of being endorsed with an ADHD diagnosis. Results may suggest refinements in the personality assessment of ADHD as it seems that the ZKPQ provides more specific subscales for the description and conceptualization of this disorder.

1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) is characterized by a persistent pattern of inattentive, hyperactive, and impulsive behavior that begins early in childhood, often persists throughout development, and interferes with adaptive functioning (American Psychiatric Association, 2000). Furthermore, ADHD is identified as one of the most frequently diagnosed disorders in childhood (Polanczyk et al., 2007) affecting around 3% to 5% of adults worldwide (Fayyad et al., 2007). Given the persistence of ADHD symptoms from childhood to adulthood (Biederman et al., 2011) there is a growing interest in the study of the normal personality correlates of this disorder.

To date, most of the research on personality and ADHD has been focused on a narrow range of personality constructs. In particular, much of this work has been carried out with the Five Factor Model (FFM) of personality using the NEO-PI-R as the assessment instrument (Costa and McCrae, 1992). A seminal study (Miller et al., 2008), using a longitudinal design with a group of young adults who were initially recruited during childhood and identified as ADHD individuals, found that subjects meeting diagnostic criteria for ADHD as adults showed high Neuroticism and low Agreeableness and Conscientiousness when compared to individuals in whom ADHD has remitted or to individuals who were never diagnosed with ADHD. Similar results regarding high Neuroticism and low Conscientiousness were previously found (Ranseen et al., 1998; Nigg et al., 2002) in subjects meeting ADHD diagnosis or showing ADHD symptoms. Regarding Agreeableness and Openness to experience there is no consistent evidence showing a link between these dimensions and ADHD (Nigg et al., 2002; Parker et al., 2004; Miller et al., 2008). Extraversion could play an important role in the conceptualization of this disorder. Extraverts may seek out stimulation to compensate for their low level of baseline arousal. Some authors have suggested that ADHD could be a consequence of a deficit in behavioral inhibition affecting executive neuropsychological functioning (Barkley, 1997) and that individuals with ADHD, as consequence of these deficits, may seek external stimulation by increasing activity and sensory experiences (White, 1999). Despite these considerations, several studies carried out with clinical samples have shown that Extraversion has an inconsistent association with ADHD (Nigg et al., 2004; Miller et al., 2008), probably due to the differential weights of the traits included in this dimension.

Given the value and importance of describing adult ADHD in terms of general personality structure for a better conceptualization of this disorder, this study provides new data on an Alternative Five Factor

* Corresponding author at: Department of Psychiatry, Hospital Universitari Vall d'Hebron, Passeig de la Vall d'Hebron 119-129, E-08035 Barcelona, Catalonia, Spain. Tel.: +34 93 489 42 94; fax: +34 93 489 45 87.
E-mail address: svalero@vhebron.net (S. Valero).

0165-1781/$ – see front matter © 2012 Elsevier Ireland Ltd. All rights reserved.
doi:10.1016/j.psychres.2011.11.006

Model (AFFM) of personality. The origins of the AFFM and FFM model are quite different. The AFFM model (Zuckerman et al., 1991, 1993) emerged from a series of factor analyses of scales that had already been widely used in human psychobiological research and/or in studies of temperament in children and adults. Using psychobiological data instead allows researchers to explore the biological origins of personality (Eysenck, 1992). The basic traits in this AFFM are measured by the Zuckerman–Kuhlman Personality Questionnaire (ZKPQ) which contains five scales: Neuroticism-Anxiety (N-Anx), Activity (Act), Sociability (Sy), Impulsive Sensation Seeking (ImpSS) and Aggression-Hostility (Agg-Host). In this model, no measures of cultural interests or intellectual styles were included because of Zuckerman's (1984) conception that basic traits should be easily comparable to traits in other species and found throughout the human lifespan. Similarly, aggression rather than agreeableness, and impulsive sensation seeking rather than conscientiousness were included. Furthermore, the broad dimension of Extraversion was divided into separated factors of Activity and Sociability (Zuckerman, 1992) because in earlier studies Activity emerged as a distinct factor at the five-factor analyses of scales (Zuckerman et al., 1991). Due to its identification as a basic developmental trait (*e.g.*, Thomas and Chess, 1977; Buss and Plomin, 1984), activity level merits a distinctive assessment as a major trait of temperament in the child as well as of personality in the adult human. Activity trait, defined in the AFFM as need for general activity, impatience and restlessness, could be considered as a potential specific and discriminant factor in ADHD. The distinction between Hostility and Anxiety is also important because both traits have different psychobiological bases (Gray, 1982). On the other hand, Impulsivity and Sensation Seeking are closely related and have many important psychobiological correlates (Zuckerman, 1994). However, in the context of the AFFM, these two traits can be assessed as different scales, which can lead to an improvement of the discriminant identification of ADHD personality profile. Impulsive Sensation Seeking, together with Socialization, forms a distinctive factor in five-factor analysis of scales (Zuckerman et al., 1991).

The aim of this study is twofold: To assess, for the first time, the personality profile of adults with ADHD under the AFFM perspective and to test the discriminant validity of the ZKPQ in differentiating ADHD subjects *vs.* normal range controls. Many studies on personality and ADHD were carried out in the context of very young adults, with non paired samples, and without comparison groups or with non-clinical samples. This study provides the largest sample of adults with ADHD compared to a matched sample, by age and gender, of subjects extracted from a wide general population sample. In as much, given the clinical symptoms shown by ADHD subjects and the dimensions assessed by the AFFM of personality, the next hypotheses are formulated: ADHD subjects would score higher on N-Anx, Activity and ImpSS than the control group.

2. Methods

2.1. Participants

For the purpose of this study, we used two samples matched by age and sex. The age range for both samples was from 18 to 61 years, with a proportion of 64.1% being males. The ADHD group consisted of a sample of 217 Caucasian outpatients visited at the Adult ADHD Program of the Department of Psychiatry at the Hospital Universitari Vall d'Hebron. The sample met DSM-IV criteria for ADHD (56.7% combined ADHD, 34.5% inattentive and 2.9% active-impulsive ADHD) and comprised of 139 men and 78 women ($M = 33.69$ years, S.D. = 10.21). Most of the participants (72.7%) completed high school studies.

To test for the clinical specificity of the dimensional personality profile, the ADHD sample was matched by sex and age with a normal-range sample which acted as a control group. Control sample comprised of 434 subjects, 278 men and 156 women ($M = 33.69$ years, S.D. = 10.20) with 51.4% of them having completed high school studies. This control group was extracted from a more comprehensive general population sample pool, stratified by sex and age, consisting of 570 males and 599 females ranging from 18 to 93 years. This general population sample, which formed part of a wider study aimed at obtaining the norms of the ZKPQ, matched the IDESCAT Census Projections in the distribution of age and sex groups (Gomà-i-Freixanet et al., 2003). We used a case–control strategy, randomly selecting two controls for each case matched by age and gender (Gomà-i-Freixanet et al., 2008a).

2.2. Assessment instruments

The Structured Clinical Interview for DSM-IV Axis I (SCID-I; First et al., 1995) and Conners Adult ADHD Diagnostic Interview for DSM-IV (CAADID Part I and II; Epstein et al., 2000) were used for diagnosing ADHD. Personality was assessed by the Zuckerman–Kuhlman Personality Questionnaire (ZKPQ; Zuckerman et al., 1993). It consists of five content scales, plus an Infrequency scale. These five scales are: Neuroticism-Anxiety, Activity (with two traits: General Activity and Work Activity), Sociability (two traits: Parties and Isolation intolerance), Impulsive Sensation-Seeking (two traits: Impulsivity and Sensation Seeking) and Aggression-Hostility. The ZKPQ also includes an Infrequency scale. This scale, rather than being regarded as a scale in the normative sense, it should only be used to detect inattention to the task or simply a validity measure for the individual test-taker. The items are mostly exaggerated, true scored, socially desirable but unlikely to be completely true statements about anyone.

In the present study participants from both samples completed the Spanish version of the ZKPQ (Gomà-i-Freixanet et al., 2004). This instrument has shown good psychometric properties, with adequate internal consistency alpha coefficients and test–retest reliabilities. The factorial structure has also been replicated in Spanish samples, including general population (Gomà-i-Freixanet et al., 2004, 2008b). The instrument has also demonstrated consensual validity between auto and heteroreports (Gomà-i-Freixanet et al., 2005) and good discriminant validity in a clinical sample meeting Borderline Personality Disorder *vs.* control subjects (Gomà-i-Freixanet et al., 2008a). The ZKPQ also provides normative data for the general population (Gomà-i-Freixanet and Valero, 2008).

2.3. Procedure

All referred patients underwent the standard assessment protocol. The diagnostic and baseline assessment protocol is comprised of a psychiatric evaluation and structured diagnostic interviews. Patients were evaluated by three psychiatrists and two clinical psychologists experienced in diagnosing adult ADHD and in administering these instruments. Diagnosis was obtained with the Structured Clinical Interview for DSM-IV Axis I (SCID-I) and Conners Adult ADHD Diagnostic Interview for DSM-IV (CAADID Part I and II). Subjects with brain syndrome, schizophrenia, drug-induced psychosis, bipolar disorder, mental deficiency, or major depressive disorder were not included in the study. The ZKPQ was administered and scored blind to the clinical evaluation. The assessment process, ZKPQ included, was conducted before the pharmacological treatment. Only a few patients had pharmacological treatment before the first contact with the Unit. The Ethical Committee of the Hospital approved the protocol and all patients gave their written informed consent before participating in this study.

As stated above, the matched control sample was a random subsample of a much larger one. The questionnaires were answered anonymously and only demographic data such as sex, age, educational level and place of residence were recorded. All respondents participated voluntarily in the study and did not receive any emolument for their participation. As the study was not intrusive in any sort, neither informed consent waivers nor participant debriefing following participation were required from the controls.

2.4. Statistical analysis

Data analysis followed two steps: Descriptive and predictive. In the first step, differences between groups were tested by two-tailed independent Student's *t*-test and Pearson's correlation coefficients among ZKPQ scales for both groups were carried out. Cronbach's alphas were also reported. We performed a logistic regression analysis, using conditional entrance method, to study the independent contribution of each ZKPQ dimensions and traits to the prediction of the categorical diagnosis of ADHD. Finally, with the purpose of providing criteria of the adjustment of the model beyond mere statistical significance, sensitivity and specificity parameters were calculated. The probability to be classified in the ADHD group is reported in terms of Odds Ratio with confidence intervals.

3. Results

3.1. Comparison of ADHD patients with normal-range controls

Means, standard deviations, *t*-test differences, Cohen's *d* and Cronbach's alphas of the ZKPQ dimensions for the ADHD and control groups are shown in Table 1. Both groups differed significantly on all scales but on the Sy scale, which partially confirmed the hypotheses: N-Anx ($t_{649} = 10.49$, $p = 0.0005$), Act ($t_{649} = 2.39$, $p = 0.017$), ImpSS ($t_{649} = 10.06$, $p = 0.0005$), Agg-Host ($t_{389.4} = 6.69$, $p = 0.0005$), and Infreq ($t_{472.3} = 1.98$, $p = 0.037$). The ADHD group scored significantly

Table 1
Mean differences of the ZKPQ dimensions between ADHD and normal control groups, Cronbach's alphas and Cohen's *d*.

	ADHD ($n=217$)			Control ($n=434$)					
	M	S.D.	α	*M*	S.D.	α	*t*	*p*	Cohen's *d*
ZKPQ									
N-Anx	12.01	4.63	0.86	7.91	4.72	0.87	10.49	0.0005	0.87
Act	8.98	3.69	0.78	8.27	3.54	0.74	2.39	0.0170	0.20
Sy	7.34	4.12	0.82	7.29	3.59	0.77	0.15	0.8720	0.01
ImpSS	11.92	4.47	0.83	8.20	4.45	0.83	10.06	0.0005	0.69
Agg-Host	9.07	3.50	0.77	7.20	3.10	0.70	6.95	0.0005	0.57
Infreq	1.49	1.48	–	1.74	1.63	–	1.98	0.0370	0.16

Note. ZKPQ = Zuckerman–Kuhlman Personality Questionnaire; N-Anx = Neuroticism-Anxiety; Act = Activity; Sy = Sociability; ImpSS = Impulsive Sensation Seeking; Agg-Host = Aggression-Hostility; Infreq = Infrequency.

higher on N-Anx, Act, ImpSS, Agg-Host and lower on the Infreq scale. The results obtained for the Infreq scale are important to stress; the clinical group not only does not show inattention when answering, but it shows a more accurate performance, scoring lower than the controls.

3.2. Correlation analyses

Table 2 shows Pearson's correlation coefficients among ZKPQ scales for both groups as a basis of comparison. In ADHD patients, the higher correlations found were Act with ImpSS and N-Anx with Agg-Host ($r=0.36$ and $r=0.35$, respectively). In the control group the higher observed correlation was ImpSS with Agg-Host ($r=0.24$). Although some correlations were low in magnitude (*e.g.*, $r=0.11$) they had associated a significant effect as a consequence of the sample size.

3.3. Predictive power and accuracy of the model at the level of dimensions

In order to test the capacity of the ZKPQ dimensions to detect correctly a categorical ADHD diagnosis, a logistic regression analysis using conditional entrance was performed. Given the small number of predictors, alpha was set at 0.05 for entry into the equation. All five ZKPQ dimensions were included in the logistic regression model where the group status (ADHD or control, coded respectively as 1 and 0) was the dependent variable. The resulting model was statistically significant ($\chi^2_3=157.62$, $p=0.0005$). Table 3 shows that three out of five dimensions entered into the model: N-Anx, ImpSS and Agg-Host. The obtained model shows that having high scores on these three scales is a bad prognostic factor with high probability of being endorsed with an ADHD diagnosis.

Table 2
Correlations between ZKPQ dimensions in ADHD group ($n=217$) and control group ($n=434$) separately.

	ADHD					
	N-Anx	Act	Sy	ImpSS	Agg-Host	Infreq
Control						
N-Anx		0.06	−0.05	0.20*	0.35*	−0.08
Act	−0.02		0.20*	0.36*	0.11	0.18*
Sy	0.01	0.13*		0.23*	0.07	0.01
ImpSS	0.19*	0.15*	0.20*		0.31*	0.03
Agg-Host	0.23*	0.04	0.11*	0.24*		−0.16*
Infreq	−0.06	0.19*	0.07	0.11*	−0.08	

Note. In the upper-right side correlations for the ADHD group are reported; in the lower-left side correlations for the control group. N-Anx = Neuroticism-Anxiety; Act = Activity; Sy = Sociability; ImpSS = Impulsive Sensation Seeking; Agg-Host = Aggression-Hostility; Infreq = Infrequency.
*$p<0.05$.

Table 3
Logistic regression analysis output of ZKPQ dimensions.

Scale	*B*	Wald	Sig.	OR	(CI 95%)
N-Anx	0.140	44.40	<.0005	1.2	(1.1–1.2)
ImpSS	0.139	39.21	<.0005	1.2	(1.1–1.2)
Agg-Host	0.066	4.53	0.033	1.1	(1.0–1.1)
Constant	−4.035				

Note. ADHD = 1; control group = 0.
OR = Odds Ratio; N-Anx = Neuroticism-Anxiety; ImpSS = Impulsive Sensation Seeking; Agg-Host = Aggression-Hostility.

A sensitivity of 65% and a specificity of 80% were obtained. The total hit rate was 75%. The probability of being endorsed in the ADHD group was 7.4 times higher.

3.4. Predictive power and accuracy of the model at the level of traits

Given that the ZKPQ can offer trait scores in three out of the five scales, we performed a second logistic regression analysis using the conditional entrance method. Two dimensions were entered into the equation (N-Anx and Agg-Host) plus six traits (GenAct, WorkAct, Parties, Isol, Imp and SS). The resulting final model was statistically significant ($\chi^2_4=238$, $p=0.0005$). Table 4 shows that four out of eight scales entered into the model: N-Anx, Imp, GenAct and WorkAct. As groups differed in educational level, this variable was introduced in the regression analysis. The significant personality variables entered into the model did not differ. The obtained model shows that having high scores on N-Anx, Imp and GenAct, and low scores on WorkAct is a bad prognostic factor with high probability of being endorsed with an ADHD diagnosis.

In this model a sensitivity of 71.9% and a specificity of 80.6% were obtained. The total hit rate was 79.1%. The probability of being endorsed in the ADHD group was 10.7 times higher.

4. Discussion

This study analyzed the personality profile of ADHD adults in the context of the Alternative Five Factor Model providing, to the best of our knowledge, the largest sample in the field of personality. Results showed that the hypotheses were partially confirmed. Subjects meeting ADHD diagnosis showed, in comparison with community subjects, higher scores on Neuroticism-Anxiety, Impulsive-Sensation Seeking and Aggression-Hostility, but not on Activity. Remarkable results appeared when introducing dimensions and traits into the analysis. High scores on Neuroticism-Anxiety, Impulsivity and General Activity, and low on Work Activity were the most powerful predictors of ADHD classification, with acceptable Sensitivity and Specificity. Under our point of view, these statistical parameters introduce a better strategy for understanding the relevance of the AFFM in the personality conceptualization of ADHD patients than a mere approximation based only on the statistical significance or on Cohen's *d*.

The AFFM is not specifically designed to measure abnormal personality, but as it has been reported in Borderline Personality Disorder (Gomà-i-Freixanet et al., 2008a) the ZKPQ provides data on basic personality traits that may be reflected in a wide range of

Table 4
Logistic regression analysis output of ZKPQ dimensions and traits.

Scale	*B*	Wald	Sig.	OR	(CI 95%)
N-Anx	0.079	11.62	0.001	1.1	(1.1–1.2)
Imp	0.496	89.18	<0.0005	1.6	(1.5–1.8)
GenAct	0.191	17.01	<0.0005	1.2	(1.1–1.3)

Note. ADHD = 1; control group = 0.
OR = Odds Ratio; N-Anx = Neuroticism-Anxiety; Imp = Impulsivity; GenAct = General Activity; WorkAct = Work Activity.

adaptive or maladaptive behaviors as well as of habits and attitudes. One of the most important dimensions that discriminates ADHD from general population is Neuroticism-Anxiety. ADHD patients show higher mood variability, negative affect, and difficulties in coping with stress than controls (Wender, 1995). Adults with ADHD have been found to have an increased risk for mood disorders (Biederman et al., 1991) and one third have been found to have a lifetime history of anxiety disorders (Miller et al., 2007). Our results are consistent with these clinical observations and with the most recent studies using the NEO-PI-R (Nigg et al., 2002; Parker et al., 2004; Miller et al., 2008). According to our results, N-Anx is the dimension with the highest observed effect size, and is considered a major domain with strong associations with psychopathology (Neeleman et al., 2004). However, Neuroticism should be seen as a non specific marker of vulnerability to psychopathology (Ormel et al., 2004) therefore other personality traits should be worth considering obtaining a good discriminant or specificity power.

Impulsivity is another dimension with a predominant role. Unfortunately, this important trait has not been specifically addressed in adult ADHD personality research. Moreover, it is important to emphasize that only the Impulsivity trait, not the Sensation Seeking, is the one that discriminates between ADHD and the control group. Some associations have been reported between ADHD and Sensation Seeking (Hines and Shaw, 1993; Shaw and Giambra, 1993), however, the majority of these results were obtained exclusively with children, adolescents or young adults, with small samples and, in some cases, with different groups that were analyzed all together. A study by Faraone et al. (2009) conducted with adults and using the TCI, found that Novelty Seeking was associated with ADHD. However, if Novelty Seeking is analyzed not considering its subscales (Impulsiveness is one of them), it is not possible to determine how much Novelty Seeking is specifically addressed by the effect of its impulsiveness component. Although Impulsivity and Sensation Seeking are sometimes confounded, they do not tap into the same range of behaviors. Impulsivity refers to a lack of self-control or deficiencies in response inhibition, leading to unplanned behaviors, while Sensation Seeking identifies the tendency to seek out novel, varied, and highly stimulating experiences, and willingness to take risks in order to attain them (Zuckerman, 1979). According to the obtained results, ADHD subjects are impulsive, but not sensation seekers. There is growing research determining the different conceptual and empirical relevance of these two variables on neurodevelopment and psychopathology (Magid et al., 2007; Steinberg et al., 2008) and it seems necessary to provide a personality framework where both variables could be explored separately. Our results with ADHD indicate that this consideration seems to be especially relevant.

The last dimension of significant interest was Activity. This trait, along with Sociability, conform the two main components of Extraversion in terms of Eysenck's theory, and the ZKPQ provides separate measures for both traits. Sociability showed no association with this disorder. ADHD subjects can be described as gregarious as the controls, although their social interactions can frequently be accompanied by relational difficulties or interpersonal problems (Mannuzza and Klein, 2000; Davidson and Harrison, 2008). The two traits included in the dimension of Activity, General Activity and Work Activity, have both a significant and independent contribution to the ADHD personality profile. Results showed that ADHD patients are characterized by showing a high need for activity and difficulties in becoming relaxed, in accordance with some of the most important symptoms of the disorder. However, they also show a low capacity for engaging in activities that require an important energy investment which could be expressed by frequent changes of job and/or low academic achievement (Murphy and Barkley, 1996). It is important to mention that Activity did not enter into the model when a multivariate analysis was executed at the level of dimensions. The non association of this dimension was probably a consequence of the aggregation of its two traits, General Activity and Work Activity, taking into account that these two traits have a reverse effect.

Aggression-Hostility dimension was not associated when all personality traits were simultaneously considered. In other studies, Hostility has been associated with hyperactivity, but according to Nigg et al. (2002) this association was statistically explained by covarying antisocial behaviors. In fact, in adults, it has been reported that it is not clear the link between ADHD and aggression in absence of co-occurring disorders that involve aggression, as Conduct Disorder or DSM-IV Cluster B personality disorders (Lahey et al., 2005; Caspi et al., 2008).

In previous studies, Extraversion has been analyzed as a unitary construct (*e.g.*, Nigg et al., 2004; Miller et al., 2008) and the results concerning its link with the disorder have been equivocal. According to the differential results obtained regarding Activity and Sociability, we postulate that the discrete effect attributed to Extraversion in former studies could be a consequence of an attenuation effect of its two central components. It is suggested, in future studies, analyzing separately the two components of Extraversion as both have a differential contribution; in as much as, introducing the two traits of the Activity dimension, General activity and Work Activity, as they also have a differential and reverse contribution to the ADHD diagnosis.

There are several unique aspects to this study that have to be pointed out. Participants in this study were adults meeting ADHD diagnosis. Most of the previous studies have been carried out with college students enrolled in introductory psychology courses. This fact could limit the generalization of the previous obtained results as this population is in its late adolescence and even it can show ADHD symptoms, it does not met diagnostic criteria. Additionally, our study uses a case–control strategy, matching the groups by age and gender, and using two controls for each case. This strategy enables a control of the possible modulating effect of these two demographical variables. Furthermore, the AFFM in giving separate measures for Impulsivity and Sensation-Seeking, and for General Activity and Work Activity allows researchers to disentangle the personality profile of ADHD disorder, identifying which traits are more associated with the disorder, and thus allowing a more accurate description and conceptualization of it.

There are, however, limitations to this study. Adults who seek treatment for ADHD may represent a small and select subset of the ADHD population characterized by high academic achievement and/or significant personality difficulties (Marks et al., 2001). It would be useful to see if the results of the present study could be replicated in a sample of adults with ADHD not looking for treatment.

The findings enable a new linkage to be made between dimensional models of normal personality and psychopathology research that can shed light on long-term outcomes for children and adults with ADHD symptoms and provide clues to developmental pathways. The results of this study seem to indicate temperamental vulnerability to ADHD, and can serve to stimulate the assessment of normal personality in ADHD by clinicians and researchers interested in adaptive and maladaptive personality traits. According to our results, the analysis of the discriminant properties of the personality variables should be encouraged as a means of refining the assessment of ADHD, not only at the level of dimensions but also at the level of traits. This strategy should lead to an increase of the accuracy of the predictors, reducing the lack of irrelevant information. Furthermore, introducing dimensions and traits in the assessment process would allow clinicians a more accurate and fine description of the disorder itself and provide an improvement in case conceptualization, differential treatment planning and predicting response to treatment.

References

American Psychiatric Association, 2000. Diagnostic and Statistical Manual of Mental Disorders, 4th ed., rev. ed. APA, Washington DC.

Barkley, R.A., 1997. Behavioral inhibition, sustained attention, and executive functions: constructing a unifying theory of ADHD. Psychological Bulletin 121, 65–94.

Biederman, J., Faraone, S.V., Keenan, K., Tsuang, M.T., 1991. Evidence of familial association between attention deficit disorder and major affective disorders. Archives of General Psychiatry 48, 633–642.
Biederman, J., Petty, C.R., Clarke, A., Lomedico, A., Faraone, S.V., 2011. Predictors of persistent ADHD: an 11-year follow-up study. Journal of Psychiatric Research 45, 150–155.
Buss, A.H., Plomin, R.A., 1984. Temperament: Early Developing Personality Traits. Lawrence Erlbaum, Hillsdale, N.J.
Caspi, A., Langley, K., Milne, B., Moffitt, T.E., O'Donovan, M., Owen, M.J., Polo Tomas, M., Poulton, R., Rutter, M., Taylor, A., Williams, B., Thapar, A., 2008. A replicated molecular genetic basis for subtyping antisocial behavior in children with attention-deficit/hyperactivity disorder. Archives of General Psychiatry 65, 203–210.
Costa, P.T., McCrae, R.R., 1992. Normal personality assessment in clinical practice: the NEO Personality Inventory. Psychological Assessment 4, 5–13.
Davidson, M., Harrison, A.G., 2008. Processing speed deficits in ADHD: a function of ADHD or of comorbid LD? Archives of Clinical Neuropsychology 23, 657–658.
Epstein, J.N., Johnson, D., Conners, C.K., 2000. Conners' Adult ADHD Diagnostic Interview for DSM-IV. Multi-Health Systems Inc., North Tonawanda, NY.
Eysenck, H.J., 1992. 4 ways 5 factors are not basic. Personality and Individual Differences 13, 667–673.
Faraone, S.V., Kunwar, A., Adamson, J., Biederman, J., 2009. Personality traits among ADHD adults: implications of late-onset and subthreshold diagnoses. Psychological Medicine 39, 685–693.
Fayyad, J., De Graaf, R., Kessler, R., Alonso, J., Angermeyer, M., Demyttenaere, K., De Girolamo, G., Haro, J.M., Karam, E.G., Lara, C., Lépine, J.P., Ormel, J., Posada-Villa, J., Zaslavsky, A.M., Jin, R., 2007. Cross-national prevalence and correlates of adult attention-deficit hyperactivity disorder. The British Journal of Psychiatry 190, 402–409.
First, M.B., Spitzer, R.L., Gibbons, M., Williams, J.B.W., 1995. Structured Clinical Interview for Axis I DSM-IV Disorders, Non-patient Edition (SCID/NP, Version 2.0). New York State Psychiatry Institute, New York, NY.
Gomà-i-Freixanet, M., Valero, S., 2008. Spanish normative data of the Zuckerman–Kuhlman Personality Questionnaire in a general population sample. Psicothema 20, 324–330.
Gomà-i-Freixanet, M., Valero, S., Puntí, J., Comas, J., Salcedo, A., Zuckerman, M., 2003. Psychometric appraisal of the ZKPQ in a general population. Paper presented at the 11th Biennal Meeting of the International Society for the Study of Individual Differences. University of Graz, Graz, Austria.
Gomà-i-Freixanet, M., Valero, S., Puntí, J., Zuckerman, M., 2004. Psychometric properties of the Zuckerman–Kuhlman Personality Questionnaire in a Spanish sample. European Journal of Psychological Assessment 20, 134–146.
Gomà-i-Freixanet, M., Wismeijer, A.J., Valero, S., 2005. Consensual validity parameters of the Zuckerman–Kuhlman Personality Questionnaire: evidence from self-reports and spouse reports. Journal of Personality Assessment 84, 279–286.
Gomà-i-Freixanet, M., Soler, J., Valero, S., Pascual, J.C., Pérez, V., 2008a. Discriminant validity of the ZKPQ in a sample meeting BPD diagnosis *vs.* normal-range controls. Journal of Personality Disorders 22, 178–190.
Gomà-i-Freixanet, M., Valero, S., Muro, A., Albiol, S., 2008b. Zuckerman–Kuhlman Personality Questionnaire: psychometric properties in a sample of the general population. Psychological Reports 103, 845–856.
Gray, J.A., 1982. The neuropsychology of anxiety: an enquiry into the functions of the septo-hippocampal system. Oxford University Press, New York.
Hines, A.M., Shaw, G.A., 1993. Intrusive thoughts, sensation seeking, and drug use in college students. Bulletin of the Psychonomic Society 31, 541–544.
Lahey, B.B., Loeber, R., Burke, J.D., Applegate, B., 2005. Predicting future antisocial personality disorder in males from a clinical assessment in childhood. Journal of Consulting and Clinical Psychology 73, 389–399.
Magid, V., Maclean, M.G., Colder, C.R., 2007. Differentiating between sensation seeking and impulsivity through their mediated relations with alcohol use and problems. Addictive Behaviors 32, 2046–2061.
Mannuzza, S., Klein, R.G., 2000. Long-term prognosis in attention-deficit/hyperactivity disorder. Child and Adolescent Psychiatric Clinics of North America 9, 711–726.
Marks, D.J., Newcom, J.H., Halperin, J.M., 2001. Comorbidity in adults with attention-deficit/hyperactivity disorder. Annals of the New York Academy of Sciences 931, 216–238.
Miller, T.W., Nigg, J.T., Faraone, S.V., 2007. Axis I and II comorbidity in adults with ADHD. Journal of Abnormal Psychology 116, 519–528.
Miller, C.J., Miller, S.R., Newcom, J.H., Halperin, J.M., 2008. Personality characteristics associated with persistent ADHD in late adolescence. Journal of Abnormal Child Psychology 36, 165–173.
Murphy, K.R., Barkley, R.A., 1996. Attention deficit hyperactivity disorder adults: comorbidities and adaptive impairments. Comprehensive Psychiatry 37, 393–401.
Neeleman, J., Bijl, R., Ormel, J., 2004. Neuroticism, a central link between somatic and psychiatric morbidity: path analysis of prospective data. Psychological Medicine 34, 521–531.
Nigg, J.T., John, O.P., Blaskey, L.G., Huang-Pollock, C.L., Willcutt, E.G., Hinshaw, S.P., Pennington, B., 2002. Big five dimensions and ADHD symptoms: links between personality traits and clinical symptoms. Journal of Personality and Social Psychology 83, 451–469.
Nigg, J.T., Goldsmith, H.H., Sachek, J., 2004. Temperament and attention deficit hyperactivity disorder: the development of a multiple pathway model. Journal of Child and Adolescent Psychology 33, 42–53.
Ormel, J., Rosmalen, J., Farmer, A., 2004. Neuroticism: a non-informative marker of vulnerability to psychopathology. Social Psychiatry and Psychiatric Epidemiology 39, 906–912.
Parker, J.D.A., Majeski, S.A., Collin, V.T., 2004. ADHD symptoms and personality: relationships with the five-factor model. Personality and Individual Differences 36, 977–987.
Polanczyk, G., de Lima, M.S., Horta, B.L., Biederman, J., Rohde, L.A., 2007. The worldwide prevalence of ADHD: a systematic review and metaregression analysis. The American Journal of Psychiatry 164, 942–948.
Ranseen, J.D., Campbell, D.A., Baer, R.A., 1998. NEO PI-R profiles of adults with attention deficit disorder. Assessment 5, 19–24.
Shaw, G.A., Giambra, L.M., 1993. Task unrelated thoughts of college students diagnosed as hyperactive in childhood. Developmental Neuropsychology 9, 17–30.
Steinberg, L., Albert, D., Cauffman, E., Banich, M., Graham, S., Woolard, J., 2008. Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: evidence for a dual systems model. Developmental Psychology 44, 1764–1778.
Thomas, A., Chess, S., 1977. Temperament and Development. Brunner/Mazel, New York.
Wender, P.H., 1995. Attention-deficit hyperactivity disorders in adolescence. Journal of Developmental and Behavioral Pediatrics 16, 192–195.
White, J.D., 1999. Personality, temperament and ADHD: a review of the literature. Personality and Individual Differences 27, 589–598.
Zuckerman, M., 1979. Sensation Seeking: Beyond the Optimal Level of Arousal. Lawrence Erlbaum Associates, Hillsdale NJ.
Zuckerman, M., 1984. Sensation seeking: a comparative approach to a human trait. The Behavioral and Brain Sciences 7, 413–434.
Zuckerman, M., 1992. What is a basic factor and which factors are basic: turtles all the way down. Personality and Individual Differences 13, 675–681.
Zuckerman, M., 1994. Behavioral Expressions and Biosocial Bases of Sensation Seeking. Cambridge University Press, New York.
Zuckerman, M., Kuhlman, M., Thornquist, M., Kiers, H., 1991. Five (or three): robust questionnaire scale factors of personality without culture. Personality and Individual Differences 12, 929–941.
Zuckerman, M., Kuhlman, D.M., Joireman, J., Teta, P., Kraft, M., 1993. A comparison of three structural models for personality: the big three, the big five, and the alternative five. Journal of Personality and Social Psychology 65, 757–768.