Research Article

Adult ADHD Patients: Emotional Dysregulation and Personality Dimensions

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Abstract

Objectives: To evaluate personality dimensions especially emotional dysregulation (ED), in adults with attention deficit and hyperactivity disorder (ADHD) and to investigate differences in ADHD types and ED between patients and controls.

Method: We performed a cross-sectional study of patients with ADHD and controls. The study population comprised 78 outpatients attending Arganda Mental Health Center (MHC) (Arganda del Rey, Spain) and 27 control patients, who were also attending MHC. The study was performed from January 2013 to August 2016. A review of ED and personality dimensions in ADHD is shown.

Results: The DERS (Difficulties in emotion regulation scale) and CAARS (Conners' Adult ADHD Rating Scale) dimensions of ED were associated with ADHD. Some NEO-PI-R (Revised NEO Personality Inventory) personality dimensions are seen in both ADHD subtypes.

Conclusion: In adult ADHD, several dimensions are compatible with ED. Some ED subscales (eg, awareness, clarity and no acceptance) are not specific to ADHD. High neuroticism and low conscientiousness are personality dimensions in adults with ADHD.

INTRODUCTION

Studies have shown that 50-65% of children diagnosed with ADHD will continue to have this disorder as adults [1,2]. However, some adult symptoms change with age, and this is more evident for symptoms of in attention than symptoms of hyperactivity [3].

Personality dimensions in ADHD

Personality dimensions can be assessed using the NEO-PI-R [4]. This instrument includes five personality dimensions: extraversion, neuroticism, openness, agreeableness and conscientiousness [5]. Individuals with high scores for neuroticism are described as fearful, anxious, depressed, helpless, and unable to resist impulses [6].

Neuroticism was related to severity in emotional disorders such bipolar disorder [7,8], avoidant personality disorder [8], depression [9], premenstrual dysphoric disorder [10],severe alcohol dependence [11], disability [12], substance use disorder [13],and comorbid anxiety disorder [14]; and with borderline personality disorder (BPD), bipolar disorder, schizophrenia, ADHD, and substance use disorders [15]. Besides, a defective regulation of negative emotional states could play a role in adult psychopathology [16,17]. ADHD has been conceptualized as a disorder of extreme maladaptive temperament and/or personality traits [18].

Lower self-esteem and sense of mastery and higher levels of neuroticism and social inadequacy have been reported by older adults with ADHD [19].In their study on ADHD, Jacob et al. showed that scores for the anxiety- and depression-related personality traits neuroticism and harm avoidance (HA) were significantly higher than the reference values. Patients with ADHD scored significantly lower for conscientiousness and significantly higher for novelty seeking (NS) [20].

Emotional dysregulation

ED has been considered an independent construct leading to various psychiatric symptoms and disorders [19,21,22]. Consequently, emotion regulatory processes could function as dimensional schemata on which to base diagnostic classifications. Consistent with this supposition, regulatory difficulties have been associated with heightened negative affect [23], BPD [24], anxiety disorders [25], eating disorders [26], substance abuse [27], aggression [28], suicidality [29], oppositional defiant disorder [30,31], and bipolar disorder, suggesting that ED presents low specificity as a diagnostic criterion for ADHD and that ED is a transversal feature in psychiatric disorders other than ADHD [32,33].The overlap between ADHD and ED is unclear, since many ADHD patients do not exhibit pathological levels of ED

(55%-75% of children and 30%-70% of adults with ADHD) [34].

In DSM-III, emotional symptoms were an "associated feature" rather than a diagnostic criterion of ADHD.DSM-IV and the recently published DSM-V do not include emotional lability (EL) as a diagnostic criterion for ADHD. According to several authors, ED is a core defining feature of ADHD that is as central to the disorder as hyperactivity, impulsivity, and inattention[32, 35-37].

The specific EL subscale of the Conners' Adult ADHD Rating Scale (CAARS) was used to evaluate ED or EL (we use both names in the text with the same meaning) [38]. ED was also included in the Utah criteria [39] in which deficits in emotional regulation are defined by three domains (temper control, affective liability, and emotional over-reactivity) [40].

There is no consensus as to how ED in ADHD should be defined and measured [41].One possibility is that attention and disorganization items are loaded onto one factor, while emotional symptoms—temper control, mood liability, emotional over-reactivity, and hyperactivity/restlessness—are loaded onto a second factor, which is diagnosed as ADHD ED [42].

ED in ADHD may be an inability to modulate emotional responses and excessive reactions to a particular emotional trigger that would be considered inappropriate for the developmental age of the individual and the social setting [43].

Objectives

To evaluate adult ADHD personality dimensions (NEO-PI-R) and ED (with DERS and the lability scale from CAARS-SR-L). To find the differences in ADHD types and ED between patients and controls.

The research questions posed in the present study were as follows:

(a) Is there a high association between ADHD and ED? This may be a dimension or a new type of ADHD. (b) Is hyperactivity more frequently associated with ED? (c) Personality dimensions such as high neuroticism and low conscientiousness have been more associated with ADHD. d) Are there significant differences between cases and controls in ED and ADHD types?

We expect to see specific personality dimensions in adult ADHD and probe the importance of ED inside this mental disorder.

MATERIAL AND METHODS

The present study is a cross-sectional case-control study. The study population comprised 78 outpatients attending Arganda MHC (Sureste Hospital, Arganda del Rey, Madrid, Spain) (cases) and 27 control patients, also from the MHC (they may have depressive and/or anxiety disorders, but without ADHD). The study was performed from January 2013 to August 2016 and approved by the Investigation Committee of Hospital Sureste.

The inclusion criteria were ADHD disorder (first on DSM-IV and then DSM-V), alone or associated to: depressive and/or anxiety disorder, bipolar disorder, personality disorders; non-use of drugs in the previous six months, and signed informed consent for test results to be published.

The exclusion criteria were psychotic features (except for bipolar disorders) substance/alcohol abuse in the previous six months, organic brain syndrome and any clinically significant medical condition that might have a psychiatric manifestation, diagnosis of mental retardation (documented IQ<70) or moderate/severe cognitive impairment, and unwillingness or inability to provide informed consent or to comply with the assessment.

Procedures

The cases comprised patients diagnosed with ADHD based on specific tests (CAARS-SR-long version, Wender-Utah Rating Scale (WURS) and a clinical interview (Conners Adult ADHD Diagnostic Interview, CAADID). Patients had not received treatment with stimulants oratomoxetine (Table 1). Cases were younger, and there were more men than control patients.

We evaluated a subsample of cases using the NEO-PI-R (n=41) but found no significant differences between patients evaluated using the NEO-PI-Rand those who were not with respect to variables such as sex, marital status, and scores on the CAADID for DSM-IV.

Instruments

Adult ADHD was diagnosed based on the DSM-IV-TR and DSM-V criteria for ADHD, CAADID and CAARS-SR-L.

CAADID: The Spanish version of the CAADID for DSM-IV (part II) was used for the diagnosis of ADHD [44,45]. The CAADID is a semi-structured interview that consists of two parts. The first part is divided into four areas: demographic history, psychomotor development, risk factors, and comorbidity. It can be completed by the patient or by a clinician. The second part is administered by the clinician in order to evaluate the DSM-IV criteria for ADHD.

CAARS: It was developed to aid in the assessment and diagnosis of adult ADHD [38], with self-report and informant-rating forms. We used the long version of the CAARS self-report form that contains 66 items scored on a five-Point Likert-type scale that make up the eight clinical subscales. We obtain a Cronbach's α of 0.919for cases and controls.

We also used an instrument to measure ADHD from childhood to adolescence, namely, the abbreviated version of the WURS [39], which is completed by a family member (parents) to evaluate the patient retrospectively.

Personality dimensions of ADHD were measured using the NEO-PI-R [46,47]. Form S (self-reported form) is a psychological personality inventory comprising a 240-item measure of the

Table 1: Sociodemographic data of cases and controls.

N	78		27	
	M	SD	M	SD
Age	34.6	10.5	41.2[*]	11.3
Sex (m)	45	57.7%	8[a]	29.6%
Marital status (%): **Married** **Single**	35% 50%		54% 31%	

Note: [*]p <0.05; m: men; a: p<0.085.

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five-factor model of personality. The NEO-PI-R also measures six subordinate facets of the five personality traits, on a five-point Likert scale. There is considerable empirical support for the five-factor model (FFM) in terms of its construct validity, temporal stability, and cross-cultural relevance in children, adolescents, and adults [48].

ED was assessed using the following instruments:

The impulsivity/emotional lability scale from the CAARS [38]. This 12-item subscale assesses temper, irritability, stress intolerance, and labile mood.

CAARS is the only psychometric measure to have been validated in Spanish and contains specific items for the assessment of emotional lability in adults with ADHD [49].

The DERS total score was also used as an indicator of overall difficulties in emotion regulation. It is measured based on the total of the five scales from the DERS, which contains 36 items and produces six subscales, as follows: i) non-acceptance of emotional response (DERS-Non-acceptance); (ii) difficulties in adopting goal-directed behaviors (DERS-Goals); (iii) difficulties in controlling impulsive behaviors (DERS-Impulse); (iv) limited access to emotion regulation strategies (DERS-Strategy) (v) lack of emotional identification or clarity (DERS-Clarity) (vi) lack of emotional awareness (DERS-Aware) [50].

The Spanish version was validated in adolescents by Gomez-Simon et al [51]. In our study we obtain a Cronbach's α for cases and controls of 0.826.

Statistical analysis

Data are expressed as frequencies and percentages or as means and medians where appropriate. The association between qualitative variables was studied using the chi-square test and Fisher exact test. Analysis of normality was performed with the Kolmogorov-Smirnov test. Comparison of continuous variables was analyzed using the Mann-Whitney U-test due to non-normality. The association between numeric variables was assessed using the Spearman correlation coefficient (rho). Multivariate logistic regression was applied to compare ADHD types and NEO-PI personality dimensions.

All statistical tests were two-tailed, and a p value of <.05 was considered statistically significant.

The analysis was performed using IBM SPSS Statistics for Windows (IBM Corp, Version 21.0. Armonk, NY, USA).

RESULTS

Personality dimensions

The findings for the dimensional scores of the NEO-PI-R expressed as median and standard deviation were as follows: neuroticism 68.3 (6.7), e

xtraversion 43.9 (12.8), openness 48 (11.4), agreeableness 40 (9.9), and conscientiousness 33 (8.2). On this scale, scores>65 are very high, and scores <36 are very low. The remaining scores are shown in (Table 2), where it can be observed how ADHD is associated with high scores for facets in neuroticism and low scores for facets in conscientiousness.

ADHD types

The frequencies of ADHD cases are as follows. In inattention CAADID n=74: yes 56 (76%), no 18 (24%); of the 56 patients with inattention, 33 were combined (58.9%) and 23 inattention only (31.1% of all cases of inattention).In hyperactive CAADID: yes 46 (62%), no 28 (38%). In hyperactive patients, 33 were combined (with inattention in 72%) and 13 were only hyperactive (28%). In combined CAADID: yes 33 (45%), no 41 (55%) (Table 3).

The association between CAADID types and NEO-PI-R dimensions was studied using the Pearson test and the comparison of medians between NEO-PI-R and CAARS was studied using the Mann-Whitney test (Table 4). We observed a negative association between inattention/combined ADHD and conscientiousness, i.e., more inattention with less conscientiousness. We also observed an association between several sub dimensions of neuroticism (N) and all ADHD types. However, only N3 (neuroticism facet: depression) was associated with hyperactive and combined, although this association was negative. All N dimensions were associated with CAARS lability scores. Hyperactive and combined ADHD were associated with extraversion (within the normal range, >45).

Table 2: Mean scores and standard deviations of facets and subfacets of NEO-PI-R in ADHD cases.

NEO PI-R	MEDIAN	STANDARD DEVIATION
NEUROTICISM	68.3	6.7
N1 anxiety	62	9.9
N2 hostility	68.8	5.8
N3 depression	67.9	7.1
N4 social anxiety	60.1	10.8
N5 impulsivity	64.5	7.5
N6 vulnerability	66.8	7.4
EXTRAVERSION	43.9	12.8
OPENNESS	48	11.4
AGREEABLENESS	40	9.9
CONSCIENTIOUSNESS	33	8.2
C1 competence	34.8	7.1
C2 order	37.4	13
C3 sense of duty	38	9.4
C4 achievement need	37.4	11.2
C5 self-discipline	33.4	8.7
C6 deliberation	34.7	8.7

Table 3: Types of ADHD according to CAADID and WURS.

	Yes %	No %	Non-combined %
CAADID in attention	76	24	31
CAADID hyperactive	62	38	18
CAADID combined	45	55	
Reduced WURS ≥ 46	73	27	

Table 4: Mann Whitney U and Pearson correlation coefficient between ADHD types (CAADID and CAARS) and dimensions in NEO-PI-R.

	N1 anxiety	N2 hostility	N3 depression	N4 social anxiety	N5 impulsivity	N6 vulnerability	Extraversion	Conscientiousness
Inattention CAADID								31/39.5 **(negative)
Hyperactive CAADID			66/70 *(negative)				48/37.8**	
Combined CAADID			66/69** (negative)				49/41**	
Inattention CAARS					0.44**	0.28*		30/46 **(negative)
Hyperactive CAARS		0.39**			0.34**			
Lability CAARS	0.39**	0.59**	0.48**	0.37**	0.4**	0.31*		
Combined CAARS								30/37 **(negative)
CAARS		0.41**			0.44**			

Note: Ratings are yes/no ADHD with each median NEO-PI-R dimensions.
*p<0.05; **p<0.01

Correlations between WURS ≥ 46 and NEO-PI dimensions and CAARS hyperactive

Agree ableness (A) with WURS (W). If W >46 A mean 36.60 vs. W<46A mean 45.64.A higher W is associated with lower A.

Included in Neuroticism, hostility (H): U, 81; Wilcox on w, 147; z –2.082, p=.037, W>46 H mean 70.20 vs. W <46 H mean 65.45: both scores are higher than the mean, although WURS >46 is associated with greater hostility.

Correlation between hyperactive CAARS and reduced WURS ≥ 46: mean 63.72 vs. <46 mean 55.64; U, 112; p=018. A higher WURS is associated with hyperactive CAARS.

ED between cases and controls in DERS and CAARS

A significant association was found between cases in DERS subtypes and lability-impulsivity in the CAARS score (Table 5a); however, when we examined the association between controls in DERS and lability in the CAARS score, no differences were observed for non-acceptance, clarity and awareness on the DERS scales. Similarly, differences were observed in goals, strategies, impulse and overall DERS (Table 5a).

Differences in DERS scores (Gratz [52]** and Gomez Simon [51]* Mann-Whitney) were found between cases and controls (Table 5b): no differences were detected between cases and controls in the DERS subscale non-acceptance.

Significant differences were detected (Mann-Whitney) between cases and controls in all CAARS types.

Frequencies and medians of DERS in ADHD types

- CAADID inattention: median DERS overall, 113. CAARS inattention: median DERS, 118. A correlation was observed with all DERS subscales.

- CAADID hyperactive: median DERS, 116. CAARS hyperactive, median DERS, 117.5. A correlation was observed with all DERS subscales except for clarity and

Table 5a: ED between cases and controls in DERS and CAARS (rho Spearman).

DERS subtypes	Labil-imp CAARS, cases	Labil-imp CAARS, controls
Overall	.61**	.52**
Non-acceptance.	.39**	.28
Goals	.47**	.58**
Impulse	.72**	.51**
Strategy	.48**	.55**
Clarity	.3**	.28
Awareness	.35**	-.28

Note: ** p<0.01

awareness.

- CAADID combined: median DERS, 111. CAARS combined: median DERS, 124. A correlation was observed with all DERS subscales except for awareness.

We can see that combined ADHD has the highest score in DERS and, once again, that awareness and clarity in DERS are not associated with ADHD.

ED and ADHD

All CAARS types and CAADID inattention correlate with CAARS lability impulsivity.

After applying logistic regression based on CAARS inattention with neuroticism, conscientiousness, and overall DERS, we observed the following: B, –0.469; p=.030; exp B, 0.626 with conscientiousness. Accordingly, logistic regression showed that a higher score on conscientiousness was associated with a lower risk of CAARS inattention (OR=0.63; 95% CI, 0.41-0.95; p=.030) without affecting ratings for neuroticism and overall DERS.

DISCUSSION

We investigated personality dimensions in adult ADHD patients. Using the NEO-PI-R, we observed higher ratings

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Table 5b: Differences in DERS scores (Gratz [39] and Gomez Simon [40] and DERS between cases and controls (Mann-Whitney (SD)).

	DERS (39)	**DERS** (40)	**DERS cases**	**DERS controls**
Overall	w 78, m 80	w 83, m 82	110.9 (32)**	84.2 (18.8)
Non-acceptance	w 12, m 12	w 14, m 13	17.5 (7.4)	14.4 (5.8).
Goals	w 14, m 14	w 15, m 14.8	17.8 (5.5)**	13 (5.2)
Impulse	w 11, m 12	w 12, m 13	20.9 (7)**	12 (5.2)
Aware	w 14, m 16	w 15.8, m 16.3	17.9 (5.4)**	14.2 (4.4).
Strategies	w 16, m 16	w 15.5, m 14.3	25.6 (8.5)**	18.7 (7.2)
Clarity	w 11, m 11	w 10.4, m 9.5	13.5 (5)*	11.1 (3.5)

Note: w: women; m: men.
* p<0.05, ** p<0.01

in neuroticism and lower ratings in conscientiousness and agreeableness. Finally, we recorded differences between cases and controls in ED, except in specific subscales and ADHD types.

ED

We observed higher ratings of ED in patients with ADHD on the DERS and CAARS lability scale in all the subscales. In the DERS subscales, differences were detected between cases and controls, in strategies, impulse, overall DERS, goals, awareness and clarity. It can be interpreted that non-acceptance of emotions is a Trans diagnostic dimension of ED.

We observed that the combined subtype of ADHD was the one with the highest ED. This finding has been reported elsewhere [40] and in children [53], but in other studies hyperactivity, especially impulsivity, showed a stronger connection with ED than inattention [34,35,42,43,54,55].

The possibility that EL is independent of the presence of psychiatric disorders other than ADHD has been discussed. ADHD patients with comorbid conditions had higher rates of EL than those without comorbid conditions; adults with ADHD present significantly higher rates of EL than non-ADHD patients [34,56,55]. No significant differences in ED scores were observed between the inattentive and hyperactive/impulsive types.

In our study, ED was associated with all ADHD types. In the cases, ED in DERS and CAARS was associated with all ADHD types: inattentive ADHD correlated with all DERS subscales, hyperactive ADHD with all DERS subscales except for awareness and clarity, and combined ADHD with all subscales except for awareness. This finding is similar to the previous one comparing cases and controls with CAARS's lability scale, and may be interpreted in such a way that awareness and clarity are not specific dimensions in ED and ADHD, but that they are shared with other types of psychopathology (eg,bipolar disorder, BPD [57]).The presence of comorbid disorders was only related to greater intensity of these EL symptoms; therefore, it seems that ED is a specific feature of ADHD and not merely a consequence of the presence of other comorbid disorders [58]. ED is a major indicator of the severity of ADHD [43].

Personality dimensions

In our study, differences in the association between NEO-PI dimensions and ADHD types were observed, as follows: in attention is significantly associated with impulsivity and

vulnerability (both facets of neuroticism), and hyperactivity is significantly associated with hostility, depression, social anxiety, and impulsivity (also facets of neuroticism). In other studies, neuroticism/negative emotionality and reactive control are associated with impulsive/hyperactive symptoms [59]. High scores for assurgency and negative affect may be specifically associated with inattentive and hyperactive-impulsive ADHD, as may low scores for effortful control [60,61].

Studies on the association between personality dimensions and inattention and hyperactivity have generally mirrored the findings for ADHD symptoms taken together; the inattentive type should have relatively high scores for neuroticism, and individuals with combined and hyperactive-impulsive types have relatively high scores for disagreeableness [62,63]. ADHD was associated with high scores for neuroticism, and HA [62,64]. High scores for HA have been associated with inattention and high scores for NS with hyperactivity/impulsivity in ADHD patients [8,9,13,20,53,55,65,66];other authors have seen low scores in the dimensions persistence [67], reward dependence[67,68,20],self-directedness [13,68,66], and cooperativeness [67,68,13], and high scores in self-transcendence [13,65,67,66]. Higher scores in NS in adult ADHD are also replicated [69,70,64]. Valero et al. [71], showed that high scores on neuroticism-anxiety, impulsivity, and general activity and low scores on work activity were the most powerful predictors of ADHD. Merwood [72] found that NS was genetically associated with both symptoms of inattention and hyperactivity/impulsivity and that HA was genetically associated with inattention only.

Our findings suggest that all types/specifies of individuals with ADHD will have high scores for neuroticism and low scores for conscientiousness and agreeableness. These findings are in line with the literature[73-75].

Multivariate logistic regression revealed that a higher score on conscientiousness was associated with a lower risk of inattentive ADHD. In addition, a comparison of WURS and NEO-PI dimensions showed that higher WURS was related to less agreeableness and more hostility (within neuroticism). This conclusion implies that there is potential to use FFM measures when screening for ADHD. Individuals who are likely to have ADHD can be distinguished from those who are less likely to have ADHD in terms of high scores for neuroticism and low scores for conscientiousness and agreeableness.

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Depression is closely associated with personality and neuroticism and more moderately associated with extraversion and conscientiousness [76]. We try to distinguish between ADHD and depressive disorder when excluding patients who had been in a depressed state during the previous three months. Merwood et al. [72], suggest of an increased risk for internalizing symptoms such as anxiety disorders in ADHD subjects with higher number of inattentive symptoms.

We found that all neuroticism dimensions are correlated with CAARS lability scores and that only a few neuroticism dimensions were correlated with inattention and hyperactive ADHD. Consequently, we must ask whether CAARS lability-impulsivity is more important inside an ADHD construct.

We observed a greater association with personality disorders and NEO-PI dimensions in hyperactive and combined ADHD, as well as in the correlation with WURS.

ADHD types

Other types of ADHD have been proposed based on specific scales (Self-report Wender-Reimherr adult attention deficit disorder scale, WRAADDS) [31], namely, inattention and ED. The latter represents a more impaired group of individuals in at least three of four WRAADDS domains, namely, hyperactivity/restlessness, temper, affective lability, and/or emotional over-reactivity [30,31,42]. We found that all neuroticism dimensions are correlated with CAARS lability scores and that only a few neuroticism dimensions were correlated with inattention and hyperactive ADHD. Consequently, we must ask whether CAARS lability-impulsivity is more important inside an ADHD construct.

Limitations

Our study was subject to a series of limitations. First, assessment of ED was only self-reported, and future investigations need to include clinically reported symptoms. No common consensus has been reached on how to

Appropriately assess emotional problems in patients with ADHD [77,78]. Besides, the CAARS subscale may be sensitive not only to ADHD symptoms, but also to other Axis I disorders that include inattention as a prominent symptom. Although there is support for the convergent validity of CAARS, further research is needed to investigate its ability to discriminate between symptoms of ADHD and similar features of other disorders (i.e., anxiety and depressive disorder).Second, as the study was cross-sectional; the findings show only associations and not causal relations. Third, the small size of the control sample can be considered a limitation, although our sample was sufficiently large to detect differences between cases and controls.

Data on personality disorders were not included, since they had already been presented in a previous study by our group [79]. We felt that it was unnecessary to include them in the present study. Despite the fact that ADHD shares many comorbid conditions with personality disorders, we used several instruments to measure ADHD and detect patients with this disorder and not false positives.

CONCLUSIONS

Several dimensions of adult ADHD are compatible with ED,

which could be another ADHD type or included in a type. Some ED subscales, such as non-acceptance, clarity and awareness, are not specific to ADHD. High scores for neuroticism and low scores for conscientiousness are typical in adult ADHD.

It is important to question the overlap with personality dimensions, which could represent two syndromes or one convergent syndrome in longitudinal studies of adolescent ADHD.

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