Emotional lability: The discriminative value in the diagnosis of attention deficit/hyperactivity disorder in adults

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Abstract

Objective: The aim of this study is to assess the discriminative value of emotional lability (EL) in the diagnosis of adults with ADHD.

Methods: A group of adults who met ADHD DSM-IV diagnostic criteria (n = 589), a clinical control group (n = 138) and a community control group (n = 98) were compared in EL scores. SCID-I, SCID-II and CAADID were used to select subjects. The specific subscale on EL of the Conners Adult ADHD Rating Scale (CAARS) was used to evaluate EL.

Results: An analysis of the covariance was carried out in order to explore the association between EL, ADHD and comorbidity. The group factor (ADHD, clinical or community group) and the comorbidity factor (presence or absence of other psychiatric disorders different from ADHD) showed to be significant on EL intensity (group: F = 81.78, p = 0.000; comorbidity: F = 25.48, p = 0.000). However, no significant differences were found in the group × comorbidity interaction (F = 1.006, p = 0.366). EL showed a sensitivity of 87.1% and a specificity of 46.6% in discriminating between ADHD patients and subjects with other psychiatric disorders.

Conclusion: EL is specifically related to ADHD and this association is not explained for the presence of other psychiatric disorders. The presence of comorbid disorders is only related to a major intensity of EL.

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1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a developmental neurobiological disability that appears in childhood and persists into adulthood in at least 57% of the cases causing a significant functional impairment [1–3]. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) includes inattention and impulsivity–hyperactivity as core symptoms and defines three predominant cluster of ADHD symptoms: combined ADHD which is the most common, followed by the predominant inattentive symptoms and the hyperactive/impulsive symptoms. Nevertheless, DSM-IV and the recent DSM-5 do not include emotional lability (EL) as diagnostic criteria for ADHD.

Different researchers have drawn attention to the presence of emotional symptoms in adults with ADHD [4]. Barkley’s theoretical model has pointed out at the importance of emotional self-regulation as a core symptom of ADHD [5]. Emotional dysregulation was also included in the Utah criteria [6]. According to this approach, deficits in emotional regulation are defined by three domains referring to temper control, affective lability and emotional over reactivity. In the same line, Barkley and Murphy [7] proposed the term “deficient emotional self-regulation” to refer to being quick to get angry or become upset, easily frustrated, overreact emotionally, easily excited, lose temper, argue with others, being touchy or easily annoyed by others and angry or resentful. On the other hand, Brown’s model proposes the domain “affective interference” [8] and finally Conners’ model adds emotional lability as an emotional feature of ADHD [9].
Emotional dysregulation [10], emotional impulsiveness [11], mood instability [12] and emotional lability [13] have been used to refer to similar conceptualizations [14–16]. Rösler et al. [17] observed high correlations between the measure of emotional dysregulation (EDS Emotional Dysregulation Scale) and Emotional Lability of the CAARS Scale (Conners Adult Attention Deficit Scale). In the current research, the term EL is used in accordance with Conners’ model referring to irritability, unpredictable moods, setting off easily, hot temper, low frustration tolerance and difficulties in anger management [9].

EL has been previously investigated in adults with ADHD [7,18,19] and in children [13,20–31]. It has been associated with several variables of ADHD severity, such as greater ADHD functional impairment [7,32], lower quality of life [33], ADHD persistence [1,11] and higher ADHD severity in childhood [13]. These studies have reported that EL explains part of the functional impairment in ADHD that is not accounted by the core symptoms of inattention and hyperactivity/impulsivity. However, little is known about the significance of this construct in the diagnosis of the disorder.

There is an ongoing discussion whether symptoms of EL should be included as a core symptom to the conceptualization of ADHD. On the one hand, EL has frequently been observed in clinical samples of adults with ADHD [7,18,19]. Moreover, several empirical studies have demonstrated that EL is interlinked to ADHD [18,34]. In the same line, psychopharmacological treatments for ADHD have shown to reduce ADHD symptoms in parallel with EL in adults [17,35–38] and also in children [39,40] suggesting that EL could be an intrinsic symptom of ADHD. Furthermore, recent investigations have found common neuroanatomical substrates underlying ADHD symptoms and EL [41,42]. However, previous reviews reported that EL is present in other disorders such as anxiety, depression, bipolar disorder, oppositional defiant disorder and personality disorders suggesting that EL presents a low specificity as diagnostic criteria for ADHD and that EL constituted a transversal feature in other psychiatric disorders different from ADHD [16,43]. Only one previous study has been published which assesses the predictive ability of EL in the diagnosis of ADHD obtaining a sensitivity of .85 and a specificity of .81 [19]. However, no patients with comorbid conditions or other psychiatric diagnosis different from ADHD were included. Thus, it is still unclear whether EL is attributable to ADHD or if it is a result of the presence of comorbidity.

The main objective of the current research was to assess the discriminative value of EL in the diagnosis of adults with ADHD. The present investigation is the first in assessing the discriminative value of EL in the diagnosis of adults with ADHD considering the presence of other psychiatric disorders different from ADHD (Axis I and Axis II comorbidity).

2. Methods

2.1. Participants

The sample consisted of three groups: a group of ADHD patients, a clinical control group and a community control group.

1. ADHD group (n = 589): subjects who met ADHD DSM-IV diagnostic criteria in adulthood and in childhood. ADHD patients were recruited through an Adult ADHD Program at a University Hospital in Barcelona, Spain. The ADHD group consisted on patients with the diagnosis of ADHD with and without comorbidity.

2. Clinical control group (n = 138): this group was recruited from outpatient clinic of general psychiatry at the same hospital. The clinical control group was established in order to assess the specificity of emotional lability between the ADHD group and clinical control subjects with other psychiatric disorders different from ADHD.

3. Community control group (n = 98): constituted by general population subjects recruited through advertisements. The objective was to assess non-clinical subjects.

The inclusion criteria for the ADHD group were being older than 18 years and fulfilling DSM-IV diagnostic criteria for ADHD [44]. Patients with ADHD and other comorbid disorders: anxiety disorders, mood disorders, substance use disorders (SUD) and personality disorders were included. The ADHD patients with SUD needed to be abstinent for a minimum period of 1 month prior to the study. Exclusion criteria from the ADHD group were intellectual quotient IQ <85, schizophrenia or other psychotic disorders, symptoms of substance intoxication and withdrawal, ADHD symptoms due to mood, anxiety or personality disorders, sexual or physical abuse and neurological or systemic disorders that might explain ADHD symptoms.

The inclusion criteria of the clinical control group were to be out-clinic patients of general psychiatry at the same hospital and over 18 years of age. The exclusion criteria were to have childhood or adulthood DSM-IV diagnostic criteria for ADHD, intellectual quotient IQ <85, and schizophrenia or other psychotic disorders and symptoms of substance intoxication and withdrawal.

Finally, the inclusion criteria of the community control group were being over 18 years of age and not having accessed an ADHD program or an out-clinic of general psychiatry. The exclusion criteria were to have childhood or adulthood DSM-IV diagnostic criteria for ADHD schizophrenia or other psychotic disorders, to present symptoms of substance intoxication or withdrawal and intellectual quotient IQ <85.
2.2. Procedures

Patients from the ADHD group and the two control groups were recruited during the period running from September 2008 to September 2012. The evaluation was performed before the patients started pharmacological treatment.

A total of 600 patients with an ADHD diagnosis visited in the ADHD program during the study period. Of these patients 589 accepted to participate in the study. On the other hand, 153 patients visited in the out-clinic of general psychiatry, 138 of which participated. As for the community control group, 102 subjects were screened and 98 fulfilled the inclusion criteria. The study was approved by the committee of the hospital and all participants signed an informed consent. Patients receive no funding for their participation in the study.

2.3. Clinical assessment

2.3.1. Adult ADHD

Diagnosis of ADHD was established by senior psychiatrists and psychologists experienced in the diagnosis of adult ADHD. The Spanish version of Conners Adult ADHD Diagnostic Interview for DSM-IV (CAADID part II) was used for the diagnosis of ADHD [45,46]. 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 a clinician. The second part is administered by the clinician in order to evaluate the DSM-IV criterion of ADHD. Previous studies have observed a high diagnostic reliability between clinicians, a kappa of 1.0 has been obtained in ADHD diagnosis between clinicians with a 95% confidence interval of 0.8–1.0 [47].

Severity of ADHD symptoms in adulthood was evaluated using the following scales:

- ADHD Rating Scale (ADHD-RS) [48]: it is an 18 item scale that assesses the diagnostic criteria for ADHD. The patient rates the frequency of each item in the past 6 months on a 4 point Likert scale (0–3).
- Wender Utah Rating Scale (WURS) was implemented to assess severity of ADHD during childhood [49]. It is a 61 item self-reported scale. Patients are asked to self-report retrospectively ADHD symptoms during childhood.

2.3.2. Emotional lability

This variable was evaluated with the self-reported Conners Adult ADHD Rating Scale-long version (CAARS) [9] which is designed to assess ADHD in adults and includes the following subscales: inattention/memory problems, hyperactivity/restlessness, impulsivity/emotional lability, problems with self-concept, DSM-IV inattentive symptoms, DSM-IV hyperactive–impulsive symptoms, DSM-IV ADHD symptoms total and ADHD index. The CAARS consists of 66 items.

Of these 66 items, 12 correspond to impulsivity/emotional lability: 6 items are related with emotional lability (61, 47, 30, 19, 23, and 8) and 6 items are associated with impulsivity (12, 4, 39, 52, 43, and 35). The emotional lability factor consisted of the following items: “I am irritable”, “I have unpredictable moods”, “Many things set me off easily”, “I have a hot temper/I lose patience easily”, “I still throw tantrums” and “I get frustrated easily”. Each item is scored on a four point Likert scale ranging from 0 to 3 (0 = “not at all or never”; 1 = “just a little, once in a while”; 2 = “pretty much, often”; 3 = “very much, very frequently”). CAARS is the only psychometric measure validated in Spanish containing specific items to assess EL in adults with ADHD [50]. (Table 1).

2.3.3. Comorbidity

For differential diagnosis and comorbidity assessment, Structured Clinical Interview for Diagnostic and Statistical Manual of Mental Disorders DSM-IV Axis I (SCID-I) [51] and Diagnostic and Statistical Manual of Mental Disorders DSM-IV Axis II (SCID-II) [52] were used.

2.3.4. Intellectual quotient

IQ was screened by Vocabulary and Block Design subtests of the Wechsler Adult Intelligence Scale 3rd Edition (WAIS-III) [53]. Patients also completed the Digit Span, Arithmetic, Letter-Number Sequencing and Symbol Search subtests of the WAIS-III.

2.4. Statistical analyses

The internal consistency reliability of the emotional lability factor of the CAARS was assessed using Cronbach’s alpha. An analysis of covariance (ANCOVA) was used in order to analyse the association between EL and ADHD and comorbidity association. Two principal factors were considered, clinical conditions (ADHD vs. clinical control vs. community control) and the comorbidity (with vs. without). The interaction of both principal factors was also analyzed in order to explore if comorbidity has a differential effect between clinical conditions. Age and gender were considered as covariates. The clinic group and community participants were grouped in a non-ADHD group. A logistic regression analysis was performed to determine the capacity of EL to discriminate between ADHD vs. non-ADHD participants. Sensitivity and specificity parameters were calculated. Moreover, differences on EL between the three ADHD subtypes were analyzed considering age and gender as covariates. All statistical analyses were conducted using the SPSS 20.0 software and statistical significance was set at $p \leq 0.05$.

3. Results

3.1. Participant characteristics

Table 2 shows the participant’s demographic and clinical characteristics. Significant differences were obtained.
Participants in ADHD group were significantly younger ($M = 32.89$, $SD = 10.55$) than the clinical control group ($M = 34.83$, $SD = 11.38$) and in the community control group ($M = 38.65$, $SD = 13$). A high rate of men was observed on the ADHD group (ADHD group = 66.89%; clinical control group = 62.2% and community control group = 48.98%). The ADHD group showed fewer years of education ($M = 11.58$, $SD = 6.26$) compared to the clinical control group ($M = 11.72$, $SD = 4.42$) and the community group ($M = 14.04$, $SD = 4.22$). The clinical control group showed higher rates of unemployment (clinical control group = 21.73%; ADHD group = 19.86% and community group = 15.30%). ADHD patients showed higher prevalence of mood disorders [$\chi^2(2) = 16.165, p < 0.0005$], more anxiety disorders [$\chi^2(2) = 17.782, p < 0.0005$] and SUD [$\chi^2(2) = 25.829, p < 0.0005$] than clinical and community control group. The groups did not differ in terms of IQ scores.

In the ADHD group ($n = 589$), 57.2% of the patients were combined subtypes, 36.3% were inattentive subtypes and 6.45% were hyperactive subtype. Of the ADHD patients, 48.55% had no comorbid disorders and 51.44% of the patients present comorbid disorders: 40.24% had anxiety disorders, 41.76% had mood disorders, 42.78% with substance use disorders and 24.78% personality disorders.

The clinical control group ($n = 138$) consisted of 38.4% of patients suffering mood disorders, 34.06% with anxiety disorders, 29.71 with substance use disorders and 14.49%...
with personality disorders. In this group 52.24% of the subjects had received no diagnosis of a comorbid disorder. The community control group (n = 98) was composed of 22.44% of subjects that met criteria for other psychiatric disorders different from ADHD: 20.41% with mood disorders, 18.37 with anxiety disorders, 18.3% with substance use disorders and 6.2% presenting personality disorders. There were 77.51% of the adults who had received no diagnosis of a comorbid disorder.

3.2. Emotional lability and ADHD

Chronbach’s alpha was used in order to assess the internal consistency of the items that constituted the emotional lability construct according to the CAARS Scale. Chronbach’s alpha for the six items of EL was 0.896 indicating a high internal consistency of the EL construct.

An analysis of the covariance was carried out in order to explore the association between EL, ADHD and comorbidity/other psychiatric disorders. Group × comorbidity interaction was no significant (F = 1.00, p = 0.366). The group factor (ADHD, clinic or community group) and the comorbidity factor (presence or absence of other psychiatric disorders different from ADHD) showed to be significant on EL scores (group: F = 81.78 p < 0.0005; comorbidity: F = 25.48 p < 0.0005). The group factor explained a 16% of the variance of EL, and 30% in the case of comorbidity factor (Table 3). The discriminative value of EL in the ADHD diagnosis was assessed. EL showed a sensitivity of 87.1% and a specificity of 46.6% in discriminating ADHD diagnosis.

In the ADHD group, subjects with comorbidity obtained higher scores on EL than subjects without comorbid disorders (ADHD group mean = 10.82 vs. 8.13). In the clinical control group, subjects with a comorbid psychiatric disorder obtained higher scores on EL than those without a comorbid psychiatric disorder (clinical control group mean = 7.01 vs. 5.47). In the community group, patients with other psychiatric disorders different from ADHD obtained higher scores on EL than those without psychiatric disorders (community group mean = 4.56 vs. 2.15) (Fig. 1).

EL scores from the three ADHD subtypes were analyzed considering age and gender as covariates. A significant association between ADHD subtypes and EL was observed (F = 86.91; p < .0005), showing the combined subtype higher rates on EL (combined subtype: M = 10.68 SD = 4.38; inattentive subtype: M = 7.72 SD = 4.54; hyperactive subtype: M = 8.71 SD = 4.11). No significant differences were observed between the hyperactive and the inattentive subtype (p = 1.000). ADHD subtypes were compared between the two control groups (non-ADHD subjects) in relation to EL scores. Significant differences between the control subjects and each ADHD subtype were observed (p < 0.001), showing the two control groups lower scores on EL than the ADHD group.

The discriminative value of EL in the ADHD diagnosis was evaluated. EL showed a sensitivity of 87.1% and a specificity of 46.6% in discriminating ADHD diagnosis.

4. Discussion

The current study found that adults with ADHD presented higher levels of EL when compared to clinical control subjects and community subjects. The combined subtype of ADHD was the one with highest EL. Furthermore, our outcomes reported that EL is independent from the presence of other psychiatric disorders different from ADHD. High scores on EL were obtained in ADHD patients with and without comorbidity. Despite this fact, ADHD subjects with comorbidity showed higher rates of EL than those without comorbid disorders suggesting that presence of other disorders contributes to the likelihood of EL.

Previous studies have also found that adults with ADHD present significantly higher rates of EL compared to non-ADHD patients [7,18,19]. Furthermore, regarding the discussion if whether EL is attributable to ADHD or if it could be a result of the presence of comorbidity, we obtained similar results to Surman et al. [18]. We also found that EL is related to ADHD and is not explained by the presence of other comorbid disorders different from ADHD. On the same line, Reimherr et al. [36] observed emotional dysregulation symptoms in their sample in the absence of anxiety or depressive disorders. On the other hand, we found that the presence of comorbidity was

Table 3
The association between EL, ADHD and comorbidity.

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<th>Sig</th>
<th>Eta squared</th>
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<tr>
<td>Group × comorbidity</td>
<td>1.006</td>
<td>0.366</td>
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</tbody>
</table>

Fig. 1. Mean scores of the three groups on EL.
associated to a higher intensity of EL. Similar results were obtained in children [13]. Nevertheless, in children, EL seems to be more related to oppositional defiant disorder than to ADHD core symptoms [24,32].

In relation to the ADHD subtypes, prior investigations have also reported that the combined subtype is the one with highest scores on EL in adults [36] and also in children [25,28]. No significant differences in EL scores were observed between inattentive and hyperactive/impulsive subtypes. This outcome could mean that EL may be a distinct feature from impulsivity. However, some studies have found a relation between EL and both hyperactivity and impulsivity symptoms in adults [19] and in children [13,30]. Thus, our results could be explained by the presence of some degree of impulsivity that is observed in some patients with ADHD inattentive subtype. Moreover, the construct of EL is also related to some impulsivity dimensions (difficulties in anger management, setting off easily, hot temper, low frustration tolerance). Future research is needed to focus on the hypothesis that EL may be related to some personality profiles and that EL could be a marker of a different subgroup of ADHD patients [34,54]. In the same line, prior research has suggested a possible familiarity of ADHD comorbid with deficient emotional self-regulation (DESR) (33).

On the other hand, EL showed a sensitivity of 87.1% in discriminating ADHD patients suggesting that EL is highly frequent in ADHD. Thus, if an individual presents EL symptoms such as low frustration tolerance, irritability or difficulties in anger management, it would be appropriate to screen ADHD as a potential explanation for EL [16,43]. The presence of EL does not exclude the presence of ADHD diagnosis. However, in contrast with Skirrow et al.’s [19] findings, we obtained a low specificity (46.6%) of EL in the detection of ADHD. This result could be explained by the fact that some symptoms of EL can be also present in other psychiatric disorders. This lack of specificity could explain the absence of formal recognition of EL in adult ADHD. However, this lack of formal recognition makes the differentiation of ADHD from other disorders more difficult and could partially explain the under diagnosis of ADHD in adults. Skirrow et al. [19] obtained a higher value on specificity, probably because in their study, ADHD patients with the presence of current axis I or II comorbid psychiatric diagnosis were excluded, the sample was composed by ADHD patients with subsyndromal comorbid symptoms.

There are several limitations to the present investigation. It was not possible to compare the variable EL between ADHD subjects and subjects with personality disorder, such as borderline personality disorder (BPD) due to a reduced number of personality disorders was obtained. Thus, the high EL score of the ADHD group was not explained by the presence of BPD. Finally, the assessment of EL was only self-reported and future investigations need to include clinically reported symptoms. Despite these limitations, it is important to draw attention to the fact that structured interviews for the assessment of comorbidity (SCID-I, SCID-II) were used. Structured evaluations for differential diagnosis are needed and it has not always been considered in some prior research [7,11].

Different scales have been used in previous studies such as: The Emotional Dysregulation Scale (EDS) derived from Wender–Reimherr Adult Attention Deficit Disorder Scale (WRAADDS) [10] Emotional impulsiveness Scale [11] RATE-S (Rating Scale ADHD Training Evaluation–Self-Report) [55], Affective Lability Scale [56] and Brown ADHD rating scales [8]. Nonetheless, most of these scales include symptoms that are related to impulsivity. Therefore, there is a need of develop psychometric measures designed to evaluate EL and impulsivity as separate features on adults with ADHD. The different scales that are used to measure EL and the different terms of emotional dysregulation complicate the comparison between studies on this topic.

Despite these limitations, the sample of the current research is the largest in the studies on EL in adults with ADHD. The findings showed a high sensitivity of EL in the diagnosis of ADHD and pointed out that EL is a significant symptom in adults with ADHD. The presence of comorbid disorders was only related to a major intensity of these EL symptoms. Therefore, it seems that EL is a specific feature of ADHD and it is not merely a consequence of the presence of other comorbid disorders.

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