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Emotional Intelligence as an Evolutive Factor on Adult With ADHD

Javier Quintero[1,2,3], Rosa Vera[2], Isabel Morales[3], Pilar Zuluaga[2], and Alberto Fernández[2,4]

Abstract

Objective: ADHD adults exhibit deficits in emotion recognition, regulation, and expression. Emotional intelligence (EI) correlates with better life performance and is considered a skill that can be learned and developed. The aim of this study was to assess EI development as ability in ADHD adults, considering the effect of comorbid psychiatric disorders and previous diagnosis of ADHD. **Method:** Participants (n = 116) were distributed in four groups attending to current comorbidities and previous ADHD diagnosis, and administered the Mayer–Salovey–Caruso Emotional Intelligence Test version 2.0 to assess their EI level. **Results:** ADHD adults with comorbidity with no previous diagnosis had lower EI development than healthy controls and the rest of ADHD groups. In addition, ADHD severity in childhood or in adulthood did not influence the current EI level. **Conclusion:** EI development as a therapeutic approach could be of use in ADHD patients with comorbidities.*(J. of Att. Dis. XXXX; XX(X) XX-XX)*

Keywords

ADHD, emotional regulation, adult ADHD, comorbidity, emotional intelligence

Introduction

ADHD is a neuropsychiatric disorder that affects 2% to 3% of adults worldwide (Faraone, Biederman, & Mick, 2005; Fayyad et al., 2007; S. J. Kooij et al., 2010; Simon, Czobor, Balint, Meszaros, & Bitter, 2009). ADHD symptoms in adults can cause clinical, psychological, and social disabilities (Able, Johnston, Adler, & Swindle, 2007; Kessler et al., 2011; S. J. Kooij et al., 2010). Patients tend to present more difficulties in settling personal and working life and increased number of risk behaviors and accidents than non-ADHD adults (Barkley, Fischer, Smallish, & Fletcher, 2004; Reimer, Mehler, D'Ambrosio, & Fried, 2010; Weiss, Hechtman, Milroy, & Perlman, 1985). Moreover, three quarters of adults with ADHD show at least one comorbid condition (Biederman, Newcorn, & Sprich, 1991; Faraone et al., 2015).

The majority of the research on ADHD has focused on the defining characteristics of the disorder: inattention, hyperactivity, and impulsivity. However, some authors have claimed that another symptom of the disorder, emotional dysfunction, should also be considered a key feature of ADHD (Barkley, 1997; Shaw, Stringaris, Nigg, & Leibenluft, 2014; Uekermann et al., 2010). ADHD children and adults show poorer emotion recognition in facial expressions and voice (Bisch et al., 2016; Cadesky, Mota, & Schachar, 2000; Corbett & Glidden, 2000; Kats-Gold, Besser, & Priel, 2007; Rapport, Friedman, Tzelepis, & Van Voorhis, 2002; Shapiro, Hughes, August, & Bloomquist, 1993; Singh et al., 1998; Yuill & Lyon, 2007), increased aggressive behaviors, low frustration tolerance, and impaired emotion self-regulation (Able et al., 2007; Reimherr et al., 2005; Sjöwall, Roth, Lindqvist, & Thorell, 2013). These emotional symptoms can be at least partially uncoupled from the cognitive components of the disorder and from the associated comorbidities (Bisch et al., 2016; Rapport et al., 2002; Surman et al., 2013). More importantly, emotional dysfunction can significantly aggravate ADHD presentation. However, there are still relatively few studies that address emotional abilities in ADHD patients from a global perspective, especially in adults (Shaw et al., 2014; Uekermann et al., 2010).

Over the last decades, emotional intelligence (EI) has emerged as a relevant factor that can mediate or predict different aspects of people's life performance, in addition to cognitive intelligence (CI) and personality traits (Mayer, Roberts, & Barsade, 2008). EI can be defined as "the ability to carry out accurate reasoning about

[1]HospitalUniversitarioInfanta Leonor, Madrid, Spain
[2]Medical School, Complutense University of Madrid, Spain
[3]PSIKIDS, Madrid, Spain
[4]Technical University of Madrid, Spain

Corresponding Author:
Javier Quintero, Segre 7, 28002 Madrid, Spain.
Email: fjquinterog@yahoo.es

emotions and the ability to use emotions and emotional knowledge to enhance thought" (Mayer et al., 2008, p. 511). The four-branch model of Mayer and Salovey is one of the most accepted theoretical approaches to EI (Brackett & Mayer, 2003; Fiori et al., 2014). This model defines four components of EI: (a) Perceiving Emotions, or the perception and recognition of emotions in oneself or others, or in other sensorial stimuli; (b) Using Emotions to Facilitate Thought, or the use of emotions to prioritize and improve thinking; (c) Understanding Emotions, or the comprehension of complex emotions; and (d) Managing Emotions, or the management of one's own and others' emotions to promote personal and interpersonal development (Brackett & Salovey, 2006). The four areas of EI, as well as the global EI of an individual, can be evaluated with the Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, Caruso, & Sitarenios, 2003). The four-branch model considers EI as a set of cognitive abilities related to emotions that are largely independent of personality or emotional state (Brackett & Salovey, 2006; Mayer, DiPaolo, & Salovey, 1990). This implies that EI can be developed throughout life (Brackett & Salovey, 2006; Mayer et al., 1990). Interestingly, the concept of EI as a group of abilities that are learned and, therefore, can be trained, opens a window for therapeutic intervention.

In this study, we have assessed the EI level in adults affected by ADHD with the MSCEIT, taking into account the potential effect of their current comorbidity and of previous diagnosis during childhood. To our knowledge, no previous research has examined global and specific levels of EI in adult ADHD patients. Our hypothesis was as follows:

> **Hypothesis 1:** ADHD adults could have a poorer development of EI as ability and, therefore, would show lower EI than healthy individuals, both at global level and in each individual EI dimension.

Method

Participants and Procedure

We recruited control and ADHD adults from two different mental health units in Madrid and two support associations for parents of children affected by ADHD. Data were collected between October 2013 and December 2014. Only two licensed psychologists with a specific training evaluated participants' eligibility to ensure the coordination of the inclusion and exclusion criteria. Each participant was then evaluated in two sessions of approximately 2 h in length. During these sessions, participants completed a structured interview (Basic Minimum Data Set), from which we obtained sociological and demographical data, and were evaluated with the clinical and psychometric tests detailed in the sections below.

The final sample consisted of 116 Spanish adults, males and females, with a mean age of 38.29 years (SD = 11.48). Participants were classified into four groups, depending on (a) history of ADHD diagnosis in childhood or adolescence and (b) presentation of comorbid psychiatric pathologies. The four groups designed for this study were non-ADHD, healthy adults (healthy controls; HC; n = 25); ADHD adults without comorbidity and undiagnosed in childhood or adolescence (ADHD −C−D; n = 31); ADHD adults with comorbidity and undiagnosed in childhood or adolescence (ADHD +C−D; n = 31); and ADHD adults with comorbidity with a previous ADHD diagnosis in their childhood or adolescence (ADHD +C+D; n = 29).

Exclusion criteria of this study included intellectual disability (IQ < 70, measured with the Wechsler Adult Intelligence Scale–IV [WAIS-IV]; Wechsler, 2008), substance abuse disorder (with the exception of caffeine or nicotine) and, for the HC group, meeting diagnostic criteria of the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I). Of an initial recruited sample of 119 participants, three individuals within the HC group were excluded from the study during data analysis because they met criteria of the SCID-I. Due to the recommendation of the Ethics Committee, information about current or previous treatment was not recorded and has been not addressed in the study.

Participation was voluntary, and all participants signed an informed consent document after being informed of the aims and procedure of the study. This study was approved by the Clinical Research Ethics Committee of the Hospital Gregorio Marañón, Madrid, Spain (PSQ_TDAH_IE, dated October 7, 2013). All data were managed in accordance with the local regulation on personal data protection (LOPD 13/1999).

Measures

Diagnosis of ADHD and comorbid psychiatric pathologies. Briefly, diagnoses of ADHD and the presence of any comorbid psychiatric pathologies were performed with the information obtained from (a) clinical interview with a psychiatrist, (b) clinical history, (c) the SCID-I, and (d) the following ADHD evaluation tools: the ADHD Self-Report Scale (ASRS_V1.1), the Diagnostic Interview for ADHD in Adults (DIVA; Kooij & Francken, 2010), Wender Utah Rating Scale (WURS; Fossati et al., 2001; Ward, Wender, & Reimherr, 1993), and Conners' Adult ADHD Rating Scale (CAARS; Conners et al., 1999; Erhardt, Epstein, Conners, Parker, & Sitarenios, 1999).

Identification of ADHD participants was first conducted with the ASRS_V1.1 screening scale. ADHD diagnoses were then confirmed with the DIVA, a validated,

structured interview based on the core ADHD symptoms defined by the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association, 1994), that provides "a list of realistic and concrete examples for both current and retrospective (childhood) symptoms" (Kooij & Francken, 2010, p. 2; Ramos-Quiroga et al., 2016). Current severity of ADHD symptoms was determined with CAARS (Conners et al., 1999; Erhardt et al., 1999). CAARS comprises both a self-report questionnaire and an observer-rated form that reflect the 18 ADHD criteria included in *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000). Spanish versions of DIVA and CAARS were employed. Finally, we administered the WURS scale, a self-report questionnaire designed to retrospectively assess ADHD symptoms during childhood. A previously validated Spanish adapted version was employed in this study (Rodríguez-Jiménez et al., 2001). All ADHD participants met *DSM-IV-TR* diagnostic criteria for ADHD.

Measure of EI. EI was measured with the MSCEIT version 2.0 in its Spanish version (Extremera, Fernández-Berrocal, & Salovey, 2006; Mayer et al., 2003). The MSCEIT is a performance-based test that measures the abilities of the participants in solving problems related to the four branches of the four-branch model: Perceiving Emotions, Using Emotions to Facilitate Thought, Understanding Emotions, and Managing Emotions. The test takes between 30 and 45 min, and contains 141 items grouped in eight tasks, with two tasks accounting for each branch of the model. MSCEIT gives a global score, as well as specific scores for each branch of the model. The value ranges are (a) "improve": less than 70, (b) "consider developing": between 70 and 89, (c) "competent": between 90 and 110, (d) "skilled": between 111 and 130, and (e) "expert": more than 130.

Statistical Analysis

Values from quantitative parameters were expressed as means and standard deviation (*SD*) or medians. Normality of each quantitative variable was assessed by conducting a Shapiro–Wilk test, which is adequate for the study of small samples. For normal variables, hypotheses were tested with ANOVA (*F*), or, to test covariance, ANCOVA, and Bonferroni test was used for post hoc analysis. For nonnormal variables, comparisons between more than two groups were performed with a Kruskal–Wallis test (*H*), and Dunn's test was used for post hoc analysis. Values from qualitative parameters were expressed as frequencies, and comparisons between groups were tested with the chi-square test or Fisher's exact test. The relationship between severity of ADHD symptoms in childhood (WURS) or adulthood (CAARS) and EI was tested with Spearman correlation coefficients. All statistical analyses were performed with SPSS 22 for Windows and MedCalc.

Results

Based on clinical history and comorbidities, participants were divided into four groups called HC, ADHD −C−D, ADHD +C−D, and ADHD +C+D (as explained in the "Method" section). We analyzed sociodemographic (Table 1) and symptomatological (Table 2) variables in these groups.

As shown in Table 1, the four groups did not differ in sex or marital status distribution; however, they differed in age. Mean age was highest in controls ($M \pm SD = 43.64 \pm 9.534$) as compared with the ADHD +C+D group ($M \pm SD = 30.52 \pm 11.012$), and analysis of multiple comparisons (post hoc test) indicated statistically significant differences ($p < .001$). As age could be a confounding factor, subsequent analyses were corrected for age when necessary (i.e., ANCOVA). Regarding academic performance, the variable *Education level* showed that HC group reaches the highest educational levels with a much higher number of university graduates (52.0%) compared with ADHD groups (23.3%, 25.8%, 34.5% in ADHD −C−D, ADHD +C−D, and ADHD +C+D groups, respectively). In contrast, the ADHD +C+D group has the highest number of fails to complete compulsory education (13.8%). Moreover, ADHD groups also showed higher frequencies in *No. of grade retentions* and *No. of school expulsions* than HC, and statistically significant differences were found among groups ($p < .05$; data not shown). Regarding personal performance, the variable *No. of relationships >3 months* did not meet normality criteria, and nonparametric tests were used. Test results showed no statistically significant difference among groups. In professional performance variables, selecting those participants with at least one previous labor experience, test results showed statistically significant difference among groups in *No. of dismissals* ($p < .05$) but not in *No. of job changes*.

Table 2 shows ADHD symptomatology in childhood and adult life in each group determined with the CAARS (four subscales), DIVA, and WURS. As expected, the control group did not reach the cutoff score in any of the tests, whereas all the ADHD groups' scores were positive for all of them. Importantly, there were no statistically significant differences between the ADHD groups in CAARS or in DIVA tests, indicating that ADHD symptomatology is similar in all the ADHD participants, irrespectively of the comorbidities. In contrast, retrospective diagnosis evaluated with WURS showed statistically significant differences among groups. The ADHD +C+D group scored higher ($M \pm SD = 53.72 \pm 17.098$), that is, worse symptomatology in childhood, than the remaining ADHD patients ($M \pm SD = 44.03 \pm 12.459$ and 43.06 ± 15.459 for ADHD −C−D and ADHD +C−D groups, respectively). Multiple group comparison analysis showed statistically significant

Table 1. Sample Characteristics.

	Control (n = 25)	ADHD −C−D (n = 31)	ADHD +C−D (n = 31)	ADHD +C+D (n = 29)	Test statistics	p value
Demographics						
Age, *M* (*SD*)	43.64 (9.534)	41.71 (9.558)	37.84 (11.542)	30.52 (11.012)[a,b,c]	F = 8.600	.000
Sex, *n* (% male)	11 (44)	14 (45.2)	12 (38.7)	14 (48.3)	χ^2 = 0.584	.900
Marital status, *n* (%)					E = 27.846	.000
Married	18 (72.0)	17 (54.8)	10 (32.3)	4 (13.8)		
Partnered	3 (12.0)	10 (32.3)	13 (41.9)	11 (37.9)		
Single	2 (8.0)	4 (12.9)	5 (16.1)	8 (27.6)		
Other	2 (8.0)	0 (0.0)	3 (9.7)	6 (20.7)		
Academics						
Educational level, *n* (%)					E = 8.687	.074
University degree	13 (52.0)	7 (23.3)[d]	8 (25.8)	10 (34.5)		
Secondary school	10 (40.0)	22 (73.3)[d]	20 (64.5)	15 (51.7)		
No qualification	2 (8.0)	1 (3.3)[d]	3 (9.7)	4 (13.8)		
Personal environment						
No. of relationships >3 months, median	2	3	2	2	H = 2.852	.415
Partners with cohabitation, median	1	1	1	0	H = 1.108	.349
Professional environment						
No. of dismissals, median	0[d]	0[e]	1[f]	0[g]	H = 7.968	.047
No. of job changes, median	3[d]	3[e]	4[f]	3[g]	H = 3.373	.338

*Note.*Control = healthy participants without ADHD; ADHD −C−D = no comorbidities/no previous diagnosis; ADHD +C−D = with comorbidities/without previous diagnosis; ADHD +C+D = with comorbidities/with previous diagnosis.
[a]Versus control, p< .001.
[b]Versus ADHD −C−D, p< .001.
[c]Versus ADHD +C−D, p< .05.
[d]n = 23.
[e]n = 28.
[f]n = 29.
[g]n = 20.

Table 2. ADHD Symptomatology.

	Control (n = 25)	ADHD −C−D (n = 31)	ADHD +C−D (n = 31)	ADHD +C+D (n = 29)		
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	Test statistics	p value
Conners' Adult ADHD Rating Scale						
Subject/Inattention	5.36 (4.508)	15.42 (6.742)[a]	15.84 (6.299)[a]	17.21 (5.314)[a]	H = 41.787	.000
Subject/Hyperactivity/Impulsivity	5.20 (3.916)	12.65 (6.696)[a]	13.97 (6.210)[a]	13.69 (5.953)[a]	H = 31.837	.000
Observer/Inattention	4.60 (4.082)	15.74 (7.252)[a]	15.39 (8.361)[a]	16.79 (7.103)[a]	H = 38.202	.000
Observer/Hyperactivity	5.52 (3.798)	12.10 (7.254)[a]	16.81 (17.755)[a]	13.38 (6.935)[a]	H = 25.464	.000
WURS	16.12 (11.311)	44.03 (12.459)[a,b]	43.06 (15.459)[a,b]	53.72 (17.098)[a]	H = 49.720	.000
DIVA						
Inattention/Childhood	1.80 (1.500)	7.84 (1.157)[a]	7.61 (1.606)[a]	8.03 (1.017)[a]	H = 60.700	.000
Hyperactivity/Childhood	1.64 (1.524)	5.71 (2.341)[a]	5.97 (3.038)[a]	6.48 (2.278)[a]	H = 40.984	.000
Inattention/Adulthood	1.92 (2.139)	7.48 (1.568)[a]	7.00 (2.066)[a]	7.31 (2.020)[a]	H = 48.099	.000
Hyperactivity/Adulthood	2.12 (2.027)	5.74 (2.236)[a]	5.84 (2.841)[a]	5.76 (2.573)[a]	H = 30.852	.000

*Note.*Control = healthy participants without ADHD; ADHD −C−D = no comorbidities/no previous diagnosis; ADHD +C−D = with comorbidities/without previous diagnosis; ADHD +C+D = with comorbidities/with previous diagnosis; WURS =Wender Utah Retrospective Scale; DIVA = Diagnostic Interview for ADHD in Adults.
[a]Versus control, p< .05.
[b]Versus ADHD +C+D, p< .05.

Table 3. Emotional Intelligence and ADHD.

	Control (n = 25)	ADHD −C−D (n = 31)	ADHD +C−D (n = 31)	ADHD +C+D (n = 29)		
	M (*SD*)	*M* (*SD*)	*M* (*SD*)	*M* (*SD*)	Test statistics	*p* value
MSCEIT						
Perceiving Emotions	106.04 (12.905)	107.32 (16.022)	102.55 (13.594)	105.38 (12.408)	[c]F = 0.593	.621
Using Emotions to Facilitate Thought	100.60 (11.247)	101.84 (11.776)	93.23 (12.984)[a,b]	102.55 (10.422)	[c]F = 4.090	.009
Understanding Emotions	104.88 (11.631)	107.58 (13.043)	99.06 (13.077)[a]	107.48 (13.627)	[c]F = 2.912	.038
Managing Emotions	106.68 (11.736)	104.94 (12.868)	103.42 (16.039)	105.07 (11.376)	[c]F = 0.247	.863
Total EI	106.00 (11.605)	106.74 (13.209)	98.52 (13.976)	106.72 (10.733)	[c]F = 3.090	.030

*Note.*Control = healthy participants without ADHD; ADHD −C−D = no comorbidities/no previous diagnosis; ADHD +C−D = with comorbidities/without previous diagnosis; ADHD +C+D = with comorbidities/with previous diagnosis; MSCEIT = Mayer–Salovey–Caruso Emotional Intelligence Test; EI = emotional intelligence.
[a]Versus ADHD −C−D, p<.05.
[b]Versus ADHD +C+D, p<.05.
[c]ANCOVA; covariate: "age."

differences between the ADHD +C+D group and the ADHD +C−D and ADHD −C−D groups (p< .05).

To determine the level of EI in ADHD adults, we administered the MSCEIT questionnaire to all participants. MSCEIT results tabulated by groups and four areas are shown in Table 3. To avoid any effect that age could exert on EI, an ANCOVA analysis was performed. The covariate "age" did not have any statistically significant effect on any of the MSCEIT scores. Regarding the differences of EI levels between controls and ADHD adults, we found significant differences among groups in the global score for EI (p< .05), as well as in the Using Emotions to Facilitate Thought and Understanding Emotions items. In all these categories, the ADHD +C−D group scored lower than the control as well as than the rest of the ADHD groups. Multiple comparison analysis revealed that there were significant differences between the ADHD +C−D and ADHD −C−D groups both in the Using Emotions to Facilitate Thought (M±SD = 93.23 ± 12.984 and 101.84 ± 11.776, p< .05) and in the Understanding Emotions (M±SD = 99.06 ± 13.077 and 107.58 ± 13.043, p< .05) EI dimensions. The ADHD +C−D group also showed a statistically significant difference in the Using Emotions to Facilitate Thought score when compared with individuals of the ADHD +C+D group (M ±SD = 93.23 ± 12.984 and 102.55 ± 10.422, p< .05). In contrast, we found no statistically significant differences among groups in the dimensions accounting for the Perceiving Emotions and Managing Emotions of EI (p> .05).

Finally, we analyzed the relationship between EI and severity of ADHD symptoms either during childhood or adulthood. To this aim, we performed a correlation analysis between each ADHD scale (CAARS, WURS, and DIVA) and the four EI dimensions, as well as with the EI global score. As shown in Table 4, there were no significant correlations between ADHD symptoms and the global EI score (neither between ADHD and any of the EI dimensions).

Table 4. Correlations Between ADHD Symptoms and Total EI.

	Spearman (*p*value)
CAARS	
Subject/Inattention	−.009 (.925)
Subject/Hyperactivity/Impulsivity	−.151 (.105)
Observer/Inattention	−.035 (.712)
Observer/Hyperactivity	−.129 (.166)
WURS	−.108 (.249)
DIVA	
Inattention/Childhood	.002 (.987)
Hyperactivity/Childhood	−.025 (.787)
Inattention/Adulthood	.080 (.394)
Hyperactivity/Childhood	−.048 (.611)

*Note.*EI = emotional intelligence; CAARS = Conners' Adult ADHD Rating Scale; WURS = Wender Utah Rating Scale; DIVA = Diagnostic Interview for ADHD in Adults.

Discussion

ADHD etiology is complex and still unclear, with recent models pointing to a multifactorial model of the disorder (Faraone et al., 2015). Identifying the factors that modulate its clinical evolution and impact in patients' life is, therefore, of critical importance. Emotional dysfunction is frequently present in ADHD patients and has been reported to significantly affect life performance of ADHD adults. However, studies examining global emotional competence of ADHD adults are still scarce.

EI is a relatively new construct in clinical practice, and controversy remains regarding its theoretical approach and

measurement tools (Mayer et al., 2008). However, irrespectively of the conceptual approach or tools used, EI positively correlates with better social relationships, better academic and work performances, and better psychological well-being, which results in a higher level of life satisfaction (Brackett, Rivers, & Salovey, 2011; Mayer et al., 2008). Conversely, low EI is associated to increased stress and anxiety, and more aggressive and addictive behaviors (Matthews et al., 2006; Mayer et al., 2008). Moreover, patients affected by different mental disorders such as depression and anxiety, mood, or bipolar disorders, present lower scores of EI (Hertel, Schütz, & Lammers, 2009; Lizeretti, Extremera, & Rodríguez, 2012). Thus, we hypothesized that ADHD patients would have lower EI levels in adulthood than healthy patients, considering EI as an ability that is developed during childhood and adolescence.

In agreement with our hypothesis, we found statistically significant group effects in total EI and in the Using Emotions to Facilitate Thought and Understanding Emotions components. Unexpectedly, HC, ADHD −C−D and ADHD +C+D groups scored similarly in total EI as well as in all four specific abilities, suggesting that ADHD disorder is not necessarily related to lower EI. In contrast, the ADHD +C−D group obtained statistically significant lower scoring in global EI and in the Understanding Emotions dimension than ADHD −C−D participants. In the Using Emotions to Facilitate Thought area, ADHD +C−D participants performed significantly worse than both ADHD −C−D and ADHD +C+D groups. These results suggest that ADHD patients with comorbidity exhibit impaired EI and that previous diagnosis (and the possibility to receive treatment) could compensate this deficit. Interestingly, previous studies have shown that the use of methylphenidate and atomoxetine leads to better emotional control in participants with ADHD (Reimherr et al., 2005; Reimherr et al., 2007). However, it should be taken into account that scores reached by all four groups in all branches fall into the "competent" range of the test, challenging the significance of the differences found between groups in our study. Future research on the relationship between the level of EI and the quality of life of these patients may clarify the significance of this lower EI in patients' life performance.

Previously reported results stated that ADHD patients present lower ability to perceive emotions (Shaw et al., 2014; Uekermann et al., 2010), but we did not find differences between controls and ADHD patients in the Perceiving Emotions dimension of EI. These discrepancies could be attributed to limitations of our study, which are addressed below, and to differences in the conceptual approach (and therefore measurement tools) between studies. In addition, ADHD participants in our study showed significantly poorer academic performance in comparison with controls, with more academic failure and less number of university graduates, in agreement with previous reports (Faraone et al., 2015; Murphy, Barkley, & Bush, 2002). Interestingly, this was not significantly affected by the presence of comorbidity, as all ADHD groups present similar levels of academic performance. Likewise, academic performance was not directly affected by EI because only the ADHD +C−D group obtained significantly lower EI scores.

In our study, we evaluated the level of EI with the performance-based MSCEIT test. MSCEIT directly measures the ability of completing tasks and solving emotional problems. In contrast, self-report questionnaires of EI can lead to biased results due to the effects of self-knowledge and social desirability (Brackett & Mayer, 2003; Mayer et al., 2003; Petrides & Furnham, 2000). In addition, MSCEIT shows good psychometrical properties and reliability (Brackett & Mayer, 2003; Mayer et al., 2008). However, this test has some limitations. Some authors have suggested that MSCEIT does not entirely measure the skills included in each branch of the EI ability model (Brody, 2004; Mayer et al., 2008). Moreover, MSCEIT measures the knowledge of a suitable emotional response to a situation but not the actual ability to implement it (Brody, 2004). Finally, a recent report suggested that MSCEIT would distinguish individuals with low and average EI levels but not individuals with average and high EI levels (Fiori et al., 2014). Nevertheless, it should be noted that in our study, the ADHD +C−D group achieved lower scores in all areas. This cannot be attributable to MSCEIT limitations, because the rest of the groups with ADHD present similar results as the HC group.

In the recent years, research on emotional factors associated to or underlying mental disorders has greatly expanded (Kret & Ploeger, 2015; Shaw et al., 2014; Uekermann et al., 2010). In parallel, therapies focusing on emotion management skills have been proven effective for several psychiatric disorders, including ADHD (Mennin & Farach, 2007). The conceptualization of EI as a group of learnable abilities suggests that EI education could be of therapeutic value. In this regard, our results suggest that EI training in ADHD adults with comorbidity could be of use. However, further research should confirm EI levels in ADHD adults. Moreover, EI abilities are considered lifelong acquired skills, and further research needs to determine efficacy and suitability of EI education (Brackett & Salovey, 2006).

We are aware of some research limitations, and we assume that results must be interpreted in this context. First, regarding the suitability of the sample, participants enrolled voluntarily and its willingness and positive attitude may have biased the results. Furthermore, a significant number of participants come from private practice centers and patients' associations, which could limit the generalization of the results. Second, as we performed a transversal study, we had no opportunity to identify causal relationships. And finally, as we did not perform a clinical trial, we could not properly control the variable *Treatment*. Its potential

protective effect could influence the trend of our results. As showed in the "Results" section, previous diagnosis (or treatment) could affect EI levels, as the ADHD +C+D group scored higher than the ADHD +C−D group in EI, while both scored similar in ADHD symptomatology. We should take into consideration that these participants could have benefited from therapeutic intervention, which could have had an effect on their EI (Faraone et al., 2015; S. J. Kooij et al., 2010; Reimherr et al., 2005; Reimherr et al., 2007).

As several studies confirm the contribution of EI abilities to better well-being, we believe that future directions on research should include (a) to explore in a rigorous and systematic approach the real contribution of EI on outcome and psychological well-being of ADHD adults; (b) to further investigate EI's role as modulator factor in ADHD adults, assessing EI as ability in longitudinal studies; and (c) to improve the assessment methods of EI, which will help us to better understand the underlying mechanisms controlling emotions.

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Author Biographies

Javier Quintero, MD, PhD, is the head of the psychiatry department at a public hospital in Madrid, the Hospital Universitario Infanta Leonor, and leads the "ADHD across life span" program. He is also an associate professor at the Department of Psychiatry, Medical School, Complutense University of Madrid. His research is predominantly focused on ADHD and related issues.

Rosa Vera is a clinical and forensic psychologist. She holds a PhD in psychology from Complutense University of Madrid (Spain). Currently, she is the general manager at Vertices Psicólogos in Madrid. Her research is focused on ADHD in adults.

Isabel Morales, PhD in psychology, is a research fellow at the Hospital Universitario Infanta Leonor. Her area of study is clinical psychology with specialization in forensic psychology. At present, she is the coordinator of the Department of Clinical Psychology at PSIKIDS in Madrid.

Pilar Zuluaga is an associate professor at the Department of Statistics and Operational Research, Faculty of Medicine, Complutense University of Madrid (Spain). She holds a PhD in mathematics from Complutense University of Madrid. Currently, she is the director of Statistics and Operational Research Section, Faculty of Medicine, Complutense University of Madrid. Her research line is biostatistics.

Alberto Fernández is an associate professor at the Department of Psychiatry, Faculty of Medicine, Complutense University of Madrid, Spain. He holds a PhD in neuroscience. Currently, he is an associate investigator at the Laboratory of Cognitive and Computational Neuroscience, Centre for Biomedical Technology (CTB), Technical University and Complutense University of Madrid, and director of the research group "Magnetoencephalography" at Complutense University of Madrid.