

Influence of the symptoms of Attention Deficit Hyperactivity Disorder (ADHD) and comorbid disorders on functioning in adulthood

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Abstract

Background: ADHD is a chronic disorder that generally has a negative effect on socio-personal adaptation. The objectives of the current study were to examine the adaptive functioning in the daily lives of adults with ADHD compared to adults without the disorder and to test the influence of ADHD symptoms and comorbid problems on different areas of adaptive functioning. **Method:** Seventy-seven adults between 17 and 24 years old, 40 with a clinical diagnosis of combined-subtype ADHD in childhood and 37 controls, filled out the Weiss Functional Impairment Scale, the Weiss Symptom Record and Conners' Adult ADHD Rating Scale. **Results:** Significant differences were found between adults with and without ADHD in family and academic functioning. Moreover, the ADHD symptomatology as a whole predicted significant deficiencies in the family environment and self-concept, whereas inattention specifically predicted worse academic performance and life skills. The comorbidities mainly affected the family and risky activity domains (dangerous driving, illegal behaviors, substance misuse and sexually inappropriate behaviors). **Conclusions:** The results illustrate the importance of developing a multimodal approach to helping ADHD adults cope with associated comorbid disorders, offering them supportive coaching in organizing daily activities, and incorporating the family and/or partner in the treatment plan.

Keywords: ADHD adults, inattention, hyperactivity/impulsivity, comorbidities, adaptive functioning.

Resumen

Influencia de los síntomas del Trastorno por Déficit de Atención con Hiperactividad (TDAH) y trastornos comórbidos en el funcionamiento en la edad adulta. Antecedentes: el TDAH es un trastorno crónico que afecta la adaptación sociopersonal. Los objetivos de este estudio fueron comprobar el funcionamiento adaptativo de adultos con TDAH en comparación a adultos sin el trastorno y analizar la influencia de la inatención e hiperactividad/impulsividad y de los trastornos comórbidos en este funcionamiento. **Método:** la muestra incluyó 77 adultos entre 17 y 24 años, 40 con un diagnóstico de TDAH subtipo combinado y 37 controles que cumplimentaron el Weiss Functional Impairment Scale, el Weiss Symptom Record y el Conners' Adult ADHD Rating Scale. **Resultados:** se encontraron diferencias significativas entre adultos con y sin TDAH en el funcionamiento familiar y académico. Además, la sintomatología de TDAH predijo déficits significativos en el ámbito familiar y en el autoconcepto y concretamente la inatención predijo un peor funcionamiento académico y de habilidades cotidianas. Las comorbilidades influyeron principalmente en los dominios familiar y de actividades de riesgo (conducción temeraria, conductas ilegales, abuso de sustancias y conductas sexuales inapropiadas). **Conclusiones:** los resultados reflejan la importancia de desarrollar un enfoque multimodal en adultos con TDAH para tratar los trastornos comórbidos, ofreciéndoles entrenamiento para la organización de actividades diarias e incorporando a la familia y/o pareja en el plan de tratamiento.

Palabras clave: TDAH adultos, inatención, hiperactividad/impulsividad, comorbilidades, funcionamiento adaptativo.

Attention deficit hyperactivity disorder (ADHD) is a neurodevelopmental disorder that begins in childhood and has a chronic course (APA, 2013), with a global incidence of 3-5% in the adult population (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). In fact, only about 1/3 of children with ADHD have relatively unimpaired functioning in adulthood.

The clinical manifestations of the disorder in adulthood affect the capacity to plan, the ability to organize one's time and finish tasks or

projects, or the tendency to forget important appointments, among other difficulties that have negative effects on general adaptive functioning (Barkley, 2008). Both transversal and longitudinal studies have highlighted the significant effect of ADHD on daily functioning in adulthood in areas such as academic performance (lower grades, lower percentage of academic achievements), the social sphere (greater traffic violations and car accidents), personal relationships (fewer lasting relationships, higher divorce rate, risky sexual practices), job performance (fewer full-time jobs, more job changes in the past 10 years), health domains and the use of substances, nicotine dependence and cannabis abuse (Biederman et al., 2006; Fredriksen et al., 2014; Gjervan, Torgersen, Nordahl, & Rasmussen, 2012; Klein et al., 2012; Mannuzza et al., 2011; Miranda, Mercader, Fernández, & Colomer, 2013; Sobanski et al., 2007).

A variety of factors may be associated with impairments in ADHD adults' functioning. In addition to the symptomatology of ADHD, the disorder's comorbid problems can complicate functioning in different areas of life. Studies find a rate as high as 70-75% of adults with ADHD who present at least one comorbid psychiatric diagnosis (Kooij et al., 2010; Sobanski, 2006). Some of the most frequent types of comorbidities observed include conduct and antisocial personality disorders, internalizing disorders, such as anxiety and depression, and substance use disorders (Barkley & Brown, 2008; Jacob et al., 2014). The few studies that have compared the subtypes in adults reported that subjects with ADHD combined presentation are more likely to meet criteria for oppositional defiant disorder, conduct disorder, and bipolar disorder than subjects with ADHD inattentive and hyperactive presentations. However, subtypes characterized by significant inattention (inattentive and combined presentations) are more likely than individuals with a hyperactive presentation to meet criteria for major depressive disorder and specific learning disorders (Willcutt et al., 2012).

The results of the few studies carried out on the influence of comorbidities in the life functioning of ADHD adults are controversial. Some of them found that poor psychosocial outcomes are primarily related to ADHD, and not to other psychiatric disorders, in most of the functional areas (Sobanski et al., 2007). However, the 10-year longitudinal follow-up study by Biederman et al. (2008) found that adults with ADHD and behavior problems presented a greater impairment in their daily life functioning than adults who only had ADHD, as they showed more problems related, for example, to having been expelled, convicted of a crime or fired from a job, or having had sex before the age of 16. Halmøy, Fasmer, Gillberg, and Haavik (2009) analyzed the effects of symptom profile, comorbid psychiatric problems, and treatment on occupational outcome in adult ADHD patients. Of the patients, 24% reported having a job, compared to 79% in a population-based control group. Combined subtype ADHD, substance abuse, and a reported history of depression or anxiety were correlated with being out of work. Finally, a recent study showed that ADHD symptoms are linked to elevated rates of risky sexual behavior, and that this association reflects the contributions of comorbid problems with marijuana use and, to a lesser extent, alcohol use (Sarver, McCart, Sheido, & Letourneau, 2014).

In sum, research has shown the significant relationship between ADHD symptoms and adaptive daily life functioning in adulthood, but the role played by the comorbid disorders across the life-cycle warrants closer examination. Furthermore, many of the previous studies testing potential predictors of adaptive functioning have combined different comorbidities, so that they were unable to clarify any specific contributions. Given the limited research carried out in our context and its importance for prevention and intervention strategies, this study aims to address the adaptive and daily functioning of ADHD adults. The first aim was to explore the differences between adults with and without ADHD in their adaptive functioning in the family, academic, life skills, self-concept, social activities and risky activities domains. The second aim of this study was to analyze the influence of the Inattention and Hyperactivity/Impulsivity symptomatology on the different functioning domains. Finally, the third aim was to test the influence of the comorbid disorders (specifically externalizing, internalizing and substance abuse) on adaptive functioning in the daily lives of adults with ADHD.

Method

Participants

In this study, the participants were 77 adults between 17 and 24 years old, divided into two groups: one group of 40 adults who had received a clinical diagnosis of combined subtype ADHD (ADHD-C) in childhood, and a control group without ADHD composed of 37 adults. The two groups were matched on age, $t(75) = 1.12, p = .266$ and sex, $\chi^2(1, N = 77) = .271, p = .530$, and 96.1% were men. There were no statistically significant differences between the two groups on IQ, $t(75) = 0.25, p = .80$.

The 40 adults diagnosed with ADHD-C in childhood (hereinafter, ADHD adults) had a mean age of 18.7 ± 1.27 and a mean IQ of 103.34 ± 16.32 . In addition, 17.5% of the participants presented comorbidities with externalizing type disorders, 37.5% with substance abuse, and 22.5% with internalizing disorders of depression and/or anxiety. Moreover, 33.3% of the subjects were undergoing pharmacological treatment.

The 37 subjects in the control group presented a mean age of 19 ± 1.68 and a mean IQ of 104.16 ± 11.48 . The exclusion criteria for both groups were having an IQ < 70 and presenting neuropsychological disorders, sensorial deficits or motor deficits.

Instruments

Wechsler Intelligence Scale for adults (WAIS-III; Wechsler, 1999). Wechsler scales are widely used intelligence tests with well-accepted reliability and validity. The IQ was estimated by prorating the vocabulary and block design tests.

Conners' Adult ADHD Rating Scale-Self-Report (CAARS; Conners, Erhardt, & Sparrow, 1999). This instrument is used to evaluate the presence and severity of ADHD symptoms in adults over 17 years old. It includes the 18 ADHD symptoms from the DSM-IV, measured on a 4-point Likert-type scale and grouped in two subscales: DSM-IV-Inattention and DSM-IV-Hyperactivity/impulsivity. T-scores greater than or equal to 65 were considered clinically significant. T-scores were used as independent continuous variables in the regressions to measure the ADHD symptomatology. This instrument has satisfactory reliability and validity (Erhardt, Epstein, Conners, Parker, & Sitarenios, 1999).

Weiss Functional Impairment Rating Scale-Self-Report (WFIRS-S; http://www.caddra.ca/cms4/pdfs/caddraGuidelines2011WFIRS_S.pdf). The WFIRS evaluates the adult's capacity to function in the different areas of daily life and the impact of the behavior. It is a questionnaire with 50 items grouped in various scales that include the family (e.g., "I have problems with my family"), work (this subscale was not included due to the low number of subjects who were working at the time of the evaluation), academic skills (e.g., "I have problems taking notes"), self-concept (e.g., "I feel bad about myself"), life skills (e.g., "I go overboard with the television, video games or computer"), social activities (e.g., "I have trouble making friends") and risky activities, which include inappropriate behaviors related to driving, police, drugs and sex (e.g., "I am an aggressive driver", "I get in trouble with the police"). The scores on the items range from 0 to 3. For clinical purposes, a mean score > 1 on some of the domains (except risky behaviors, which is 0.5) indicates a significant dysfunction. The mean score on the different scales described above were used as dependent variables in the comparisons, measuring the adaptive functioning in the different

life domains. The scale has good psychometric properties, with a Cronbach's alpha >0.9 overall, and subscale domain Cronbach's alphas ranging from 0.75-0.93 (Weiss, 2008).

Questionnaire on Comorbidity - Weiss Symptom Record (WSR; Weiss, 2010). This is a clinical screening questionnaire based on the DSM-IV-TR criteria (APA, 2002). It collects information about Axis I and Axis II psychiatric disorders in any age group and from any informant. The questionnaire was filled out by the ADHD adults to evaluate clinical information about the symptoms. For this purpose, the subscales used were Oppositional Defiant Disorder, composed of 8 items (e.g., "Spiteful or vindictive"), Conduct Disorder, composed of 15 items (e.g., "Bullies, threatens or intimidates others"), Anxiety, composed of 13 items grouped in 8 anxiety disorders (e.g., "Worries excessively about health, loved ones or catastrophes"), Depression, composed of 13 items (e.g., "No interest or pleasure in life"), and Substance Abuse, composed of 5 items (e.g., "Smokes cigarettes"). This instrument was used to evaluate the presence of internalizing or externalizing disorders.

Procedure

The 40 adults diagnosed with ADHD-C in childhood were part of the IMAGE project sample (International Multicentre ADHD Genetics; Kuntsi, Neale, Chen, Faraone, & Asherson, 2006). In the present evaluation, 60% of these participants, according to the subjects themselves, and 55%, according to the observer, had 5 or more ADHD symptoms from the DSM-IV-TR (APA, 2000).

The subjects in the comparison group were selected taking into account the criteria of the Spanish National Institute of Statistics on the population distribution for academic level and job situation in the 17-24 year old age range. Contact was made with these subjects through information about this research project posted in universities or professional training centers. Six of the subjects evaluated had to be eliminated because they obtained a score of T>65 on the inattention subscale, the hyperactivity/impulsivity subscale and/or the ADHD total symptoms on Conners' Adult ADHD Rating Scale (CAARS).

All of the participants gave their written informed consent to collaborate in the study.

Data analysis

All of the data analyses were performed with the SPSS™ statistical packet, version 19.00 (SPSS Inc., Chicago, IL, USA). For group comparisons, Multivariate Analysis of Variance (MANOVA) was used. The level of significance was set at .008, after applying the Bonferroni correction, and the value of η^2_p was calculated to test the strength of the association. To study the influence of ADHD symptomatology on functioning in daily life, multiple regression analyses were conducted, introducing the DSM-IV inattention and hyperactivity scores from the CAARS as independent variables, and the different domains on the WFIRS scale as dependent variables.

Results

Differences in the adaptive functioning of adults with and without ADHD

In order to study the differences between adults with and without ADHD in their adaptive functioning in life, a Multivariate

Analysis of Variance (MANOVA) was performed. The MANOVA revealed statistically significant differences [Wilks' Lambda (Λ) = .76, $F_{6,70} = 3.76, p = .003, \eta^2_p = .244$]. The results of the ANOVAs showed statistically significant differences in the family and academic domains. In the domains related to self-concept, social activities, risky activities and life skills, no statistically significant differences were found, although the latter two domains were marginally significant with $p < .05$ (Table 1). In all cases, the ADHD group presented more problems than the control group.

Influence of the ADHD symptomatology on functioning in daily life

Regarding the second objective, the ADHD symptomatology jointly predicted worse functioning in the family setting, explaining 27% of the total variance, a lower self-concept, with 20% of the total explained variance, and worse academic and life skills, with these two latter domains explaining 39% of the total variance. Specifically, inattention was the significant predictor of daily functioning in the academic and life skills domains (Table 2).

Table 1
Means, standard deviations and F values of the ADHD and Control groups on the WFIRS subscales

Domains	ADHD		CONTROL		Statistics		
	M	SD	M	SD	F _{1,75}	P	η^2_p
Family	0.79	0.55	0.41	0.43	11.11	.001*	.129
Academic	0.96	0.64	0.43	0.41	17.95	.000*	.193
Self-concept	0.57	0.75	0.47	0.64	0.35	.556	.005
Life skills	0.56	0.39	0.35	0.30	6.38	.014	.078
Social activities	0.36	0.42	0.26	0.29	1.69	.197	.022
Risky activities	0.46	0.41	0.29	0.27	4.53	.037	.057

* $p < .008$ (Bonferroni correction)

Table 2
Regression analysis of the CAARS subscales of inattention and hyperactivity/impulsivity on the different domains of the WFIRS

WFIRS	Beta	t	p	R ²	F	p
Family				.273	7.315	.002*
Hyperactivity	.276	1.44	.157			
Inattention	.290	0.15	.137			
Academic				.392	12.22	.000*
Hyperactivity	-.238	-1.36	.182			
Inattention	.766	4.38	.000*			
Life skills				.394	12.65	.000*
Hyperactivity	-.281	-1.60	.116			
Inattention	.791	4.52	.000*			
Self-concept				.202	4.92	.012*
Hyperactivity	.077	0.38	.703			
Inattention	.392	1.95	.058			
Social Act.				.115	2.54	.092
Hyperactivity	.189	0.89	.377			
Inattention	.180	0.85	.399			
Risky Act.				.127	2.75	.076
Hyperactivity	.163	0.76	.448			
Inattention	.222	1.04	.302			

* $p < .05$

Influence of comorbid disorders on functioning in daily life of adults with ADHD

The MANOVA carried out to examine the differences between adults with ADHD with or without Externalizing Disorders (oppositional defiant disorder and/or conduct disorder) in their adaptive functioning in daily life revealed statistically significant differences [Wilks' Lambda (Λ) = .69, $F_{6,33} = 2.44, p = .046, \eta^2_p = .308$]. The results of the posterior ANOVAs revealed statistically significant differences, after applying the Bonferroni correction, in the adaptive functioning in the family and risky activities domains. No statistically significant differences were found in the academic, life skills, self-concept or social activities domains (Table 3).

The MANOVA performed to examine the differences between adults with ADHD with or without Internalizing Disorders (anxiety and/or depression) in their adaptive functioning in daily life revealed statistically significant differences [Wilks' Lambda (Λ) = .69, $F_{6,33} = 2.43, p = .047, \eta^2_p = .306$]. However, the posterior ANOVAs did not find any statistically significant differences between the ADHD group with internalizing disorders (n = 9) and the ADHD group without internalizing disorders (n = 31) in any of the domains of the WFIRS scale; family domain, $F_{1,38} = 3.52, p = .068, \eta^2_p = .085$; academic domain, $F_{1,38} = 1.96, p = .169, \eta^2_p = .049$; life skills, $F_{1,38} = .918, p = .344, \eta^2_p = .024$; self-concept, $F_{1,38}$

= 3.25, $p = .079, \eta^2_p = .079$; social activities, $F_{1,38} = .312, p = .580, \eta^2_p = .008$; and risky activities $F_{1,38} = 1.71, p = .199, \eta^2_p = .043$.

Finally, the MANOVA performed to examine the differences between adults with ADHD with and without Substance Abuse in their adaptive functioning in daily life also revealed statistically significant differences [Wilks' Lambda (Λ) = .64, $F_{6,33} = 3.09, p = .016, \eta^2_p = .360$]. In the posterior ANOVAs, statistically significant differences were found between the two groups in the Risky Activities domain, while the differences did not reach statistical significance in the family, academic, life skills, self-concept or social activities domains (Table 4).

The participants with comorbid externalizing disorders or substance abuse obtained, in all cases, worse scores on adaptive functioning than the ADHD adults without this comorbid disorder.

Discussion

The first objective of this study was to explore the differences between adults with and without ADHD on adaptive functioning in different domains of daily life. The results showed statistically significant differences in the family and academic areas. In addition, although they did not reach statistical significance, the differences in life skills and risky activities were noteworthy. These findings are consistent with other previous studies (Fredriksen et al., 2014; Shifrin, Proctor, & Prevatt, 2010), showing that adolescents and adults diagnosed with ADHD in childhood have significantly lower academic achievement than adolescents and adults without the disorder. Despite evidence of some remission in the core symptomatology of the disorder in adolescence and early adulthood (Faraone, Biederman, & Mick, 2006), from a symptomatic perspective the persistence of symptoms of inattention and/or hyperactivity/impulsivity negatively affects the subject's functioning in his/her family or personal relationships, academic and life skills, or participation in risky activities (Sciberras, Roos, & Efron, 2009).

Regarding the second objective, the ADHD symptomatology affected most of the functional areas (Sobanski et al., 2007). Specifically, inattention predicted worse functioning in the family, academic life, life skills and self-concept. These results show that the persistence of inattention problems, such as losing or forgetting necessary things, difficulties in paying attention when necessary, or simply listening, has a negative effect on important areas of daily functioning, in agreement with other studies that highlight the negative involvement of inattention in the adaptation of ADHD adults (Harpin, 2005; Sciberras et al., 2009).

The third and final objective of this study was to analyze the influence of comorbid disorders on the adaptive functioning of ADHD adults. Specifically, the comparison of ADHD adults with and without comorbidities showed that the presence of externalizing disorders (oppositional defiant disorder and/or conduct disorder) established significant differences between the two groups in family functioning and risky behaviors. The internalizing disorders (anxiety and/or depression) influenced general adaptive functioning, although the results did not reveal significant differences in the specific areas. Finally, the presence of substance abuse was related to significant differences in risky activities. The results obtained coincide with other studies that show a greater long-term functional impairment in ADHD adolescents and/or young adults with comorbid pathologies (Biederman et al., 2006;

Table 3

Means, standard deviations and F values of the groups with ADHD + externalizing D. and ADHD without externalizing D. on the WFIRS subscales

	ADHD+ externalizing D. (n = 7)		ADHD without externalizing D. (n = 33)		Statistic		
	M	SD	M	SD	F _(1,38)	p	η^2_p
Family	1.33	0.50	0.67	0.49	10.25	.003*	.212
Academic	1.32	0.69	0.88	0.61	2.85	.099	.070
Self-concept	0.94	0.89	0.49	0.71	2.16	.149	.054
Life skills	0.81	0.29	0.50	0.39	3.73	.061	.089
Social act.	0.62	0.33	0.31	0.42	3.27	.078	.079
Risky act.	0.84	0.39	0.38	0.37	8.81	.005*	.188

* p<.008 (Bonferroni correction)

Table 4

Means, standard deviations and F values of the groups with ADHD and substance abuse and ADHD without substance abuse on the WFIRS subscales

	ADHD + substance abuse (n = 15)		ADHD without substance abuse (n = 25)		Statistic		
	M	SD	M	SD	F _(1,38)	p	η^2_p
Family	0.97	0.58	0.68	0.51	2.67	.110	.066
Academic	1.26	0.69	0.78	0.55	5.80	.021	.132
Self-concept	0.81	0.73	0.42	0.73	2.64	.113	.065
Life skills	0.71	0.47	0.46	0.30	4.09	.050	.097
Social Act.	0.47	0.43	0.30	0.41	1.54	.222	.039
Risky Act.	0.76	0.48	0.29	0.22	18.03	.000*	.322

* p<.008 (Bonferroni correction)

2008; Booster, DuPaul, Eiraldi, & Power, 2012; Walker, Venter, van der Walt, & Esterhuysen, 2011) and the danger of substance abuse and dependence (Fredriksen et al., 2014; Zulauf, Sprich, Safren, & Wilens, 2014). However, the role played by the internalizing disorders is not as clear. It seems that, even from early ages, a clear differential profile is not observed between ADHD with and without internalizing disorders (López-Villalobos, Serrano, & Delgado, 2004). In sum, the different types of comorbidity may be associated with different symptomatic characteristics and clinical manifestations (Cherkasova, Sulla, Dalena, Pondé, & Hechtman, 2013; Steward, Tan, Delgaty, Gonzales, & Bunner, 2014).

This study presents some limitations. The first is the sample size, as larger samples are necessary in order to be able to generalize the results. Moreover, the study was carried out with a male population, so that possible differences in the adaptive functioning of adult women with ADHD should be examined. Another important limitation is the use of self-report scales. Even though the subjects evaluated are adults, the version of the parents or partners would add consistency to the results obtained. In addition, it should be pointed out that there was no strictly clinical diagnosis made of the comorbid disorders, but instead this information was obtained by applying a screening questionnaire based on the DSM-IV-TR criteria (APA, 2000).

Regarding the practical implications, our findings show that in adults, the optimal approach to ADHD would not only have the objective of reducing the core symptomatology, but it would also improve adaptive functioning in the different areas of life, such as the family, work, academic and social areas. Identifying the factors that influence adaptive functioning in the different areas of life of ADHD adults supports the application of programs like those by Sprich, Knouse, Cooper-Vince, Burbridge and Safren (2012) or Young and Bramham (2012), based on Cognitive-Behavioral Therapy. These programs increasingly incorporate the family and/or partner in the treatments as possible protective

factors. Specifically, they contain modules that provide the partner or family with educational information about ADHD in adulthood, helping to identify ways to support and maintain positive behavioral changes. The Young-Bramham program structure includes core symptom modules, such as the attention module, the organization and time management module, and the comorbid and associated problems modules. The focus is on treatment strategies that can be applied to improve life skills like sleep or substance risk strategies, where patients are asked to register their drug/substance intake and encouraged to stop using it. Along the same lines, in the program developed by Sprich et al. (2012), adults with ADHD receive relaxation training and educational support and CBT sessions.

The economic burden of untreated adult ADHD stems from health care costs, lower productivity and more accidents; therefore, long-term pharmacological and psychosocial treatment may be necessary. For this purpose, both European and American medical health guides recommend, along with pharmacological treatment, multimodal interventions based on cognitive-behavioral and/or psychosocial programs, both in the family and academic settings, and even in the workplace (Fredriksen et al., 2014).

In summary, the findings presented here join the line of study that highlights the involvement of inattention and hyperactivity symptoms, as well as comorbid disorders, in the adaptive functioning of adults with ADHD. Moreover, as pointed out recently by Safren, Sprich, Cooper, Knous and Lerner (2010), in spite of the pharmacological treatment, the persistence of the ADHD symptomatology has a greater effect on the work and interpersonal domains. These results point out the need to incorporate more complex treatments for ADHD that provide specific strategies to improve attentional deficits, the scant capacity for organization and planning, and hyperactivity/impulsivity in adulthood. Furthermore, there is a need for greater knowledge about the disorder's comorbid problems and, in the case of substance abuse, the types of addiction, in order to further individualize interventions.

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