

Evaluation of emotional expression of ADHD Children and Adolescents using the Parent-Rated Expression and Emotion Scale for Children (EESC)

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Abstract:

Background: Emotional regulation arises from balancing positive and negative emotions, but children and adolescents with Attention Deficit Hyperactivity Disorder can show an emotional imbalance. Any times, when they are in drug treatment can present a feature known as affective blunting, mood labile, and the “zombie effect”. Because of these issues is crucial, the physician tests the patient emotional expression. **Aim:** This study intended assessing the emotional expression of ADHD children and adolescents in drug treatment and to noting the level of emotional oscillation. Further, to analyzing the emotional expressional degree on age range. **Method:** This study selected randomly 85 patients with ADHD divided into age sub-samples and tested them about emotional expression using the parent-rated Expression and Emotion Scale for Children (EESC). The parents answered to the tool. It compared the patients (n = 85) scores with the scores of controls without the disorder (n = 85) and analyze the scores of overall sample and of the sub-samples through ANOVA statistical test and post hoc test t to analyzing of significance. **Results:** There was significance of the EESC mean scores of the ADHD overall sample when compared to the controls, what signalized lesser emotional balance. On the age range, the children age below nine years shown a satisfactory emotional balance, over nine years old presented most emotional imbalance and the adolescents over twelve years old exhibited lower emotional imbalance. **Conclusions:** Emotional expression of ADHD patients has smaller balance than the one of healthy subjects. On age range 9 and 11 years, the emotional balance is worse, but after it enhance. For children under nine years, the emotional expression is more balanced.

Introduction:

The neurological disorder known as Attention deficit hyperactivity disorder (ADHD) is more common in boys than girls (3:1)¹, has prevalence 5 to 10% of children and adolescents, but lifelong it decreases gradually²⁻⁷.

It is associated to poor school performance and academic, retention in grade, school suspensions or expulsions, poor social and familiar interrelationship, beside anxiety, depression, angry, delinquency, substance abuse^{2,8}, which occurs because of the unbalancing of the emotional expression (EE).

ADHD results from dysfunction of the dopaminergic and noradrenergic activities in the brain^{11,12}. Shaw et al.^{13,14} affirm the maturation of the brain circuits in the prefrontal cortex occurs slower, what decrease the information processing and reduce the capacity for self-control¹⁵.

Because of this delay in the prefrontal cortex, the affecting the emotion, memory, generative (i.e., goal-directedness, and inventive- ness) are impaired¹⁶. Those damages impact on EE, interfering in the daily activity and in the social interaction^{9,10} and decreasing the quality of life^{9,2}, causing problems as: demoralization, helplessness in the learned, low self-esteem, fear, anxiety, and increased frustration^{17,18,19,20}.

The emotions affect the decision-making, cognitive process, and daily activity. For their importance, they need to be managed. Emotional regulation is a skill that moderates the negative emotions (irritability, emotional lability, sadness, dysphoria, and crying) and maximizes the positive emotions (friendship, joy, happiness, and spontaneity). However, the negative emotions must not be voided, because the inability to express those is not appropriate^{21,23}.

Drug treatments and therapeutics have shown improve of the self-esteem and quality of life (QoL) of the patient²⁴, however, some negative emotions has been noted during inhibitor or stimulant drug treatment, such as affective blunting, mood labile, and the “zombie effect”^{22,25}. Thus, although it knows the improvement of the ADHD patients, there is the need monitoring their emotional expressions, for they can still not reach a whole balance, even in drug treatment^{21,22,24,25,26,27}. Then, beside the importance of evaluating the emotional expression, is necessary to keep this assessment routinely^{17,21,22,26,27}. Assessing the emotional expression mean knowing if exist emotional regulation. Therefore, it must check the ADHD patient's EE during the treatment²¹⁻²² through of a specific scale²¹. This study selected the Expression and Emotion Scale for Children (EESC), self-administered tool, and has questions on domains positive, negative and labile²¹.

The parent-rated Emotion and Expression Scale for Children (EESC) quantifies the level of the EE. Patient's parents must answer this scale. It refers to the child's mood, emotional oscillation and personality characteristics as observed in the preceding two weeks. This scale is proper for the assessing of EE of the ADHD patients in drug treatment. Through this, it is possible noting if the child/adolescent EE in drug treatment has been more balanced or not. It has 29 questions divided into three domains: positive, 13 questions; negative, 10 questions; and labile, five questions. Question nineteen (negative domain) is null for statistical analysis. The rate of the questionnaire items was made in accordance with Likert scale from 1 to 5 (1 = does not apply at all, 5 = applies perfectly). The lower score signalizes the more balanced EE. The maximum and minimum values in the positive, negative and labile domains are, respectively: 65-13, 50-10, 25-5; noting that the positive domain is inverted for the sum of the score (Kratochvil et al, 2007).

Simon et al. (2017) established the EESC scores cut off. The overall score is 52 for children between 6 and 8 years old, 51 for children between 09 and 11 years old, 52 for adolescents between 12 and 18 years old, and 51 for the total sample, i.e. results above the cutoff indicate

emotional imbalance and the scores below the cutoff indicate emotional balance.

Under Simon et al.,²⁵ the EESC cutoff to age range in the overall score is 52, positive domain 17, negative domain 15 and labile 14 to children age 06 to 08 years old; overall score 51, positive domain 20, negative domain 15 and labile 13 to children age 09 to 11 years; and overall score 52, positive domain 22, negative domain 17 and labile 12 to adolescents age 12 to 15 years old.

Perwien et al.²⁷ developed and validated this scale. Kratochvil et al.²² applied this scale to 106 children and adolescents with ADHD treated with a stimulant drug (methylphenidate) and a non-stimulant (atomoxetine) and got the significant difference in the emotional expression during the drug treatment. Schacht et al.³¹ validated the patient-rated, and in his application observed a significant difference in the EE of 504 patients (mean age 9.6 years) treated with non- stimulant medication (n = 252) or stimulant medication (n = 247). Dittmann et al.³² noted a significant difference in the emotional expression when the patient (n = 252) was in drug treatment.

The present study examined the emotional expression degree of ADHD children and adolescents in drug treatment through a parent-rated EESC. In addition, it analyzed the emotional expression scores by age range for enhancing analysis. The literature asserts being insufficient the studies about the level of ADHD patient EE^{21,26}.

Method

The Ethics Committee for Analysis of Research Projects (CAPPesq) of the Hospital Clinical approved this cross- sectional study with the number 0613/11. It assessed the emotional expression degree of the ADHD children and adolescents in stimulant treatment (methylphenidate - MPH). The patients were recruited from the Learning Disabilities Clinic of the Children's Institute of the Child Institute Hospital of Clinics, School of Medicine, University of São Paulo (HC ICR- USP).

In this study, parents of Eighty-five patients with ADHD without comorbidity treated with stimulant medication answered to the EESC. It compared the results with those answered by controls' parents (n=85). It divided the sample into age sub-samples and analyzed the results by age range (6-8, 9-11, and 12-15 years old).

For diagnoses evaluation, it was used the Swanson, Nolan, and Pelham (SNAP-IV) 30 and neurological tests. The diagnoses stayed under the criteria of the Manual of Diagnosis and Statistics of Mental Disorders (DSM 5) performed by the pediatric neurologist. ADHD sample (n = 85) and a control sample (n = 85) were homogeneous in terms of demographic, educational and socioeconomic factors. One parent answered the questionnaire parent-rated EESC, who received information about this study and provided consent to taking part it when signed the consent form.

As inclusion criteria of the ADHD sample: male and female gender, age between 6 and 15 years, an intelligence quotient (IQ) ≥ 80 , no comorbidity . The patient must follow with treatment for taking part in this study.

Health professionals selected a clean control sample, under the inclusion criteria: they have not ADHD symptoms as assessed with the SNAP-IV test, answered by the teacher and by parents and diagnosed by a pediatric neurologist. IQ ≥ 80 as assessed with a neuropsychological test. They came from the Escola Municipal de Ensino Fundamental Presidente

Professor João Pinheiro (Vila Matilde, São Paulo, SP) with earlier authorization from the school. The healthy children were matched in number and age with ADHD sample.

It divided the patient sample (n=85) into age sub-sample: Group I – six to eight years old, n = 13 (17.46%); Group II – 9 to 11 years old, n = 40 (46.82%); and Group III – 12 to 15 years old, n = 32 (35.71%). The mean age of the ADHD patients were 10.24 years. They were in MPH treatment for at least one year before of the beginning research. The mean daily dose of the MPH was low: Group I = 12.3 ± 1.07 mg, Group II = 17.7 ± 1.06 mg, Group III = 14 ± 0.91 mg (Table 1).

Table 1. Number of subjects, demographic information, medication dose, clinical characterization of the patients with Attention Deficit Hyperactivity Disorder and control sample without any psychiatric disorder

ADHD Controls

Demographics

Number of subjects – overall	85	85
Number of subjects – Group A (6-8 years)	13	13
Number of subjects – Group B (9-11 years)	40	40
Number of subjects – Group C (12-15 years)	32	32
Male gender	83%	52%
Female gender	17%	48%
Public school	74%	100%
Video games	47%	56%
Years of parent's education	9.4	11.7

Psychiatric diagnosis of ADHD

DSM-IV - ADHD, combined type	81%	----
DSM-IV - ADHD, hyperactive type	07%	----
DSM-IV - ADHD, inattentive type	12%	----

Treatment

Medication (MPH) 100%	-----	
Daily MPH dose - Group I	12.3 ± 1.07 mg	-----
Daily MPH dose - Group II	17.7 ± 1.06 mg	-----
Daily MPH dose - Group III	14 ± 0.91 mg	-----

ADHD: attention-deficit/hyperactivity disorder; MPH: methylphenidate; ODD: oppositional defiant disorder

Statistics

The statistical analyses calculated the emotional expression scores of the ADHD patients, controls and age range regard to EESC domains. One-way Analyses of Variance (ANOVA) for multiple comparisons and post hoc Student's t-test set significant difference, with Confidence Intervals 95%. Results presented the variance (F), the significance (p), mean, mean difference, and the t value, and permitted getting the emotional expression degrees of the samples and its relationship with age variable. Statistical significance is at $p \leq 0.05$. The BioEstat 5.333 got the statistical analyses.

Results

The descriptive statistic test examined the EESC scores. According to overall scores, the outcomes reported lower mean values for the controls than for the ADHD sample, i.e., the children with ADHD presented lesser balance emotional, as follows: ADHD sample 60.21 ± 14.02 , controls 46.96 ± 10.61 . The age sub-samples: Group I 48.69 ± 9.3 , controls 47.69 ± 10.97 ; ADHD Group II 57.15 ± 11.67 , controls 46.52 ± 13.42 ; and ADHD Group III 61.37 ± 14.13 , controls 51.19 ± 12.97 . The means and standard deviations of the all domains scores of the ADHD sample and control and of the age sub-samples are in Table 2.

Table 2. EESC cutoff, mean and standard deviation of the Attention Deficit Hyperactivity Disorder (ADHD) sample, age range (Group A, B and C), and control sample without any psychiatric disorder

Positive domain	Negative domain		Labile domain	
Overall score				
A				
ADHD vs control				
Cutoff total	23	16	14	51
ADHD mean - SD	24.69 ± 6.91		21.59 ± 7.41	
	60.21 ± 14.02		14.38 ± 4.06	
Control mean - SD	21.51 ± 7.16		14.73 ± 4.84	
	46.96 ± 10.61		14.381 ± 4.63	
Group A vs control				
Cutoff (6- 8 years)	17	15	14	52
ADHD mean - SD	21.92 ± 8.1		16.38 ± 4.42	
	48.69 ± 9.3		12.92 ± 3.82	
Control mean	20 ± 4.45		13 ± 4.06	
	14.54 ± 3.81		47.69 ± 10.97	
Group B vs control				
Cutoff (9- 11years)	20	15	13	51
ADHD mean - SD	22.57 ± 4.35		20.02 ± 6.76	
	57.15 ± 11.67		15.1 ± 4.22	
Control mean	20.57 ± 6.92		13.47 ± 3.96	
	46.52 ± 13.42		11.7 ± 4.38	
Group C vs control				
Cutoff (12- 15 years)	22	17	12	52
ADHD mean - SD	25.34 ± 6.40		22.31 ± 7.56	
	61.37 ± 14.13		13.75 ± 3.8	
Control mean	22.84 ± 7.34		16.06 ± 5.78	
	51.19 ± 12.97		12.62 ± 5.29	

SD: standard deviation

The ANOVA post hoc Student's t-test got the mean differences and the significance p. Significant differences in the emotional expression scores of the ADHD sample and control occurred in practically all the domains, except in some age sub-samples (Group I and III). In comparison, between ADHD sample and control, there was significance in the overall score ($p < 0.01$); the scores of the others domains are in Table 4. Age sub-samples, in the Group I, did not present significance; in the Group II had significance in the negative and labile domains with an overall score of $p < 0.001$; to the Group III had significance in the negative domain and in

the overall score, $p = 0.0038$ (Table 3).

Table 3. One-way ANOVA to get the statistically significant difference of the age range of the patients with Attention Deficit Hyperactivity Disorder and control sample without any psychiatric disorder

	PD	ND	LD	OA
ADHD vs controls				
d	4.96	6.14	1.76	13.25
t	5.08	6.29	1.80	13.58
p	< 0.001	< 0.001	< 0.05	< 0.001
Group A vs controls				
D	1.92	1.85	-0.08	1
T	0.75	1.07	-0.05	0.25
P	0.46	0.3	0.96	0.80
Group B vs controls				
D	2	6.55	3.4	3.77
T	1.54	5.28	3.53	10.6
P	0.13	< 0.001	< 0.001	< 0.001
Group C vs controls				
D	2.5	6.25	1.12	10.18
T	1.45	3.71	0.98	3.00
P	0.15	< 0.001	0.33	0.0038

d = mean difference; t = t test; p = significance; vs = versus;

PD = positive domain; ND = negative domain; LD = labile domain; OA = overall domain

Discussion

Application of EESC scale in the ADHD patients in drug treatment contributed to establishing their emotional expression degree. Evaluating the patient emotional expression is very important^{17,21,22,26,27} because they can remain unbalanced even in treatment like the Zumbi effect^{22,25}.

As results analyses, it noted high statistical significance in all emotional domains of the ADHD sample in drug treatment (100% stimulant - MPH) when compared to the controls. The ADHD sample exhibited higher mean scores than the control sample, i.e., more emotional unbalance. This finding showed that the ADHD sample, even in treatment, can present a lower emotional expression balance in all the domains when compared to the controls, therefore they need be followed up about this^{17,21,22,26,27}.

On age sub-sample, the children with aged 6 to 8 years old (Group I) presented emotional expression degree like those of the control sample; there were no significant differences between the two sub-samples. The children age 9 to 11 years (Group II) showed a decrease in emotional control. Other studies also got a similar result^{34,35}. The adolescents with ADHD between the age of 12 and 15 years (Group III) had better emotional expression in the positive and labile domains. It expected this because of the adolescent phase to the adulthood occurs diminution ADHD core symptoms^{3,5,6,7}. It is important salient if the patient does

not have proper clinical follow up may present even suffer severe comorbidity and risk behavior^{2,8}.

Due to the resulted of significant difference between the emotional expression degrees of ADHD sample and control, this study considered that the patients' emotional expression, even in treatment, needs more attention of clinical medicine.

This study has limitations because it not applied the questionnaire to the patients via the patient-rated EESC; it did not apply to the patient over age 16 years; it was not a longitudinal study.

Conclusions:

There was a higher emotional expression oscillation in ADHD children and adolescents in drug treatment as compared to the controls. This study showed that the children with ADHD below the age of nine years exhibited balanced emotions in all domains like the controls, but those between 9 and 11 years old shown emotional imbalance. The adolescents showed satisfactory improvement in the emotional expression degree.