PREDICTIVE FACTORS OF AUTO- AND HETEROAGGRESSIVE BEHAVIORS IN ADOLESCENTS WITH AUTISM SPECTRUM DISORDER

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ABSTRACT

Aggression is commonly found among people diagnosed with Autism Spectrum Disorder. Although the awareness regarding this neurodevelopmental disorder has increased and aggression among adolescents benefits from an important scientific interest, its approach is far from exhaustive. It is a significant clinical challenge in terms of its considerable impact on the quality of life and an important cause of addressability to specialized services. It interferes with the establishment of interpersonal relationships and with educational and occupational opportunities. These patients hardly face the unpredictable outcomes of adolescence, thus, aggression can be a way to express their frustration and confusion with possible dangerous consequences. Due to its influence on the evolution of behavioral therapies, early intervention is critical to the success of the treatment.

The main purpose of this study was to evaluate the influence of the socio-demographic characteristics and neurodevelopmental particularities on aggression in adolescents diagnosed with Autism Spectrum Disorder. A group of 39 patients (28 males and 11 females, aged 10 – 18), diagnosed with an Autistic Spectrum Disorder, based on ICD 10 criteria, was included in the present study. In order to measure the intensity of the auto- and hetero-aggressive behaviors, we used The Modified Overt Aggression Scale (MOAS), more precisely, the scores obtained on its subscales: "Autoaggression" and "Physical Aggression". Among the independent variables used as potential predictors in the analysis were: the socio-economic status, family structure, age, gender, severity of autistic symptoms and cognitive functioning. Both self-aggressive behaviors ($F(2, 36) = 6{,}974$; $p = .003$) and hetero-aggressive behaviors "($F(2,36) = 7{,}226$ $p = .002$) are more intense when associated with a more severe diagnostic. Also, a lower value of the IQ correlates with more important autoaggressive ($R = -0.574$, $p = .001$) and heteroaggressive ($R = -.533$; $p = .001$) behaviors. I did not obtain a statistical significant influence of the absence of language on aggressive manifestations, nor did I achieve a correlation with socio-demographic characteristics, such as: age, sex, urban or rural environment, socio-economic status and family structure.

Statistical analyses were carried out with SPSS version 23.0. ANOVA and T-test analyses were used to test for significant differences between groups and linear regression model for predictive analysis of aggressive behaviors. Significance level was set at $p< .05$.

Keywords: Autism Spectrum Disorder, auto aggression, heteroaggression, IQ.

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INTRODUCTION

Autism Spectrum Disorder is a developmental disorder that, from the point of view of its ever-increasing incidence of 1:59 (CDC 2017), can be considered a public health problem. This underlines the need to understand the characteristics of the condition as detailed as possible. Autism Spectrum Disorder is characterized by: poor social skills, unusual behavioral patterns, stereotypes, impairment of communication skills, absence or abnormal speech acquisition. Symptomatology can vary in intensity, the severity of deficits ranges from a slight deviation from typical development (able to perform daily activities) to profound impairment (requires permanent care). [1]

Infantile Autism is the severe form, characterized by serious impairment in functionality generated by marked and permanent communication and social deficits and the presence of repetitive behaviors; this form also frequently associates cognitive impairment. On the opposite side, Asperger's Syndrome includes: lack of adaptation to the context, concrete use of terms, restrictive preoccupations, lack of affective reciprocity and empathy; unlike Infantile Autism, it has good cognitive functioning and a good level of language.

Aggression is a common cause of concern among parents and therapists of people with ASD and an important cause of addressability to health care services [2].

Studies showed a higher rate of aggressive behavior among adolescents with ASD compared to other psychiatric patients or those with other developmental disorders. Patients diagnosed with cognitive impairment and ASD show aggression more frequently than individuals suffering from only one of the two conditions [3].

It was shown that the presence of auto aggressive manifestations is frequent among adolescents with ASD and has a higher intensity than in general population, or among patients with other type of developmental disorders. Prevalence data vary from study to study, but is settle somewhere around 50% (30-50%) [4]. It was observed that the association of cognitive deficit increases the susceptibility to such behaviors and the severity of manifestations [5].

Autoaggressive behaviors represent, for adolescents diagnosed with ASD, a way of coping with certain situation and to express their feelings. Many individual triggers should be considered as being involved in generating such manifestations.

People with ASD face a lower quality of life, therefore they are more predisposed to suicidal ideation and gestures. They are exposed to increased stress levels, anxiety and depression, low self-esteem, family problems, school or sentimental failure, pressure of social rigors, physical or emotional abuse (bullying), poor control or impulsiveness. It has been noticed that persons diagnosed with ASD often face atypical sensory processing, and to compensate for the lack of environmental stimulation, they are involved in autoaggressive behaviors. In addition, it was observed that lack of language or reduced communication skills can generate frustration and increase the susceptibility to autoaggressive behaviors. [6] Another hypothesis argues that these actions are used to reduce stress, discomfort or frustration. Researchers have shown that 14% of ASD adolescents face suicidal ideation or attempts, which is 28 times more than typical adolescents (0.5%) [7] .

Adolescence is a complex period that involves, besides physical maturity, important psychological changes and social, as well. For most people, adolescence is a period of transformations, especially for those diagnosed with ASD, because they have to adapt to many changes and to cope with the unpredictable that arises with it [8].

It is important to note that the human brain is not fully developed before puberty.

In the years of adolescence, major changes take place in its structure and organization, with significant implications on behavior. [3]

Neurotransmitters and their fluctuations play an important role in brain development in adolescence; this is the period when the balance of inhibition - excitation is established. At the same time, the connection between the nervous and the endocrine system is settled. Neural processes are modeled by hormonal changes [9].

Changes in neurotransmitter levels make adolescents more vulnerable to emotions, more responsive to stress and thus more sensitive to aggressive behavior [10].

In terms of impact among adolescents with ASD, aggression is a subject that requires increased attention. This type of manifestations may involve family and social consequences, increased cost of care, exclusion from groups, limited access to services and educational options, difficult interpersonal relationships. It also can associate an increased risk of hospitalization with serious morbidity (contusions, fractures, plagues, concussions), even assuming a vital risk. There is a negative impact on health professionals, who take care of them; they are more prone to burn-out and higher level of stress [8].

Research on aggressive behaviors has highlighted the existence of some factors that can associate with more intense behaviors of this type among children and adolescents. It has been noticed that male gender tends to show more aggressive behaviors than females. In addition, certain social and family risk factors have been identified: parental education level, family structure, parental negligence, number of family members, poor socio-economic opportunities, emotional, physical or sexual abuse, the existence of other psychological disorders in the family, drug or alcohol use in the family. However, aggressive behavior among adolescents with ASD appears to be less influenced by these issues, but a considerable impact seems to have specific ASD problems such as: getting access to rituals or repetitive behaviors, language skills, the degree of cognitive impairment, the level of adaptive functions [11, 12].

OBJECTIVES

This study aims to identify if there is any influence of the socio-demographic characteristics on aggressive manifestations and to observe the possible relationships between auto- and hetero-aggressive behaviors and neurodevelopmental particularities (absence of speech, presence of cognitive deficit).

METHODS

This study was conducted on a group of 39 subjects aged between 10 and 18 years diagnosed with Autism Spectrum Disorder (using ADOS or ADI-R, built on the DSM-IV / ICD-10 manuals).

All participants were patients of the Clinical Psychiatric Hospital "Professor Doctor Alexandru Obregia", during the period: January 1, 2017 to June 30, 2017. Given that the participants are minors, informed consent was obtained from parents or a legal representative before participating in the study.

To evaluate self - and hetero - aggression, we have used the Autoaggression and Physical Aggression Subscales from MOAS scale, created in 1988.

This is the revised version of Kay SR, Wolkenfelf F, Murrill LM of The Overt Aggression Scale (OAS) designed by Yudofsky, Silver, Jackson, Endicott, & amp; Williams in 1986 to evaluate aggressive behaviors among psychiatric patients. The MOAS scale is useful in retrospective measurement of aggressive behaviors. This is divided into four sub-scales that evaluate different types of aggression: Verbal aggression, Aggression against property, Autoaggression and Physical aggression (against other people). In this paper I will use the scores obtained on the

subscales "Autoaggression" and physical aggression - "Heteroaggression"

Each subscale contains four items, which evaluate the severity of the behaviors. Each item selected is marked with "1"; the score obtained for each subscale is then calculated. The results of the scores obtained on the "Physical Aggression" subscale are multiplied by 4; and those obtained on the Autoaggression subscale are multiplied by "3". A higher score indicates more aggressive behavior. Raven's Progressive Matrices (Raven's Progressive Matrices), consisting of 60 non-verbal items, were used to evaluate the cognitive level.

In order to carry out this study, the influence on auto- and hetero- aggressive behaviors was analyzed. Two types of variables were used. Categorical variables such as:

a) Socio-demographic: Sex (male/female), Socio-economic status (reduced/modest/high), Family structure (organized - both parents/disorganized - one parent or other relative/institutionalized), respectively
b) certain psychiatric particularities: Diagnosis (Infantile autism / Asperger's syndrome/other ASD), Speech (presence or absence).

The second category of variables used are quantitative, such as: Age (years), Intelligence Coefficient (IQ), scores obtained on MOAS subscales "Autoaggression", "Physical Aggression (Heteroaggression)".

For all analytical tests used, the value indicating the existence of statistical significance is set to p = .05.

The data obtained were statistically processed using the T-test for independent samples to highlight the differences between the averages of the two groups and one-way ANOVA test when there are more than 3 groups. In situations where we have found statistically significant differences between groups, we performed the effect observation test: Test between Subjects Effects, and subsequently a post-hoc analysis was used for the comparison between these groups using the Tukey HSD test.

To examine if there were correlations between the results obtained for Heteroaggression, Autoaggression and continuous variables, such as age and IQ, the Pearson Test for Bivariate Correlations was used; which was illustrated by Scatter plot- charts, with trendline trace. It is further tested if the correlations obtained have a predictive value with Linear Regression analysis.

RESULTS

To analyze the variation of the mean values obtained on the Autoaggression and Heteroaggression subscales with the severity of diagnosis we used the one -way ANOVA test. From Table 1, there are statistically significant differences between the mean values obtained for both Autoaggression (F (2,36) = 6,974; p = .003) and Heteroaggression (F (2,36) = 7,226 p = .002) (where F = variation of group averages / group variation) when grouped and compared to the three possible values of the "diagnostic" variable: "Infant Autism", "Asperger's Syndrome", "other ASD".

Table 1: ANOVA One-Way Analysis for Diagnostic and Variable variables of Autoaggressiveness and Heteroagresivity

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Auto_agresivitate	Between Groups	169,867	2	84,933	6,974	,003
	Within Groups	438,441	36	12,179		
	Total	608,308	38			
Hetero_agresivitate	Between Groups	241,857	2	120,928	7,226	,002
	Within Groups	602,451	36	16,735		
	Total	844,308	38			

Table 2. Effect of the results obtained in ANOVA analysis on Autoaggression

Tests of Between-Subjects Effects

Dependent Variable: Auto_agresivitate

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	169,867[a]	2	84,933	6,974	,003	,279
Intercept	775,161	1	775,161	63,648	,000	,639
Diagnostic	169,867	2	84,933	6,974	,003	,279
Error	438,441	36	12,179			
Total	1872,000	39				
Corrected Total	608,308	38				

a. R Squared = ,279 (Adjusted R Squared = ,239)

Table 3. Effect of ANOVA results for Heteroaggression

Tests of Between-Subjects Effects

Dependent Variable: Hetero_agresivitate

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	241,857[a]	2	120,928	7,226	,002	,286
Intercept	1630,809	1	1630,809	97,450	,000	,730
Diagnostic	241,857	2	120,928	7,226	,002	,286
Error	602,451	36	16,735			
Total	3536,000	39				
Corrected Total	844,308	38				

a. R Squared = ,286 (Adjusted R Squared = ,247)

In order to observe the effect of the results obtained in ANOVA, we used the Test Between -Subjects Effect. It shows that the value of the Eta squared coefficient is .279, which means that 28% of the variance of Autoaggression Average is based on diagnostic severity (Table 2). From Table 3, we note that in the case of Heteroaggression Eta square is .286, which means that 28% of the observed variability can be attributed to the diagnosis.

Because we have noticed that the severity of the diagnosis: "Infantile Autism", "Asperger Syndrome", "other ASD" influences statistically significantly the averages of the scores obtained on the Autoggression and Heteroaggression subscales, we have analyzed by multiple comparison with the Tukey - HSD Test which of these groups there are differences. Thus, comparing 3 outcomes we noticed that a diagnosis of Infantile Autism is associated with more intense autoaggressive behaviors than the diagnosis of Asperger's Syndrome (p = .006), and also towards a diagnosis that can be classified as "other ASD" (p = 0.020). There are no significant differences between the values obtained for Asperger's Syndrome and other -ASD (p = .463).

In the case of Heteroaggression, Table 5 shows that there is statistically significant difference only when comparing Infantile Autism with Asperger's Syndrome (p = .002).

Cognitive skills of patients with autism spectrum disorders (ASD) can vary among individuals, and has a great influence on their behaviors, evolution and course of therapy.

In order to show if there is any impact of cognitive impaiment on auto- and heteroaggression among adolescents diagnosed with ASD I used Pearson's correlation test.

Table 6 shows that there is a statistically significant but negative correlation between

Table 4. Tukey Test for multiple comparisons – Autoaggression Score vs. Diagnosis

Multiple Comparisons

Dependent Variable: Auto_agresivitate

Tukey HSD

(I) Diagnostic	(J) Diagnostic	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Autism infantil	Asperger	5,44*	1,657	,006	1,39	9,49
	alte TSA	3,44*	1,216	,020	,47	6,41
Asperger	Autism infantil	-5,44*	1,657	,006	-9,49	-1,39
	alte TSA	-2,00	1,671	,463	-6,08	2,08
alte TSA	Autism infantil	-3,44*	1,216	,020	-6,41	-,47
	Asperger	2,00	1,671	,463	-2,08	6,08

Based on observed means.
The error term is Mean Square(Error) = 12,179.

*. The mean difference is significant at the ,05 level.

Table 5. Tukey HSD Test for multiple comparisons : Heteroaggression based on diagnosis

Multiple Comparisons

Dependent Variable: Hetero_agresivitate

Tukey HSD

(I) Diagnostic	(J) Diagnostic	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Autism infantil	Asperger	7,25*	1,943	,002	2,51	12,00
	alte TSA	2,84	1,425	,129	-,64	6,32
Asperger	Autism infantil	-7,25*	1,943	,002	-12,00	-2,51
	alte TSA	-4,42	1,958	,075	-9,20	,37
alte TSA	Autism infantil	-2,84	1,425	,129	-6,32	,64
	Asperger	4,42	1,958	,075	-,37	9,20

Based on observed means.
The error term is Mean Square(Error) = 16,735.

*. The mean difference is significant at the ,05 level.

Table 6 Correlation between IQ and the scores for Autoaggression and Heteroaggression

Correlations

		Hetero_agresivitate	Auto_agresivitate	IQ
Hetero_agresivitate	Pearson Correlation	1	,859**	-,574**
	Sig. (2-tailed)		,000	,000
	Sum of Squares and Cross-products	844,308	615,692	-1975,385
	Covariance	22,219	16,202	-51,984
	N	39	39	39
Auto_agresivitate	Pearson Correlation	,859**	1	-,533**
	Sig. (2-tailed)	,000		,000
	Sum of Squares and Cross-products	615,692	608,308	-1556,615
	Covariance	16,202	16,008	-40,964
	N	39	39	39
IQ	Pearson Correlation	-,574**	-,533**	1
	Sig. (2-tailed)	,000	,000	
	Sum of Squares and Cross-products	-1975,385	-1556,615	14033,897
	Covariance	-51,984	-40,964	369,313
	N	39	39	39

**. Correlation is significant at the 0.01 level (2-tailed).

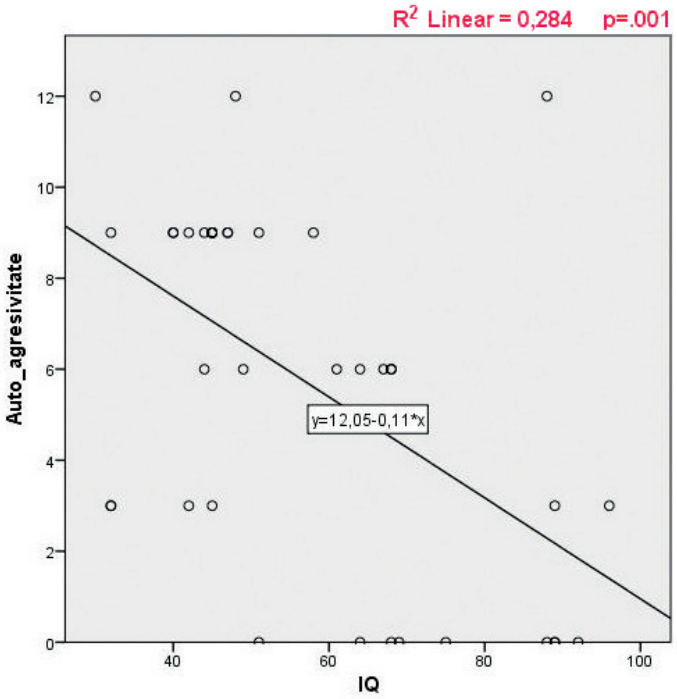

Figure 1. The Scatter plot shows the Autoaggression-IQ correlation

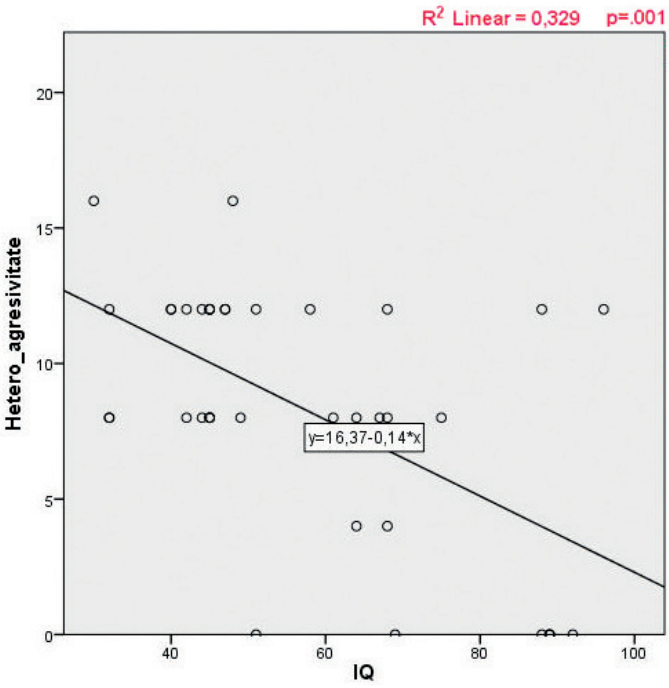

Figure 2. Scatter plot shows the correlation between Heteroagresivity-IQ

IQ and Autoaggression Score (r = .574, p = .001) and also between IQ and Heteroaggresion score (r = -533, p = 001). This means a lower IQ value is associated with a higher risk of aggressive behaviors.

From Fig. 1 it is observed the negative correlation between the IQ value and the score obtained on the Autoaggression subscale with R = 0.574, which means a moderate correlation (p = .001)

From Fig. 2 it is observed the negative correlation between the IQ value and the score obtained on Heteroaggression subscale (R = 0.533) – meaning a moderate correlation was found (p = .001). There can be pointed out a downward trend (Table 7).

Univariate linear regression analysis asserts that IQ has a predictive value for Autoaggression score (beta = - ,533, t = -3,829, p = .001). The influence of IQ value on the Autoaggression score variation is 28% (R^2 = 0.284). (Table 8)

Univariate linear regression analysis asserts that IQ has a predictive value for Heteroaggression score (beta = -, 574, t = -4,262, p = .001) The influence of IQ value on Heteroaggression score is 33% (R^2 = 0.329).

To see if the mean values of Heteroaggression and Autoaggression scores were significantly different, depending on sex, T -test was performed. Although null hypothesis is invalidated (H0: there is no significant difference between the mean, with the Levene Test p> .5) for both scores; the values obtained as a result of the T-test are not statistically significant (p = .819, Autoaggression

Table 7. Predictive character of IQ for Autoaggression.

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	12,046	1,748		6,892	,000
	IQ	-,111	,029	-,533	-3,829	,000

a. Dependent Variable: Auto_agresivitate

Table 8. Predictive Character of IQ for Heteroaggression

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	16,371	1,993		8,215	,000
	IQ	-,141	,033	-,574	-4,262	,000

a. Dependent Variable: Hetero_agresivitate

and p = .803 for the Heteroaggression. These results suggest that both types of aggressive behaviors are not significantly influenced by the sex of the participant among adolescents diagnosed with ASD.

To test a possible correlation between subject age and aggression scores, Pearson Bivariate Correlation is used. It is noticed that there is no statistically significant correlation between the variable age and the score obtained on the Autoaggression (p = .1), respectively Heteroaggression (p = .803).

The following mean values were obtained: urban area 5.04 ± 4.087 and rural area 7.36 ± 4.955 for Autoaggression; while for Heteroaggression the average values were 7.43 ± 4.955 for the urban environment and 10.55 ± 3.236 for the rural environment. Higher average values for rural areas have been observed in both situations. Using the -T independent test, to analyze if these differences have statistical significance, I obtained: In the case of Autoaggression (p = .103) and in the case of Heteroaggression (p = .062). Thus, the observed differences are not statistically significant.

It is noticed that the socio-economic status, divided into 3 categories "low", "modest" and "high", doesn't significantly influence the average values obtained on the subscales Autoaggression (p = .222) and Heteroaggression. 066).

Using the one-way ANOVA analysis we have found that the way the family of the participants is structured: "organized family", "disorganized family" and "institutionalized" do not assume the existence of statistically significant differences in the average values Autoaggression (p = .676) and Heteroaggression (p = .270).

Although, higher values of Auto- and Heteroaggression in adolescents without speech acquisition, T- test shows no relevant link between them. Auto-aggression (p = .159) and) Hetero-aggression (p = .214).

DISCUSSION

The present study shows that auto- and hetero-aggressive manifestations among adolescents diagnosed with Autism Spectrum Disorder cannot be predicted on the basis of socio-demographic characteristics: sex, age, urban / rural environment, socio-economic status or family structure, but rather the peculiarities of this disorder. We have obtained that the more affected are the areas interested by this disorder and the more severe the diagnosis, the more self-healing and hetero-aggression are more pronounced (Infantile Autism vs. Asperger Syndrome). Also, a lower value of Intelligence Coefficient (IQ) will result in more serious auto- and hetero-aggressive behaviors. Although non-verbal participants showed an average of higher aggressive behaviors than those who acquired language, a statistically significant relationship could not be highlighted. Interpretation of the results of the present study is conditioned by the methodological limitations (the reduced size of the participants group, the subjective character of the answers from the parents and the different degree of accept-

ance of the diagnosis, the differing interpretation of the items / the level of understanding / the cultural / educational difference of the respondents). A thorough analysis of aggressive behaviors requires in-depth studies.

CONCLUSIONS

Based on the study, the following conclusions are synthesized: adolescents diagnosed with Autistic Spectrum Disorder who experience more serious Hetero-aggressive behaviors also associate a higher level of Auto-aggression. Infantile Autism, a more severe form of the disorder, with extensive impairments, is accompanied by more aggressive manifestations against people around them and self-injury, than other form with higher functionality. The existence of a marked cognitive deficit is a predictor for a higher level of aggression.

On the other hand, the study shows that socio-demographic characteristics such as: gender, age, background, socio-economic status do not influence the scores obtained for Autoaggression and Heteroaggression among adolescents with Autistic Spectrum Disorder. Also, the family structure has no impact on these scores. The results highlight the importance of early intervention through specific behavioral therapy, cognitive stimulation and medication for a better prognosis regarding the evolution of aggressive behaviors, on long-term.

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