

Correlations between the Drawing Process in Autistic Children and Developmental Indexes

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Abstract

Objective: In developmental age the drawing process represents one of the best tools to assess the level of maturity reached by the child in his various areas of functioning. This study considers a sample of 84 children aged between 2.5 and 15 years, all diagnosed with autism, evaluated by an expert team of professionals, in order to highlight the drawing stage reached and the correlation with the severity of autistic symptoms assessed by the ADOS and cognitively evaluated with the Leiter-R nonverbal scale.

Methods: The drawing level was observed in spontaneous production by establishing a scale ranging from the presence of the disordered scribbling to the presence of the body schema, taking into account the stereotypes that can lead to some *echo-graphic* representations that are similar to the *echo-lalic* productions of the verbal language.

Results: The results showed a significant correlation between the drawing production and the Social-Affection component of the ADOS, so demonstrating that the delay in the drawing is heavily influenced by an emotional as well as intellectual inhibition.

Conclusion: Through some examples of drawings it is also emphasized the relationship between drawing and chronological age and the difference that emerges between drawings made in the evaluation context and those that come to life during the therapeutic process.

Keywords: Autism spectrum disorder; Drawing; Graphic activities; Emotional components; Developmental profile; ADOS 2; Leiter-R

Introduction

In developmental age, drawing is one of the best tools to objectify the level of maturity reached by the child in psychomotor, cognitive and emotional areas and, at the same time, it represents a valuable communication instrument in both educational and therapeutic fields. In fact, of any graphic image or sign we can analyze many elements that lead to subjectivity and then to the inner world of the subject who realized it, as can be seen also from the drawing tests elaborated in the psychodiagnostic context. Drawing is, in fact, for the child, a unique experience of representation of the self and the world, so constituting one of the main channels of expression of his mental and physical condition. Through the use of his gestures the child impresses on the sheet a trace that gradually becomes the tool to explore the environment and to leave a shareable mark of himself. According to most of the authors, the maturation of drawing expressiveness is proportional to the maturation of cognitive and emotional functions [1-4].

Research shows that children with autism spectrum disorder have a lower somatosensory perception than normotypical age-matched children [5-8]. Other studies also emphasized that the hand function is less developed compared with children of typical development [9]. Huri stressed that the preference of autistic children for hard objects respect to soft ones allows considering a minor tactile awareness compared to normotypical children [5]. This view is in line with what has been shown by Frances Tustin [10] as a result of a separation that did not occur from the care-giver. In addition, the difficulty of initiating and planning activity is often impaired in children with autism, and it is related to the presence of restricted and repetitive behaviors [11] and this could inhibit the motor planning necessary for the realization of the drawing.

In an interesting research where autistic children with and without an upper extremity trauma history were compared there was evidence that children with the presence of motors trauma had lower scores at the

Sensory Integration and Praxis Test and in somatosensory perception [5]. This study demonstrates the relationship between somatosensory perception and hand function in autistic children with upper extremity trauma. Although the presence of unusual sensory behaviors is still not part of the diagnostic criteria, the DSM 5 emphasizes their importance in the structuring of autism. The somatosensory perception plays a key role in the early years of life. In autistic children a lower somatosensory perception is associated with deficits in communication, in motor skills and social abilities [8].

The drawing activity, object of analysis in this research, is a key element of both the evaluation phase and of the therapeutic work that children with autism spectrum disorder receive at the Institute of Ortofonia, in Rome. The therapeutic project in which the child, his family and the school are involved provides outpatient activities (for a total of 10 h per week), home-care intervention (4 h per week), informative sessions and individual or group counseling for parents, in addition to educational support at school as well as medical, neuropsychological, physiatrist, psychological and speech therapist evaluations. The purpose of this treatment model is to emphasize the emotional and relational dimension to expand the repertoire of communicative behavior, thus allowing the expression of latent intellectual and social abilities.

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A study conducted on a sample of autistic children included in the therapeutic project, well highlighted that the drawing developmental stages of these children are slowed if compared with those of typically developed children of the same age but however could express the characteristics of personality of each one [12]. Correlating drawing development to the level of autistic symptomatology of each child we found that the decrease of the ADOS score corresponded to an increase in drawing that in its manifestation took a greater communicative value, so becoming a valuable tool for assessing the relational openness.

In fact, when a child begins to use his own drawings to spontaneously represent objects of the surrounding world, this opens an important channel of communication which allows him to express needs and desires. Unlike words, which evoke in the child invisible sound tracks, drawings leave tangible traces that allow the child a more concrete comparison with the world. Considering the difficulties that the child with autism spectrum disorder encounters in integrating the various senses and in conceptualizing them, it is better understood as how important is draw, if intended as act of knowledge.

The difficulties in sensory integration are responsible for most of the problems of autistic children. Ayres stressed the importance of an adequate sensory organization in order to use the objects and interact with the world [13]. In a psychodynamic framework, the lack of sensory integration is a result of the defensive mechanism of dismantling which protects the child from a relationship with the objects that is perceived as too threatening. The trace that the child produces can be a first step towards the integration process because it is acted by the child himself who can go up to where his potentialities allow.

A not appropriate drawing of the children is not the consequence of an altered aesthetic or physical development (such as visual or fine motor problems), but of a strong inhibition of the socio-relational components. This observation is supported by the fact that also those children with autism spectrum disorder with have an appropriate intellectual level show delays in drawings [14]. Children with autistic disorder showed, in fact, many difficulties to express and give shape to their emotional state because of an affective attunement deficit that interfered on both verbal and non-verbal behaviors such as drawing [15,16]. The drawing productions of these children were affected by the marked decrease in social integration and communication. As already pointed out, in fact, the drawing development, both in production and in spontaneous copying of graphic stimuli, resulted correlated with the severity of autistic symptoms and delayed in comparison to chronological age.

According to Machover [17] we know that the figure drawn represents the author himself and provides information about the perception that he has of his body and desires. On the basis of the presence of certain details and the manner in which the various parts of the body are elaborated or omitted it is possible to infer the emotional condition of the subject, that otherwise would not be communicable in a symbolic way.

The representation of the body is always, in fact, in the early stages of development, a transposition of the knowledge achieved and at the same time a stimulus for new bodily sensations. So that the concept of image of the human figure and the feelings with it associated could become meaningful for the child there must be body awareness and self-perception. This perception typically starts around the second half of the first year of life when the child begins to separate the outside world from the inside, to make himself aware of each part of his body, of his position in the environment, of his ability to control movements and to respond to sensations coming from the outside world [18,19]. Because of the difficulty that the autistic child has to attune with the outside world, all these experiences are greatly compromised and require a careful observation by therapists to promote those stimulations which are necessary to better attune.

In the therapeutic project of the Institute of Ortofonologia, which provides constant monitoring through clinical evaluations, it was noted that the first significant drawings often come to life within the therapeutic setting, there where the communication with the other acquires its importance. In fact, the child, in the therapeutic context, within a significant relationship, becomes able to lower his defense mechanisms and to express, so more, his emotional experiences through nonverbal instruments, unlike what happens in assessment context. Only within a meaningful context the drawing could become, for the autistic child, a means to tell to another his own needs, desires and emotions even if in the absence of verbal language.

Objectives of the research here presented are: to evaluate the drawing development of children with autism spectrum disorder, both in relation to the severity of the symptoms and of the cognitive level; to investigate the differences in drawings in connection with the age and the time spent in the therapy path.

Method

Participants

The research sample consisted of 84 children with a diagnosis of autism spectrum disorders (ASD), who had an age comprised between the 2.58 and 15.00 years (M=7.63 years; SD=3.2) at the time of the assessment. Of these, 15 were female and 69 were male (Table 1). Most children were Italian (93%); there also were an African minority (2%), Asian (2%) and Eastern Europe (3%).

Procedures

Children who participated in this study came in consultation at the Institute of Ortofonologia in Rome (IdO), between 2006 and 2015, with a diagnosis of autism spectrum disorders and a request for treatment. The diagnosis of these children was confirmed according to the diagnostic criteria of DSM-IV and DSM-5 and to the score obtained at the Autism Diagnostic Observation Schedule, First and Second Edition (ADOS-2) [20,21] that indicates their severity. The assessments

	Mean	SD	Minimum	Maximum
Chronological Age, years	7.63	3.4	2.58	15.00
ADOS	16.08	6.2	1	26
SA	11.79	4.8	1	20
RRB	4.18	2.2	0	8
IQ	68.77	21.4	36	103
Drawing Level	2.94	1.6	0	5

Legend: SA: Social Affect ADOS-subscale; RRB: R Restricted and Repetitive Behavior; IQ: Intelligence Quotient Score

Table 1: Description of the sample of 84 children with ASD (mean, ds, max-min range): age, ADOS-2 scores, IQ scores, drawing Level.

considered in this study refer to the period between 2014 and 2015, so include both children newly arrived at the Institute both children who were already taken into care. After four years of therapy, some of these children were not more in the ADOS autism spectrum category.

The diagnosis of children involved in autism research was prepared by a group of experts with at least 10 years of experience (psychologists/ psychotherapists, child neuropsychiatrists, neurologists and other specialized figures). The sample of this research did not include children with certified neurological damage, sensory disabilities or under 2 years old. This study was carried out in accordance with the recommendations of the national guidelines and the APA ethic. All subjects gave their informed consent for inclusion before they participated in the study. The study was conducted in accordance with the Declaration of Helsinki.

Measures

Autism diagnostic observation schedule, second edition: The Autism Diagnostic Observation Schedule-Second Edition [20,21] is a semi-structured standardized assessment concerning the areas of communication, social interaction, play, and repetitive and restricted behaviors. It is considered a gold standard so being the most commonly standardized measure used in research protocols. It has strong psychometric properties, including good reliability and validity. The ADOS-2 includes five modules, but during the assessment process, just one module is administered and it is selected on the basis of the expressive language level and chronological age of the child:

Toddler Module: For children between 12 and 30 months of age who do not constantly use sentences in their speech. This module allows you to precisely identify children at risk of autism spectrum disorders (ASD);

Module 1: For children aged from 31 months who do not continuously use sentences in their speech;

Module 2: For children of all ages who use sentences in the speech, without being verbally fluent;

Module 3: For verbally fluent children and adolescents;

Module 4: For verbally fluent older adolescents and adults.

In Modules 1 to 4, the algorithm scores are compared to get one of three classifications: Autism, Autism Spectrum, and Not Spectrum. The cut-off for the ADOS-2 classifications ADOS-2 varies according to the module used and to the child's language level. The ADOS-2, in addition to providing an overall score, also measures the domain of Social Affection (SA) and the domain of Repetitive and Restricted Behaviors (RRB). The SA includes the evaluation of aspects related to communication and reciprocal social interaction. The RRB includes unusual sensory interests, mannerisms, repetitive interests and behaviors and stereotyped-idiosyncratic use of words and/or vocalizations.

Leiter international performance scale-revised: The Leiter International Performance Scale-Revised [22] is designed for the evaluation of intellectual functions of children and adolescents aged between 2 and 20 years. The Leiter-R is formulated to meet the clinical need of evaluating the non-verbal intelligence through a comprehensive analysis of the strengths and weaknesses of the child, with a view to a diagnosis that includes both neuropsychological and cognitive aspects. Non-verbal cognitive abilities do not require the ability to perceive, manipulate and reason with words and numbers, so that the scale

can be administered completely without the use of verbal language, including instructions, because it does not require verbal responses from the subject. The validity coefficients of the IQ score was calculated for each age group (alpha 0.92 to 0.93). The Leiter-R has good evidence of its validity, with data from a wide analysis from the criterion related studies, the accuracy of classification of intellectual disability and various studies related to the construct [22]. The IQ score has a mean of 100 and a standard deviation of 15. The intellectual disability is indicated by a composite score that is two standard deviations or more below the average, so that a score of 70 constitutes the borderline value.

The drawing evaluation: The drawing process was evaluated in semi-structured observation in which an examiner unknown to the child asked him to spontaneously draw, providing markers and A4 sheet of paper. The examiner was not the therapist who has followed the child in the course of therapy and this in order to make the evaluation as objective as possible, so avoiding excessive distortions dictated by familiarity built within the therapeutic relationship.

The drawings obtained were evaluated by referring both to the process of drawing (through semi-structured observations) both to the final product, considering the close relationship of space and time implied by the drawings of that child at that time of his evolution.

Specifically, with regard to the process of drawing, the following parameters were observed:

- The attitude of the child during the administration and the activity. It was observed how that activity was accepted (if the child starts drawing waiting for the administration, or anticipating it; if the child initially refuses the activity going away and/or if he interrupts the activity several times).
- Eye contact during the action (if present, discontinuous or absent).
- The use of color (if the child tends to use only one or several).
- The prehension of the instrument (functional, high into a fist or between the fingers).
- The presence of interaction with the examiner during the activity, by observing if the drawing is used in a relational manner or not.
- The duration of the drawing and the attentive level.
- The use of the space in the sheet.
- The form and the order of the elements that constitute the drawing.
- The line, shape, proportion and erasures (if the child asks for other sheets or gets them individually).
- The child's posture while drawing.

Considering the above mentioned parameters detected during the activity, the drawing was then placed in a specific phase of the drawing development, following the stadial theories [19]. These theories provide a key to understanding the different developmental steps of drawings, distinguishable according to age, always keeping in mind the individuality of the child and the context. In this way the drawings of the sample were evaluated, codified and placed within the following 5-point scale [14,19].

Level 0. Refusal to draw or absence of productions.

Level 1. Disordered, random scribbling (age range 2 to 3.6 years): uncontrolled graphic marks, in which all the surface of the sheet is used, with little or no visual control over motor activity.

Level 2. Controlled scribbling (age range 2 to 3.6 years): Graphic marks are smaller and controlled and there is a growing ability to visually control the motor activity.

Level 3. Named scribbling, with meaning attribution (age range 2 to 3.6 years old): the child connects his graphic marks to objects of the outside world so originating the representative world.

Level 4. Preschematic (Age range 3.7-5, 6 years): deliberate attempts to represent reality even if the different elements are not well organized on the sheet.

Level 5. Schematic (age range 7-8 years): the drawing has appropriate form to represent an object of reality; the space-time parameters are achieved and the drawing is well recognizable.

Following the evaluation of the drawing level, the child was asked to draw a human figure giving access to a pencil and a sheet, in order to verify the presence of the body image in children with ASD. Given the variety and severity of autistic symptoms of the sample, it was impossible to use the Human Figure Test through the typical modes of the standardized Machover test [8], because it was not possible to use the same administrations to all subjects (because of the verbal language deficits and the discontinuous attentive difficulty), so preventing the reliable and valid use of the relative scale.

Data analysis: We used the Statistical Package for Social Sciences (SPSS) version 21 for data analysis. Significance level was set at alpha 0.05 (two-tailed). Analysis of Variance (ANOVA) was used to evaluate differences between groups. Effect sizes were reported as partial eta squared (η^2_p). A η^2_p of 0.02 was considered a small effect size, 0.13 a medium effect size and 0.23 a large effect size. Correlation analysis was performed to analyze the relationship between dependent variables. Chi-squared analyses were conducted to examine group differences in demographic variables between the categorical variables. Finally, the linear regression analysis was conducted to identify predictors of the level of drawing.

Results

The 84 children in the sample were divided according to the ADOS-2 scores in: children with severe autism (AUT; 78.6%), children with autism spectrum disorder (SpD; 8.3%); children out of the cut-off for the spectrum (No-spectrum; 13.1%). The children were in therapy, on average, from 3 years and 3 months (SD=2.4).

The drawing development in children with ASD

As shown in Table 2, in the AUT Group about the 6% of children refuses to draw or is not able to, about the 44% of children were in the

scribbling phase, about the 47% of the children achieved preschematic and schematic drawings.

In addition, all the AUT children with preschematic and schematic drawings also reached the ability to produce the body schema.

In the SpD group, about the 14% of children refuses to draw or is not able to, approximately the 70% of children were in the scribbling phase, about the 14% of children produced preschematic drawings; no child realized schematic drawings. Only 1 child was able to draw the body schema.

In the No-spectrum group, nobody refuses to draw or is not able to and nobody realizes disordered scribbling, approximately the 45.5% of children produced controlled scribbling or with meaning attribution, about the 55% realized preschematic and schematic drawings. More than the 50% of children was able to draw the body schema.

Investigate chronological age differences and therapy duration

Dividing the children into age groups, that is: 2-5 years (N=32), 6-9 years (N=31) and 10-15 years (N=21) a significant difference emerged ($F_{2,83}=18.47$; $p<0.001$; $\eta^2_q=0.33$), so that the drawing level in ASD children increased with the age, and the body schema started to appear in about the half of them between 6 and 9 years of age, while it is almost always present after 10 years of age.

The children, also, were divided according to the time already spent in therapy at the time of the drawing assessment. Children who had about 3-4 years of therapy behind them showed a significantly higher level of drawing ($F_{3,83}=5.80$, $P<0.001$; $\eta^2_q=0.17$) than those who attended therapy from 1-2 years. These differences are accentuated with the increasing of the children's chronological age (Table 3).

As for the representation of the body schema, there was a significant difference compared to the chronological age of children: of the 38 children with the body schema, 3 were preschoolers, 17 were 6-9 years old and 18 were 10-15 years old (Chi square=31.6, $p<0.001$).

Correlation between drawing level, cognitive skills, autistic symptoms

The analysis of the correlations showed that the drawing level improves with the increase of the age of children and the improve of the ADOS scores, and in particular with the improve of the Social Affections (SA). However there is no correlation between drawing and restricted, repetitive behaviors (RRB).

Finally, the drawing scores have a higher correlation with IQ scores than with ADOS scores (Table 4).

To show that ADOS scores relate directly to drawing level, a regression model was conduct, with drawing level as the dependent variable and IQ entered as the first predictor and ADOS scores as

Drawing level	AUT (N=66)	%	SpD (N=7)	%	No-spectrum (N=11)	%
Refuses or is not able to	4	6.1	0	0.0	0	0.0
Disordered, Random Scribbling	14	21.2	1	14.3	0	0.0
Controlled Scribbling	15	22.7	2	28.6	2	18.2
Named Scribbling, with meaning attribution	2	3.0	3	42.9	3	27.3
Preschematic	19	28.8	0	0.0	1	9.1
Schematic	12	18.2	1	14.3	5	45.5
Body Schema	31	47.0	1	14.3	6	54.5

Table 2: Division according to the drawing level of AUT (N=66), SpD (N=11) and No-spectrum (N=7) children.

the second (Figure 1). When ADOS scores was adding as a predictor, results in a significant change in the variance explained by the model, so we can assume that ADOS scores influence drawing over and above IQ (Table 5).

By way of explanation in Figure 2 we can examine a spontaneous drawing that is in delay if compared to typical development: the child is 8 years old and has an autistic disorder with severe symptoms (ADOS=19) and an IQ that cannot be assessed, neither with the Leiter-R scale, because of the his relational closure and his labile attentive times. His spontaneous production can be placed in the disordered scribbling stage that normally is acquired at about two years of age.

In Figure 3, there is an example of a stereotypical image: here we find small squares, colored with a precise succession of colors (red, green and yellow) which cover all the space of the sheet. In this drawing, no living objects appear and the movement is absent. The author is a 10 years old child who has an autistic disorder assessed using the ADOS

with a score of 19 and an intellectual disability assessed through the Leiter-R with an IQ score of 50.

During the execution of the drawing, which took place in an observational context, the child showed a strong relational closure also through an echolalic verbal language, a rigid body posture and a discontinue eye contact that made it impossible any intervention to change the interaction and its realization, since stereotypies prevent the flexibility necessary to modify the process in reference to external stimuli.

Observing and evaluating the drawings of autistic children we notice that many of them do not use the drawing in a communicative and relational way, but in a stereotyped way to evade the context. In fact, as well as many children use bizarre verbal language so often repeating words, sounds or phrases they heard say (*echo-lalia*), in the same way they produce stereotyped drawings, copying or repeating forms many times (*echo-graphic*).

	From 2 to 5 years	From 6 to 9 years	From 10 to 15 years
Drawing Score	1.9 (0.2)	3.2 (0.2)	4.1 (0.3)
Refuses or is not able to, %	12,5	19,4	
Disordered Scribbling, %	25,0	19,4	4,8
Controlled Scribbling, %	34,4	6,5	9,5
Named Scribbling, with meaning attribution, %	18,8	29,0	
Preschematic, %	6,3	25,8	42,9
Schematic, %	3,1	19,4	42,9
Body Schema, %	9.4	54.8	85.7

Legend: SA: Social Affect ADOS-subscale; RRB: R Restricted and Repetitive Behavior; IQ: Intelligence Quotient Score

Table 3: Drawing development in children divided by age.

	SA	RRB	IQ	Drawing level
ADOS2	0.95**	0.74**	-0.52**	-0.46**
SA		0.55**	-0.48**	-0.51**
RRB			-0.46**	-0.15
IQ				0.39**

Legend: SA: Social Affect ADOS-subscale; RRB: R Restricted and Repetitive Behavior; IQ: Intelligence Quotient Score

Table 4: Correlation between drawing scores, ADOS-2 scores and IQ scores.

Predictors	R	R squared	B	SE	P	90%-95% CI Exp(B)	Collinearity statistics	
							Tolerance	VIF
IQ scores	.397	.147	.029	.007	.001	.014 / .044	1.00	1.00
ADOS scores	.464	.215	-.117	-.464	.001	-.166 / -.068	1.00	1.00

Table 5: Regression Model.

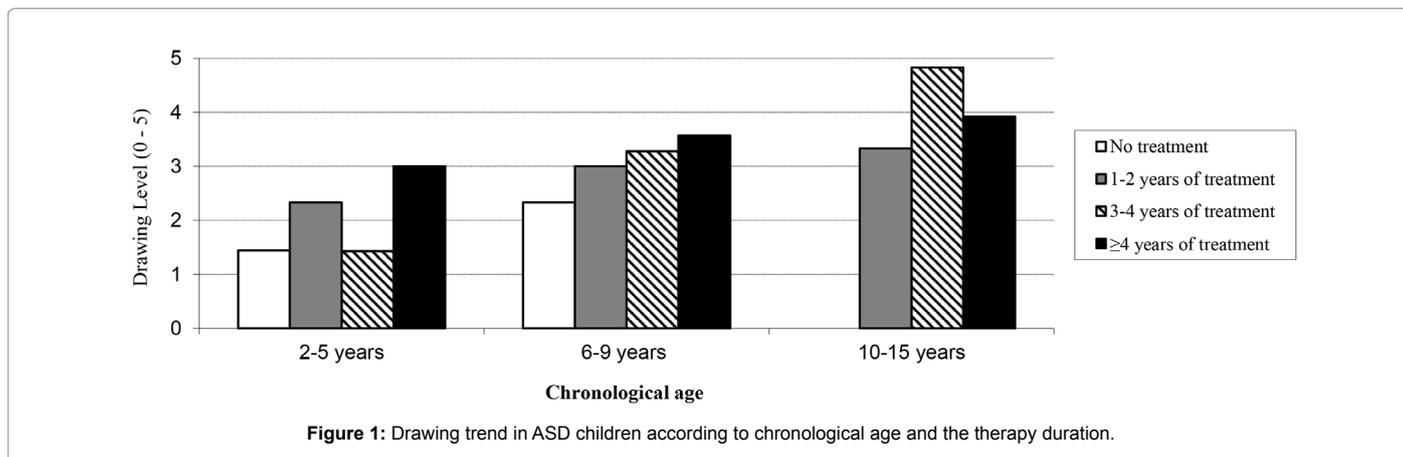


Figure 1: Drawing trend in ASD children according to chronological age and the therapy duration.



Figure 2: 6 years old girl; ADOS score: 21 (severe symptoms); IQ: 52 (moderate retardation).



Figure 3: 10 years old boy; ADOS score: 19 (severe symptoms); IQ: 50 (moderate retardation).

Stereotyped drawings are distinguished from those spontaneous for their static character, rigid and close to the surrounding environment. The drawing, in these cases, does not lead the child to an adaptation nor to an interaction neither to the final “product” nor to the drawing process. In stereotyped drawings, in fact, the dialogical component fails and this means of communication is used as a tool of estrangement from the surrounding environment.

In the Figures 4-6 it can be seen as the first attempts to represent the human figure are connected to the emotional-relational state rather than to the chronological age and cognitive level. However, it is again emphasized that there are completely different ways of development and that it cannot assess the affective and cognitive level of a child on the basis of a single drawing.

In the Figure 4, without taking account of the orientation in the vertical direction, it is represented a circle that would be the head with all the elements of the face, eyes, nose, mouth, ears and hair. The author is a child of six years and four months with autistic symptomatology in the absence of intellectual disability, which obtained an ADOS score of 13 and an IQ score of 71 in the Leiter-R, which is a borderline value.

In the Figure 5, a nine years old child, who has severe autistic symptoms as measured by the ADOS with a score of 14 and a cognitive development that cannot be assessed through the Leiter-R, produces only some elements of the face without the contour of the head and the body. It stands out in particular the choice of excluding the contour of the face, since it is unusual, and of including, instead, the pupils.

Both designs are incomplete and strongly inadequate if compared

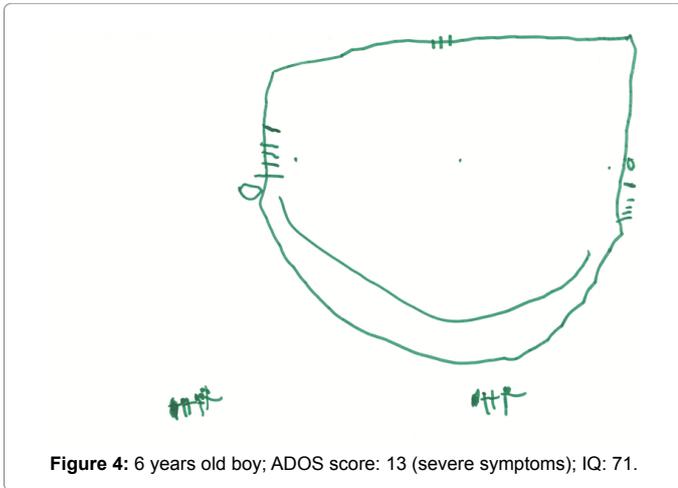


Figure 4: 6 years old boy; ADOS score: 13 (severe symptoms); IQ: 71.

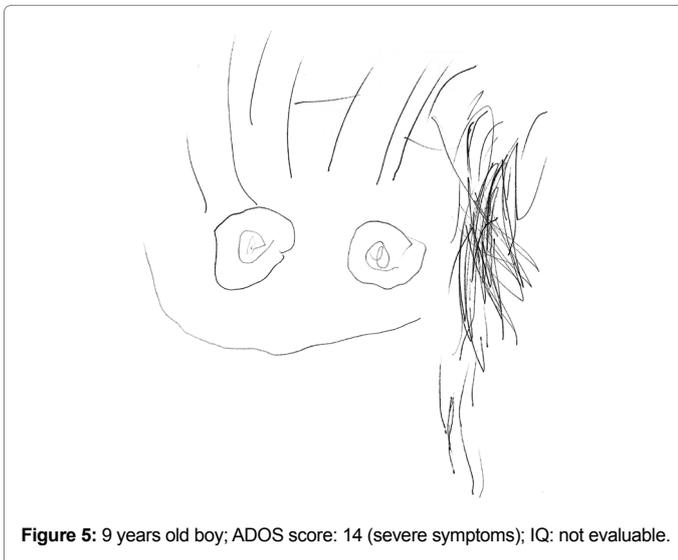


Figure 5: 9 years old boy; ADOS score: 14 (severe symptoms); IQ: not evaluable.

to the age criterion, but at the same time they both express, in their diversity, the specificity of each individual author. The first drawing of the human figure, even if in late, also indicates the way in which the child perceives and shows the beginning of a more structured intellectual process.

In the Figure 6, however, we can examine the drawing of the so called “big head”: the autistic child who drew it at the age of 4 years and 11 months by submitting had an autistic disorder with mild symptoms (ADOS score of 8) and no intellectual disability (IQ score of 71). His drawing production was impaired because these kinds of representations usually appear around the age of three. It should be noted that this drawing was realized as a result of a treatment path, thanks to which the changed his ADOS diagnosis. At his first ADOS administration, in fact, the child obtained a score of 20 which placed him in a severe symptoms category (it was at the intake that is two years before this drawing). It appears that the child, thanks to the good course of treatment and then to the reduction of symptoms, could acquire a greater perception of the self and the surrounding world that allowed him also to draw the human figure. This drawing production can be read as a positive indicator, predictive of his emotional state. As evidence of this, the same child in later years of his course of treatment achieved further significant improvements in all the developmental areas.

Observing the Figures 4 and 6 we can see that these two children, albeit presenting the same IQ, show a different capacity of representing the body schema and the figure 6, which belongs to a younger child, is better than the other. Considering many variables, this difference seems attributable to the lower level of autistic symptoms and not to the age.

If we consider two drawings of the same child we can do further reflections. In the Figures 7 and 8, in fact, we observe the body schema produced in two different contexts in a time frame of about a month. It is a 7 years old child with an ADOS score of 12 and an IQ score of 116. The Figure 7 was carried out in an assessment context while the Figure 8 was made in a therapeutic setting. They both are not complete of all the elements of the body schema and appear immature and altered with respect to the age and especially if compared to the child’s IQ but both express the emotional state of the child although if in different ways for the quality and quantity. In particular in the Figure 7 emerges a strong inhibition, an emotional block related to the performance requested by the operator. This interpretation is confirmed by the observation of the child’s behavior during the execution of the drawing because even through his body posture he shows a strong inhibition and high anxiety levels. Instead the second drawing (Figure 8) reveals a greater peace in the drawing process by which the child is able to express with a softer style his self-perception.

In comparing drawings of the same child in different contexts, we found that they often differ significantly. In particular we found that in the therapeutic setting: there are fewer occasions of refusal in performing drawings; the emotional connotation of the graphic image

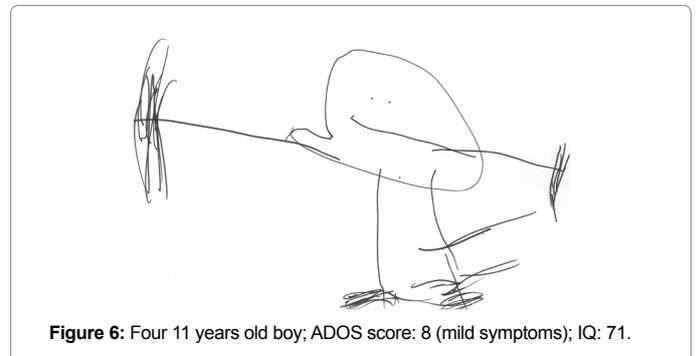


Figure 6: Four 11 years old boy; ADOS score: 8 (mild symptoms); IQ: 71.

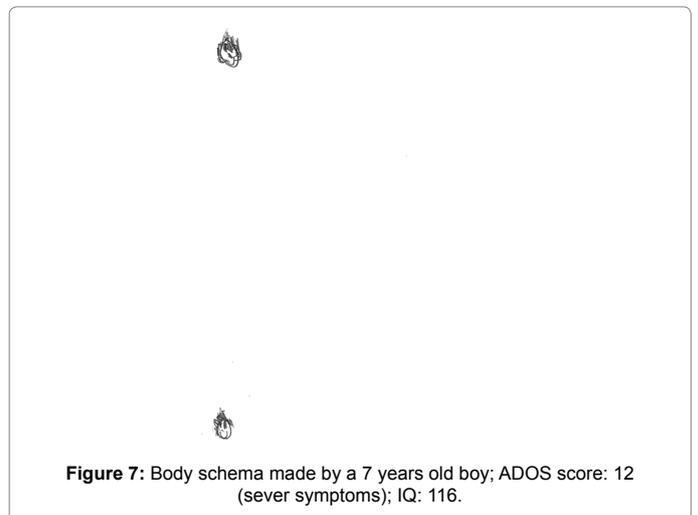
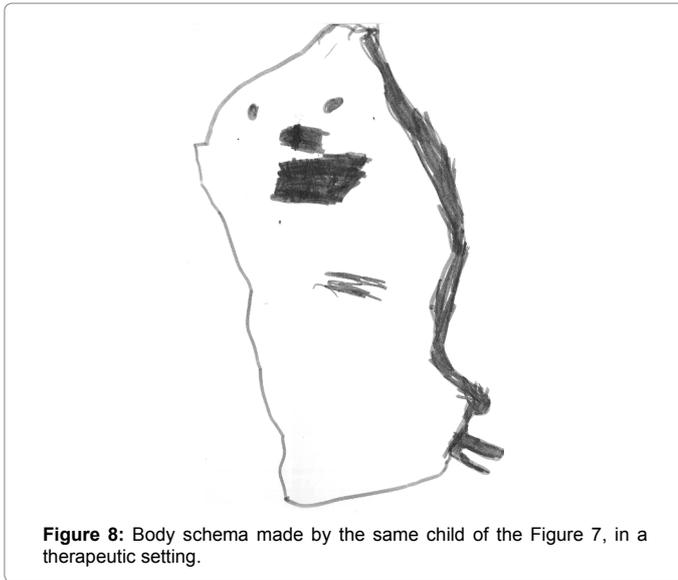


Figure 7: Body schema made by a 7 years old boy; ADOS score: 12 (sever symptoms); IQ: 116.



is stronger than that produced in observational settings; the child uses this production to express his emotional experiences in order to communicate them to the therapist (who can then reuse drawings to work on the main elements emerged).

Conclusion

The results demonstrate the close relationship of drawing with the level of autistic symptomatology. All children who are part of an autism spectrum disorder have a significant delay in the drawing process, and this delay is not related to the IQ, but rather to the Social Affection area investigated by the ADOS-2. Within the Social Affect area may be included all the tactile and proprioceptive feelings that allow the child a relational opening. A significant fact that emerges from the research is that the drawing development improves with age and duration of therapy. The increased presence of the body schema in children aged from 6 to 9 years is in fact due to therapy duration of at least 2 or 3 years.

Children who at the time of the assessment obtained a score of No-Spectrum (determined by four years of prior therapy) show graphic capabilities far superior to that of other groups, thanks to a greater social openness that allows the child to use drawings communicatively. The fact that children come out of the ADOS diagnoses of autism have significantly improved their autistic production shows how the initial difficulties were pervasive and not specific. In children from 10 to 15 years old, instead, the appearance of the humane figure is linked not only to a greater maturity, but also the various stimuli received in family, educational and therapeutic contexts. It is important to stress that when there is the representation of the human figure, this appears immature and impaired with respect to age. However, we could also show that the presence of the human figure constitutes a sign of a positive development of autistic symptoms. In fact, the appearance of the body schema is an important relational opening index for an autistic child, since it demonstrates his initial ability to recognize himself with his own body and then to differentiate himself from the other.

The highlighted data allow us to state that none of the children included in the Turtle Project has a special ability to draw. This is in contrast to a part of the scientific literature that emphasized extraordinary drawings abilities of a specific sample with autism

spectrum disorder in absence of intellectual disability [23,24]. In particular, it was found that the characteristic of the artistic work of these individuals was their visual realism, specifically the linearity, which captures the contours, and the prospect of an object or scene. However, some other studies [25,26] already refuted the notion of a connection between drawings skills and autism, in particular showing that autistic children do not get better performance than those of children with typical development with corresponding mental age, and that visual realism is not a feature of all autistic children's drawings. These studies also found that the artistically gifted autistic individuals may have much in common with not autistic people artistically gifted [23].

In this research we observed that children of our sample have a difficulty in their drawing ability that increases with the severity of symptoms and, in addition, that none of them possesses unique skills.

In conclusion we can say that the delay in drawing development supports the concept of a pervasive disorder noting that the lack of communication affects not only the verbal level, but all the expressive channels and imaginative processes, as it is clear also from the poorness or lack of symbolic play.

It seems important to emphasize the fact that a therapeutic approach, which could properly take account of the emotional component of development, promotes the natural unfolding of some of the child's abilities including those inherent the drawing process. The spontaneous appearance of the drawing, in our experience, it is always a result of a greater relational opening of the child and then an expansion of the cognitive strategies necessary to adapt to the outside world. Recent researches [27-29] documented how generally the cognitive level and also intellectual inhibition are closely related to the ADOS score and if this decreases, thanks to the course of treatment, as a result the intellectual inhibition will reduce and the IQ score of the subject will increase. Similarly the autistic symptoms may block the drawing development, in the sense that serious symptoms correspond to a low IQ score and to a drawing level which strongly deviates from the norm.

In patients belonging to the Turtle Project we found that some children, at a distance of approximately one year from the first observation, significantly improved their drawings and this finding also was confirmed at the ADOS retest and at the Leiter-R with a positive change of diagnosis and with an IQ improvement.

Many of the children, in the course of treatment, significantly changed the type of response given to the various tests and in some cases, following the ADOS score, went from an autistic disorder to an autism spectrum or to an absence of the disorder, accompanying these results also to a positive intellectual change. In particular, for a subsample of 78 children in the Turtle Project who were administered the ADOS procedure in different time periods, there was a significant improvement: 31 children (40%) achieved a less severe ADOS diagnosis, among which the 24% got an ADOS score lower than 7, so placing out of the autistic spectrum.

Finally, in this paper we also highlighted the usefulness and desirability of using the drawing tool both in an observational context and in therapy, especially considering the lack of attention until now attributed to this aspect. Children's scribbling and drawings, even those of autistic children, are valuable materials for reading the path of growth, through the evolution of signs, forms and composition: real and proper elements of a grammar and syntax of the grapho-pictorial language.

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