

## Syntactic Profile in Children with Autism Spectrum Disorders (ASD)

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### ABSTRACT

**Background:** in autism spectrum disorder the range of language abilities varies between total muteness to an apparent grammatically complex language. There is a debate on the effect of autism on syntax development if it is normal, delayed or deviant.

**Aim of the Work:** it was to assess the syntactic profile of ASD children.

**Patients and Methods:** a cross sectional descriptive research design. The subjects of this study comprised a convenient sample of 20 children diagnosed as ASD and other 20 normal children as control group with age range between 3 years 8 months and 11 years 8 months. Modified Arabic preschool language scale (PLS-4) Test and Stanford Binet intelligence scales, fifth edition were done for all children and Child autism rating scale (CARS) was done for children with ASD.

**Results:** syntax in ASD is significantly delayed compared to the syntax of normal subjects. Significant impairments in certain items of syntax as (Making grammatical judgments or repairing grammatical errors, understanding pronouns or expressing them, retelling sentences or stories, answering logically using negation, expressing jobs in speech, using irregular plurals, using dualization, question formulation, using past tense forms and using words that describe physical state) was found.

**Conclusion:** syntax in ASD was found to be affected and is found to be below the total language level of the study subjects and this was confirmed by sustained repeated impairments in certain items of syntax.

**Keywords:** Autism spectrum disorder, syntax, language delay, and Arabic PLS-4.

### INTRODUCTION

People with Autism Spectrum Disorder (ASD) tend to have communication deficits, dependence on routines, high sensitivity to changes in their environment, and intensely focusing on inappropriate items<sup>(1)</sup>.

Syntax is the set of rules, principles, and processes that govern the structure of sentences in a given language, specifically word order. The term syntax is also used to refer to the study of such principles and processes<sup>(2)</sup>.

There is a debate on the effect of autism on syntax development, while some studies<sup>(3)</sup> suggest that the syntactic levels of autistic individuals with spoken language do not appear to be delayed relative to other language domains, or relative to non-autistic peers with developmental delays, some other studies<sup>(4)</sup> suggest that the mastery of syntax in autistic children lags behind that of both normal and mentally retarded children who have attained the same level of nonlinguistic mental functioning.

A variety of specific features have been described in the language of individuals with autism, for example:

- The reversal of pronouns (saying “you” for “me,” and vice versa)<sup>(5)</sup>.
- Impaired comprehension of words referring to emotions<sup>(6)</sup>.
- Reduced sensitivity to grammatical errors<sup>(7)</sup>.
- Errors of verb tense marking<sup>(8)</sup>.
- Impaired use of articles and conjunctions<sup>(8)</sup>.

- Children with autism produce less question and negation utterances<sup>(9)</sup>.

### AIM OF THE WORK

To assess the syntactic profile of ASD children.

### PATIENTS AND METHODS

**Type of study:** descriptive cross sectional study.

**Patients:** This study was applied on 20 children diagnosed as ASD in Phoniatic or Psychiatry clinics and other 20 normal children as control group.

**Inclusion criteria:** Total language age above 2.5 years.

**Exclusion criteria:**

- Children having any other psychological comorbidity.
- Children having any neuromotor disorder interfering with assessment.
- Children having any known genetic or chromosomal abnormality.
- Children having visual or hearing impairment.

### Procedures and clinical tools

For assessment of children, the following selected assessment steps; extracted from the language assessment protocol that is structured and used at the Unit of Phoniatics Ain Shams University was used:

- 1) Patient interview and case history taking including child name, age, sex.
- 2) General examination to exclude any neuromotor disorders or visual or hearing imparments interfering with assessment.
- 3) Mental status examination by psychometric test (Standford Binet) <sup>(10)</sup> to provide mental age.
- 4) Preschool language scale, fourth edition (PLS-4) Arabic version (Arabic language test) <sup>(11)</sup> to pick up the syntactic profile.
- 5) Child autism rating scale (CARS) <sup>(12)</sup> to assess the severity of autism symptoms.

**Preschool language scale, fourth edition (PLS-4) Arabic version** <sup>(11)</sup>: was standardized on Egyptian children (Arabic language test) to pick up the syntactic profile. It is an interactive assessment of developmental language skills that can give the language age of the tested child. It has an age limit of 7 years and 5 months. In order to overcome this obstacle and to correctly determine the language age and syntactic profile the test was started from the beginning for each child regardless his chronological age and starting point.

**Stanford Binet intelligence scales, fifth edition** <sup>(10)</sup>: to provide mental age and intelligence level through assessment of 5 factors of cognition: fluid reasoning, knowledge, quantitative reasoning, visuospatial processing and working memory.

**Child autism rating scale (CARS)** <sup>(12)</sup>: to assess the severity of autism symptoms. It rates the child's behavior and abilities in relation to the expected behavior of normal child. The aspects evaluated are: relationship to people, imitation, emotional response, fear, activity level, level of intellectual response, verbal and nonverbal communication and general impressions.

**Ethical considerations:** parental informed consent was taken for all subjects.

**The study was approved by the Ethics Board of Ain Shams University.**

**Statistical analysis**

Data were coded and entered using the statistical package SPSS (Statistical Package for the Social Sciences) version 24. Data was summarized using mean, standard deviation, median, minimum and maximum in quantitative data and using frequency (count) and relative frequency (percentage) for categorical data. Comparisons between quantitative variables were done using the non-parametric Mann-Whitney test. For comparison of serial measurements within each patient the non-parametric Wilcoxon signed rank test was used <sup>(13)</sup>. For comparing categorical data, Chi square ( $\chi^2$ ) test was

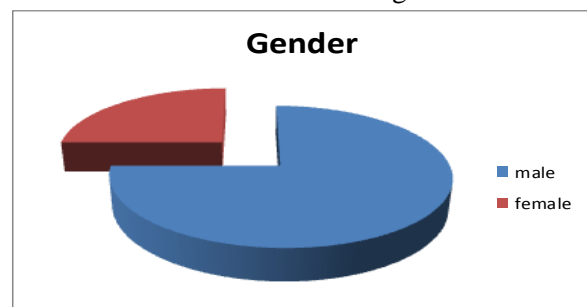
performed. Exact test was used instead when the expected frequency is less than 5 <sup>(13)</sup>. Correlations between quantitative variables were done using Spearman correlation coefficient <sup>(13)</sup>. P-values less than 0.05 were considered as statistically significant.

**RESULTS**

This study was conducted on (20) Egyptian children diagnosed with autism spectrum disorder (ASD) in phoniatic or psychiatry clinics and other (20) normal children as a control group. Controls are normal children matched to subjects in age and sex.

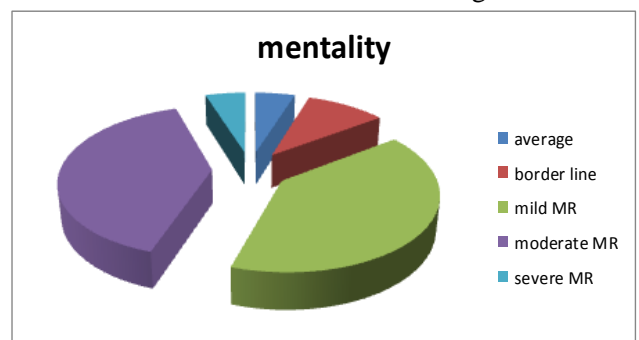
- 1- Subjects age range between 3 years 8 months and 11 years 8 months.

75% of the participants were male, while 25% were females as shown in fig 1.



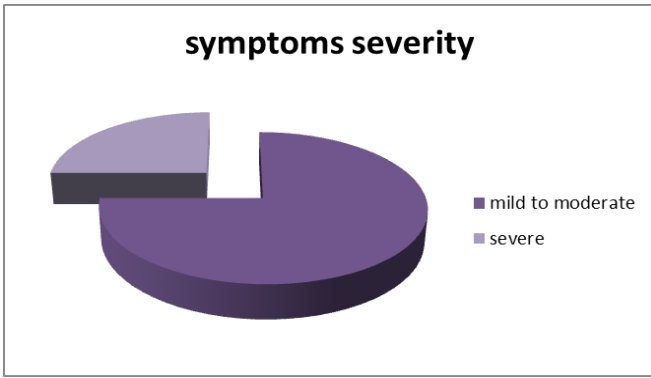
**Figure (1):** Gender distribution in study group (n=20).

- 2- One subject has average mentality, 2 subjects have border line mental retardation, 8 subjects have mild mental retardation, 8 subjects have moderate mental retardation and 1 subject has severe mental retardation as shown in fig 2.

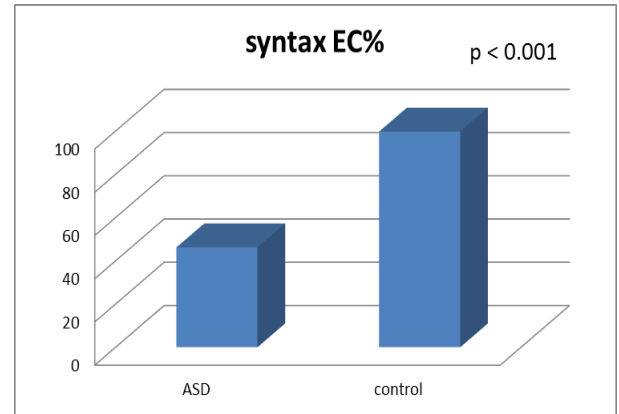


**Figure (2):** Mentality level distribution in study group (n=20).

- 3- 75% of subjects have mild to moderate ASD symptoms and 25% subjects have severe symptoms according to Child autism rating scale (CARS) as shown in fig 3.

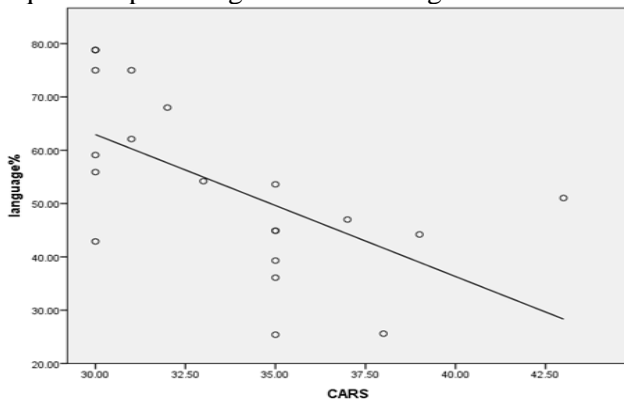


**Figure (3):** Symptoms severity distribution in study group (n=20).



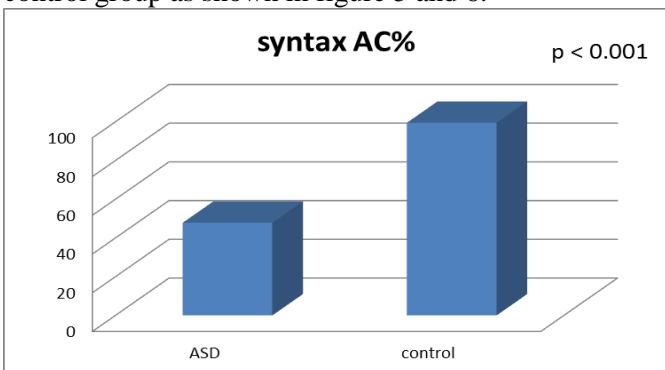
**Figure (6):** Comparison between ASD children and control group children as regards their EC syntactic acquisition percentage.

- 4- Examination of the data indicates that there is a negative significant relationship between **child autism rating scale (CARS)** and language acquisition percentage as shown in figure 4.

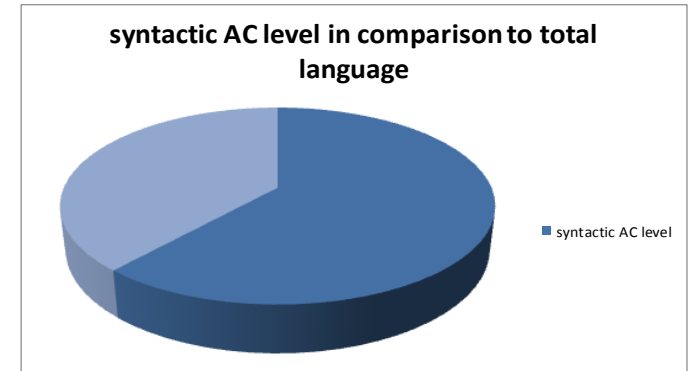


**Figure (4):** Relation between child autism rating scale (CARS) and language acquisition percentage in ASD children.

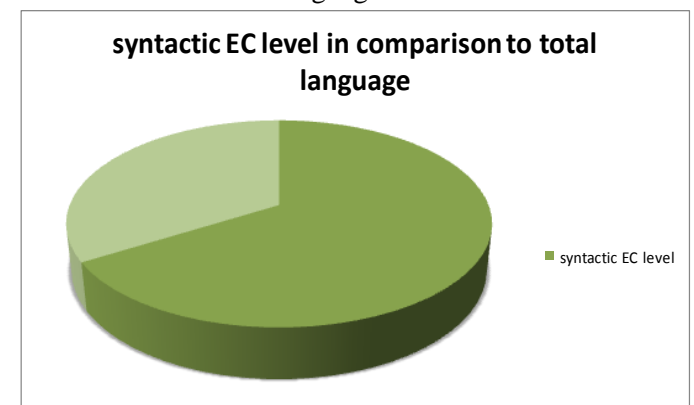
- 5- Examination of the data indicates that there is a significant difference between ASD children and control group children as regard their syntax acquisition percentage both at auditory comprehension (AC) and expressive communication (EC). With better results in the control group as shown in figure 5 and 6.



**Figure (5):** Comparison between ASD children and control group children as regards their AC syntactic acquisition percentage.



**Figure (7):** Syntactic AC level in comparison to total language.



**Figure (8):** Syntactic EC level in comparison to total language.

7- The significantly delayed items of syntax in ASD children are:

- Making grammatical judgments or repair grammatical error.
- Understanding pronouns or expressing them.
- Retelling sentences or stories.
- Answering logically using negation.

- Expressing jobs in speech.
- Using irregular plurals.
- Using dualization.
- Question formulation.
- Using past tense forms.
- Using words that describe physical state.

## DISCUSSION

The results in this study were focused on establishing linguistic especially syntactic criteria in children with autism spectrum disorder. All cases had total language levels below the expected level of their chronological age as were collected them from Phoniatric and Psychiatry clinics, and it is well known that poor verbal and nonverbal communication is common feature of ASD. So, the outcome of the comparison of PLS-4 scores suggests that the mastery of language in autistic children lags behind that of normal control group. The significant negative correlation between performance on the PLS-4 and the symptoms severity of autism according to CARS found in current study was also reported by many studies <sup>(14,16)</sup>.

Autistic children are found to be significantly lower than normal children in their acquisition of syntax. The analysis of the PLS-4 data showed that children with autism performed at significantly lower levels than age matched controls ( $p$  value < 0.001) (and this was expected because of total language delay). The interesting finding was that autistic children had lower levels of syntax than the expected levels according to their own total language age (ASD children have only 61.5% of their expected syntactic AC levels according to their own total language age and 66.26% their expected syntactic EC levels according to their own total language age). It is also important to note that none of the children reached the cut-off point for syntactic abnormalities in relation to their own language age.

There is a debate on the effect of autism on syntax development, a number of studies carried out and several of these have failed to report syntactic deficits in these children <sup>(17,18)</sup>.

Durleman <sup>(5)</sup> suggested that the mastery of syntax in autistic children lags behind that of both normal and mentally retarded children who have attained the same level of nonlinguistic mental functioning. Tager-Flusberg <sup>(6)</sup> reported autistic children might be comparable in their syntactic performance to younger normal or younger mentally retarded children and they appear to be able to construct rules similar to linguistic rules but they can't apply these rules, so their syntax is rule governed but less complex than that of normal and mentally retarded matched for the same nonlinguistic mental age. Other studies suggested that syntax is deviant and not only delayed in ASD <sup>(19)</sup>.

The research review of Boucher <sup>(18)</sup> stated that Syntax, and possibly also morphosyntax, is unimpaired. However, certain morphemic anomalies persist; but this can be applied only when language isn't delayed.

In disagreement with current study results in other study on Arabic candidates <sup>(3)</sup> the autism group showed deficits when compared with the chronological age matched group, but not the total language age matched group. This may be explained by using different language assessment tool.

On the other hand, a study on syntax and morphology done in Danish Speaking Children with ASD suggests that even many of high-functioning children with ASD show syntactic and morphological impairments <sup>(19)</sup>.

According to syntactic items measured by PLS-4 (Arabic version) in the present study it was found that

- According to grammatical judgements none of the subjects supposed to make grammatical judgments or repair grammatical errors were able to do this, this is consistent with other studies that stated the impairment of the ability to judge and correct grammatical errors <sup>(8)</sup>. This can be explained by the cerebellar changes observed in ASD <sup>(20)</sup>
- According to pronouns only 15% of subjects could understand pronouns and none of subjects supposed to express relative pronouns and demonstrative pronouns were able to do this. Recent studies done in 2018 confirmed the pronoun reversal in ASD children <sup>(21)</sup> Difficulty using pronouns in autism has been explained in some researches by deixis (the aspect of language that codes shifting reference between the speaker and the listener) <sup>(22)</sup>.
- According to Negation 60% of subjects can understand negation but only 5% of subjects supposed to answers logically using negation were able to do this. This is in line with studies reported that ASD children produce less negation utterances <sup>(23)</sup>.
- 6.7% of subjects supposed to formulate question with correct grammar were able to do this. These findings are in line with the studies showing that children with ASD produce less question utterances <sup>(23)</sup>. ASD child has his\her own world "the child in the glass ball" and has the triad of limited interest, poor social interaction and poor communication. Thus the child is not in need to give question utterance. This also may explain why using words that describe physical state is also significantly delayed.
- 60% of subjects can use present verb tense while 25% of subjects can use past tense forms. Bartolucci and Albers <sup>(24)</sup> found that past tense is more affected in ASD than present progressive. This finding was repeated in more recent studies <sup>(21,25)</sup>.

- None of subjects supposed to repeat sentences correctly as regards grammar or retell story were able to do. Studies reported that ASD children seemed to process the input and tell the story in an unusual way<sup>(21)</sup>
- Using irregular plurals, dualization, and expressing jobs in speech are also significantly delayed. This may explained by deficits of theory of mind and joint attention which are needed for learning language skills.

## CONCLUSION

Syntax in ASD is usually affected in ways that can't be explained only by the accompanying total language delay and this was confirmed by sustained repeated impairments in certain items of syntax (Making grammatical judgments or repairing grammatical errors, understanding pronouns or expressing them, retelling sentences or stories, answering logically using negation, expressing jobs in speech, using irregular plurals, using dualization, question formulation, using past tense forms and using words that describe physical state).

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