The attribution of mental states in the speech of children with autistic spectrum disorders

Atribuição de estados mentais no discurso de crianças do espectro autístico

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ABSTRACT

Purpose: To analyze the attribution of mental states in the speech of children within the Autistic Spectrum Disorders, and verify the modification in their vocabulary and phrasal extension, after a period of speech-language therapy. **Methods:** Speech samples from the initial Speech-Language Pathology evaluation and follow-up evaluations carried out after six months and one year of speech-language therapy were collected from the records of five children with autism and five with Asperger syndrome, with the aim to characterize their verbal performance and ability of attribution of mental states. Considering only spontaneous emissions, the classes of words nouns and verbs were verified and classified as terms refering to physical and mental states. The comparison between the three evaluations was performed by assessing the significance between the medians of the samples obtained (median test, with significance level at 10%). **Results:** It was observed an increase in the number of words produced and in the number of words per sentence between the evaluation periods and after a year of speech-language therapy, for children with autism. No differences were found for the attribution of verbs regarding physical and mental states and nouns regarding mental states, for both groups. A decrease in the number of nouns regarding physical states was observed in the autism group. **Conclusion:** The attribution of mental states increased after a period of speech-language intervention, however, with no significant difference; there was an increase in the verbal behavior of children with autism.

Keywords: Autistic disorder; Asperger syndrome; Language; Language disorders; Rehabilitation; Cognition

INTRODUCTION

Child autism and Asperger syndrome are ailments that compose the Disorders of the Autistic Spectrum, and may be characterized by the presence of severe and invasive damages in the areas of social interaction, communication and interests[1-3].

These disorders manifest themselves through delays or abnormal functioning in many developmental areas, such as an accentuated deviation in the individual's mental age. There may be failure in developing reasoning with their peers, little or no interest in developing friendships, lack of spontaneous seeking of shared pleasure, absence of emotional and/or social reciprocity, resistance to changes, attachment to inanimate objects, fascination with movement in general, posture abnormalities, stereotyped body movements (including hands), insistence in sameness, limited interests[1].

The damage in communication is quite severe, and may affect both verbal and non-verbal abilities. There may be a delay or total absence of expressive Language and, in the individuals who do get to speak, there is serious damage in the ability to begin and engage in conversation, as well as stereotyped or repetitive use of language, or use of idiosyncratic language. Receptive language levels may be below the expressive language levels, and many children in the Autistic Spectrum are not able to understand questions, directions or simple jokes, evidencing inability in language comprehension[1].

The social and communication inabilities of children of the Autistic Spectrum may be explain by the absence and/or difficulty to understand attribute intentions, desires and feelings to others. This is an inborn capacity, and is named Theory of Mind[4-6].

The Theory of Mind is a cognitive ability which, developed, promotes the attribution of mental states to others, providing

the interpretation of the interlocutor's social and communicative behavior[5,7,8].

The decision to carry out this study was taken based on the considerations from literature presented above. The hypotheses on which this study is based are: children of the autistic spectrum are unable to recognize and attribute mental states, and, therefore, have difficulties interpreting non-literal information. Thus, their receptive and expressive vocabularies reflect this inability, in the limited use of words relative to mental states, wishes and interests. Therefore, the purposes of this paper were: to analyze the attribution of mental states in the speech of children in the Autistic Spectrum attending Speech-Language therapy, and to verify the changes in expressive vocabulary and phrasal extension of these individuals, after speech-language therapy intervention.

METHODS

Type of study

Longitudinal study, approved by the Research Ethics Committee of the Universidade Federal de São Paulo (UNIFESP) on April 13th, 2007 (protocol number 0469/07).

Sample selection

The sample was composed of ten children of both genders, in between five and 11 years of age, diagnosed by a multidisciplinary team as having an Autistic Spectrum Disorder. Of these, five children had child autism, and five had Asperger Syndrome, according to the diagnostic criteria of the DSM-IV-TR[1] and were under treatment at the Speech-Language Pathology and Audiology Investigation Laboratory for Speech and Language – Global Developmental Disorders, of the Human Communication Disorders discipline in the Speech-Language Pathology Department at UNIFESP.

Procedures

Three speech therapy sessions of each child were transcribed, with parental consent. These sessions were recorded in video tapes which belong to the video archive of the Speech-Language Pathology Investigation Nucleus – Global Developmental Disorders (NIFLINC/TGD) at the Speech-Language Pathology and Audiology Department at UNIFESP. Each therapy session lasted approximately 45 minutes, and was selected from different periods: 1st speech therapy session (initial moment 1 – assessment); 6 months after the start of therapy (intermediate moment 2), and at the end of one year of therapy (final moment 3).

Each child's speech was analyzed according to the following parameters [9]:

- variety: spontaneous or repeated utterances;
- speech articulation: intelligible or unintelligible utterances;
- length: counting of the number of vocal utterances, babbling or words.

The number of words in each enunciate uttered by the child was added, and then divided by the sum of the total number of enunciates utter in the transcription (for each transcription), in order to obtain a simple average number of words (WA) uttered by phrase in each situation. The criteria used for the purpose of this calculation were[10,11]:

- all exact repetitions of utterances and words were counted;
- expressive elements such as *ã?*, were not considered, but all of the *é, yes, no* and *ok* were counted;
- ritualized reduplications and double names of people and places were counted only once;
- occurrences of irregular verbs in the past tense were considered as only one morpheme.

All words were considered as only one morpheme, so that a simple average of the number of words per utterance would be calculated, and at the same time, not be considered as a measurement of syntactic complexity[11].

Then, the uttered words were classified according to the following parameters[9]: noun; verb; preposition; descriptors; pronoun.

For the purpose of this study, only the nouns and verbs were considered, and these were classified as[12]:

a) terms which reflect physical states, such as motor actions (action verbs: to fall; description of perceptual characteristics: shape; concrete object naming: pen);

b) terms which reflect mental states, such as abstract words (verbs such as to cry, to think, to feel; naming feelings: happiness, sadness).

Spontaneous utterances, and not repeated ones, were considered, and, in this study, the verified words were either nouns or verbs, and were classified as terms which reflect physical and mental states.

The characterization of patients selected to compose the sample in this study is presented according to the multidisciplinary diagnostic criteria, age and schooling (Chart 1).

Chart 1. Sample distribution at the initial moment

Child	Diagnosis	Age	Schooling
1	AS	7 years 11 months	1st grade
2	AS	10 years 11 months	Special class
3	AU	6 years	Pre-school
4	AU	5 years	Pre- school
5	AS	5 years 6 months	Pre- school
6	AU	7 years 9 months	1st grade
7	AS	10 years 11 months	3rd grade
8	AU	11 years 4 months	5th grade
9	AU	9 years 4 months	3rd grade
10	AS	5 years	Pré-school

Legend: AU = autism; AS = Asperger syndrome

Statistical analysis

The children's performance was analyzed by comparison of their linguistic performance in the three different situations (moments 1, 2 and 3), using the non-parametric median test. In this test, the median shows the central value, and the absolute deviation from the median represents a dispersion measurement. Data comparison was obtained through the

assessment of the significance between the medians of the analyzed samples, where a significant level of difference was established at 10%[13].

For this purpose, the following were analyzed: number of uttered words, number of words per sentence (WA), total number of utterances, percentage of repeated utterances, percentage of unintelligible utterances, percentage of spontaneous utterances, and percentage of physical and mental states nouns and verbs in spontaneous utterances, for all the children in the sample, only for the Aperger Syndrome group, and only for the autism group. Finally there was an inter-group comparison for each moment (1, 2 and 3), in regards to the percentage of uttered mental and physical states verbs and nouns.

RESULTS

In regards to the number of words uttered in each moment, when comparing the group of children with Asperger syndrome with the group of children with autism, there was a 10% difference between moments 1 and 3 for the autism group, which presented a greater number of words per utterance after a period of speech therapy.

As far as the number of words per sentence in each one of the moments, when comparing the total number of children in the study, the group with Asperger syndrome, and the group with autism, there was a 10% difference when comparing moments 1 and 3 in the group containing all children in the sample, and also in the group with autism. In these two groups there was a greater number of words per sentence uttered with the course of speech therapy sessions.

As far as the total number of utterances in the children's speech, considering all the children, and also the groups with Asperger syndrome and autism, there was no difference found when comparing the various moments.

In relation to the comparison of moments 1, 2, and 3 regarding repeated utterances as well as unintelligible utterances for all children and each group separately, there were no significant differences; however, when comparing spontaneous utterances in each moment, for all children, and for each group, there was a 10% difference in the autism group in the comparison between moments 1 and 2, and 1 and 3.

Figure 1 shows the demonstrative graph of the median of nouns representing physical states, in the comparison of the three different moments, for the total number of children and for the three separate groups. There was a 10% difference in
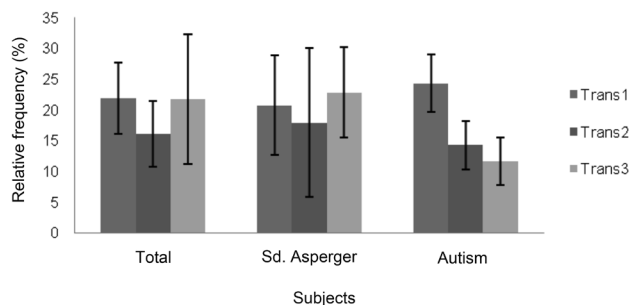

Figure 1. Median physical state nouns in each moment for the groups

the comparison for moments 1 and 2, for the all the children, as well as for the autism group.
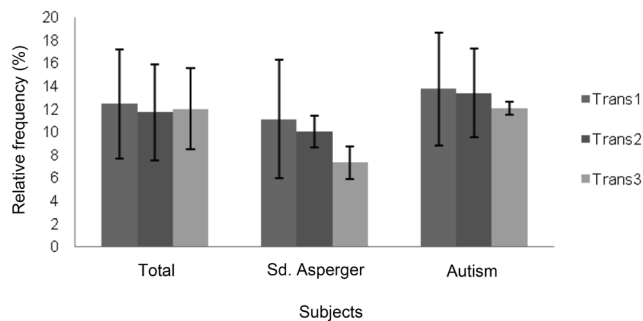

Figure 2. Median physical state verbs in each moment for the groups

Figure 2 presents the demonstrative graph of the median for verbs showing physical states, in the comparison of the three different moments, for the total number of children, and for the three separate groups. There was no difference in the comparison of the three distinct moments in any one of the groups, or when considering all the children in the sample.

Figure 3 presents the demonstrative graph of the median of nouns representing mental states, in the comparison of the three different moments, for the total number of children, and for each separate group. There was no difference in the comparison of the three moments in any one of the separate groups or when considering all the children in the sample.
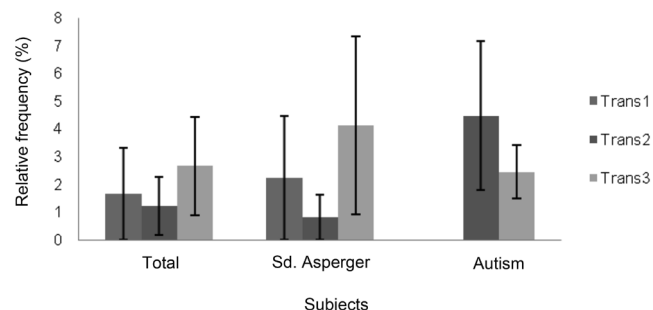

Figure 3. Median mental state nouns in each moment for the groups

Figure 4 shows the graph representing the median of verbs standing for mental states, in the comparison of the three different moments, for the total number of children, and for each separate group. There was no difference in the comparison of the three different moments in any of the groups, or when considering the total amount of children in the sample.

DISCUSSION

Studies show that children pertaining to the Autistic Spectrum Disorders produce less words per utterance than typical children of similar ages[9], however, as far as the number of words uttered in the speech of the studied children, there was a difference with the increase of utterances in children with Autism between the transitions from the initial (1) and final (3) moments, as well as an increase in the number of words
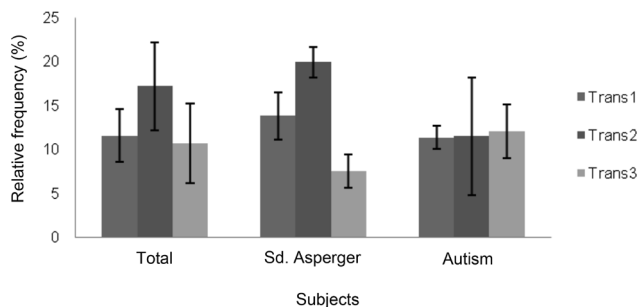
Figure 4. Median mental state verbs in each moment for the groups

per sentence in the transitions between moments 1 and 3 for the autism group, and when considering all the children in the sample. Furthermore, there was a difference in the increase of spontaneous utterances between moments 1, 2, and 3 for autistic children.

Studies point towards a significant lexical increase, effective use of oral language, and the insertion of new elements in speech and sentence utterance (subject-verb), showing that the autistic child had a significant improvement in communication after nine months of speech therapy[14].

For the total number of sentences uttered in the children's speech, there was no difference in any group, which coincides with the characteristics present in individuals of the Autistic Spectrum Disorders and described in literature, such as difficulties in maintaining dialogues, due to a primary dysfunction of pragmatics[4,15-17] as well as communication damages, which affect both verbal and non-verbal abilities[1,3,18,19].

There may be a direct relationship between the interaction of communication, the proportion of verbal communication, social-cognitive performance and meta-representation abilities[20].

There was a difference when comparing moments 1 and 2 with the decrease of the utterance of physical state nouns for the total number of subjects, and also for the autistic children (Figure 1). However, there was no difference in the utterance of physical state verbs (Figure 2), as well as of mental state nouns and verbs (Figures 3 and 4), which evidences both language and Theory of Mind damages in children of the autistic spectrum[8,15], being the Theory of Mind one of many potential factors that contribute to the variation in these children's speech abilities[21].

Children of the autistic spectrum were not able to attribute more mental state nouns and verbs in their speech after a period of speech therapy, and so there was no difference observed in the total number of utterances in the speech of any of the studied groups[8,21,22]. Factors such as the child's age, language and cognition levels, as well as the Theory of Mind, contribute in different ways towards the autistic child's ability to engage in conversation with others[21].

These children's deficit in understanding emotions can

be remedied with appropriate treatment. However, in spite of the group of high-functioning autistic children have acquired Theory of Mind abilities, and even having received intensive behavioral treatment, there are still many more perseverations and pragmatic communication difficulties than in typically developed children[16,23,24].

The difficulties in socializing presented by the child of the autistic spectrum leads to a poor awareness of the other person[6]. Therefore the difficulty found in maintaining speech, for example, could justify the difficulty of the studied children to attribute mental states in their speeches, and to signal failure or absence in the meta-representational process of attribution of mental states[5,22,25].

Vocabulary extension is an important measurement of intellectual ability, vocabulary is strongly correlated to the intelligence quotient (IQ)[26], and there is a direct relationship between the interaction of communication, proportion of verbal communication, social-cognitive performance, and the meta-representation abilities[20].

In the inter-group comparison, there was no difference in the three described moments, as far as the use of physical and mental state nouns and verbs (Figures 1, 2, 3 and 4).

There was an increase in vocabulary and phrasal extension of these individuals, which points towards the efficacy and importance of speech therapy for children in this spectrum[27-30].

The inability of the children with Autistic Spectrum Disorders to recognize and attribute mental states has been considered an important focus in the clinical practice with these children, so that the analysis of the use of mental terms (feelings, intentions) in children's speech, over the time of speech therapy, enables the verification of the effectiveness of speech therapeutic interventions performed under the perspective of the acquisition of the attribution of mental states.

CONCLUSION

In the present study, there were no differences regarding the increase of vocabulary relative to mental states, in the speeches of children with Autistic Spectrum Disorders, when comparing two groups (Asperger syndrome and child autism). There were differences with the increase of verbal behavior of the children in the autism group, between the first and intermediate (1 and 2), and first and final (1 and 3) moments; the increase of the number of words and the increase of the number of words per uttered sentence, and the decrease of physical state nouns in their speech.

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RESUMO

Objetivo: Analisar a atribuição de estados mentais no discurso de crianças pertencentes aos Distúrbios do Espectro Autístico e verificar a modificação no vocabulário e extensão frasal desses, após período de terapia fonoaudiológica. **Métodos:** Foram colhidas amostras de fala da avaliação fonoaudiológica inicial, após seis meses e um ano de terapia fonoaudiológica, registradas nos prontuários de cinco crianças com autismo infantil e cinco com síndrome de Asperger para caracterização do desempenho verbal e da habilidade de atribuição de estados mentais de cada criança. Considerando-se apenas as emissões espontâneas, foram verificadas as palavras pertencentes às classes substantivo e verbo e classificadas como termos que referem estados físicos e mentais. A comparação entre os três momentos foi realizada por meio da avaliação da significância entre as medianas das amostras obtidas (teste da mediana, com diferença significativa ao nível de 10%). **Resultados:** Verificou-se aumento no número de palavras emitidas e também no número de palavras por frase emitida entre os períodos de avaliação e após um ano de terapia fonoaudiológica para crianças com autismo infantil. Não foram encontradas diferenças para a atribuição de verbos de estados físicos e mentais e substantivos de estados mentais para ambos os grupos, sendo observada diminuição na emissão de substantivos de estados físicos no grupo autismo infantil. **Conclusão:** A atribuição de estados mentais aumentou após período de intervenção terapêutica fonoaudiológica, porém, sem diferença significativa, verificando-se aumento no comportamento verbal de crianças com autismo infantil.

Descritores: Transtorno autístico; Síndrome de Asperger; Linguagem; Transtornos da linguagem; Reabilitação; Cognição

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