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Language Assessment in Autism

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1. Introduction

Language development is strongly related to the linguistic and environmental contexts. There are individual differences in language development that relate to the onset period of certain abilities as well as to the rhythm of development and language characteristics. Those factors are associated to individual abilities and are deeply influenced by environmental aspects. The language acquisition process is dependent of a series of non-linguistic strategies and better language resources are usually available to further developed children. In this constant interaction the knowledge about language is constructed and used in different contexts. Those steps of language and communication development, however, do not occur always as expected. Some children transgress several of the steps and milestones of development. Language acquisition is considered a fundamental element of infantile development, potentiating also the social cognitive development (Amato & Fernandes, 2010).

Language is also considered an important diagnostic and prognostic factor in autism. Regardless of the theoretical perspective or etiology, the linguistic issues are important features of the descriptions of autism spectrum disorders, varying from lack of verbal communication to pedantic speech (Miilher & Fernandes, 2009). The identification of this group's language pattern would answer questions such as whether there are specific or underlying deficits and if they are common to all autistic children.

The exact nature of language impairments in the autism spectrum is still unclear, especially due to the variations of symptoms. Approximately half of the autistic children do not use language functionally and present persistent communicative delay. Other children present language development similar to normal children but with pragmatic inabilities such as difficulties varying communicative stiles according to the situations or the interlocutor, misunderstanding rhetoric expressions such as metaphors or irony (Roberts et al, 2004; Young et al, 2005; Bekaldi, 2006; Smith et al, 2007).

However, there is a general agreement that any therapeutic intervention proposal should be based on an individual language and communication profile, as detailed as possible (Bekaldi, 2006). Therefore, issues such as how and what to assess in an autistic child's communication are continually being addressed by several studies that provide some evidence about the available alternatives.

Jarrold et al. (1997) stated that evidence suggests that there are at least three differences between autistic and normal children's language: articulation abilities seem to be better

developed then the other areas; verbal expression seem to be more advanced than verbal comprehension and lexical comprehension is superior than grammatical comprehension.

The identification of this group's language pattern would answer to questions such as if there are specific or underlying deficits and if they are common to all autistic children. Hetzroni & Tannous (2004) suggested that linguistic impairments are linked to one of the three language components (form, use and meaning) or to their association. Walenski et al (2006), however, stated that the linguistic profile of autistic subjects is defined by pragmatic and grammatical disorders and intact lexical abilities.

Several authors (Fernandes, 1994; Folstein & Rosen-Shedley, 2001; Volkmar & Pauls, 2003; Bekaldi, 2006; Smith et al, 2007) pointed out that the pragmatic inabilities are a central feature of autistic disorders and thus are the focus of many researches since the 1980 decade. However, since the beginning of the XXI century the interest about formal and semantic issues have been restored.

Generally, literature points out to grammatical, lexical and pragmatic deficits in autistic children. However, it is still not clear how these abilities relate and mutually interfere. Tager-Flusberg & Calkins (1990) reported that autistic children's grammatical abilities measured by the Index of Productive Syntax (IPSyn) and by the Mean Length of Utterance (MLU) are the same, either if spontaneous or imitative speech is analyzed. In the study by Rollins & Snow (1998) communicative intent with joint attention purposes was related to syntactic development. However, there was no correlation of the syntactic development with communicative intent with regulatory purpose. The authors concluded that apparently, autistic children's pragmatic abilities contribute to grammatical acquisition. Kjelgaard & Tager-Flusberg (2001) observed that autistic children presented lexical-syntactic and grammatical impairments in standardized tests. Condouris et al (2003) used standardized tests and spontaneous speech to assess autistic children's language performance and observed that the children presented impairments in formal aspects of language on both conditions. Among the grammatical measures used by the authors to spontaneous speech assessment, MLU was the one that presented the largest number of correlations with other measures and was considered a useful way to assess grammatical abilities. In the research by Paul et al (2004) autistic children presented the lowest performance in pragmatic and grammatical aspects including word combining, use of functional terms and grammatical markers, use of language to communicate personal experiences and share new information. Roberts et al (2004) reported that autistic children actually present grammatical deficits when compared to peers of the same chronological age. Eigsti et al (2007) observed syntactic delays in autistic children and stated that these children present an atypical developmental pattern, marked by inconsistent performance. Walensky et al (2006) pointed out that the main grammatical impairments refer to flexional morphology but that it is not clear if to morpho-phonology or to morpho-syntax. Evaluating the pattern of verbal abilities along seven years, Anderson et al (2007) found out that the linguistic development path followed a predictable pattern from two to nine years of age.

There are different methods of language assessment, each one with specific advantages and disadvantages. However, due to autistic children's characteristics such as lack of social engagement, the use of spontaneous speech samples may provide important information about their functional linguistic performance especially when environmental variables such

as familiarity and cognitive demand are controlled. Besides, this method also reflects language use's productivity (Tager-Flushberg, 2000; Condouris et al, 2004).

The aim of this chapter is not to present strict models of assessment protocols, but to present data and report results of different alternatives and suggestions for assessing language and communication in children of the autism spectrum. There are several options of tests and measures available to assess a few languages such as English, French and Spanish. But all the other languages need specific tools and parameters and demand adaptations by the speech and language pathologist. Some of the studies described discuss important issues involving language-specific adaptations and group-specific analysis criteria.

2. Core aspects of language assessment in ASD children

Determining which ones are the language aspects that should be systematically assessed in all ASD children is frequently a challenge to the speech and language pathologist (SLP). A comprehensive language assessment doesn't have to be necessarily exhaustive, but it must provide the necessary information to allow the determination of a complete profile of characteristics that will be the basis for diagnosis and intervention proposals.

Considering the areas of social, cognitive and linguistic development, necessarily impaired in autistic individuals, overall information about them is obviously necessary. But how the different linguistic systems are associated is an aspect that still demands further research.

Aiming to confirm the consistency of the assessment results, a study was conducted to verify and analyze the relation between grammatical, lexical and pragmatic development in autistic children in a period of 12 months of language therapy (Miilher & Fernandes, 2009). In this study, subjects were 10 individuals with diagnosis within the autism spectrum that were assessed and attended to language therapy on a specialized service. The average age on initial assessment was 7 years, 2 months. All were male and had received no prior language therapy. Video-taped samples of initial assessment, six and twelve months after language therapy onset were analyzed in regard to the Functional Communicative Profile (FCP) and communicative functions; Mean Length of Utterance (MLU) and Vocabulary. It totalized three samples per subject with a total number of 30 recordings with 30 minutes each. The Functional Communicative Profile (FCP) included the analysis of the number of communicative acts expressed and the communicative functions they expressed (among 20 possibilities). These communicative functions were divided in more interpersonal and less interpersonal according to Cardoso & Fernandes (2003). The FCP also considered the communicative means used to express each communicative act: verbal (emission with more than 75% of the correct form), vocal (emission with less than 75% of the correct form) and gestural (facial and body movements), adapted from Weterby & Prutting (1984). The communicative functions were also analyzed according to Halliday's (1978) proposal as: instrumental, regulatory, interactive, personal, heuristic and imaginative.

To the assessment of the Mean Length of Utterance (MLU) the same videotaped therapy sessions were used, providing the necessary 100 speech segments and singing and delayed echolalia were excluded from the analysis. The grammatical classes considered were: adverbs, adjectives, articles, conjunctions, prepositions, pronouns, nouns and verbs. Grammatical Morphemes (GM) were divided in two sub-groups: GM1 (nouns, verbs and articles) and GM2 (prepositions, conjunctions and pronouns). The total sum of GM1 and GM2 constituted the Total-MLU. The ratio of MLU-words and MLU-morphemes was also determined.

To the assessment of Vocabulary the same 100 speech segments described above were used. The terms of psychological state (physical, emotional, of desire and cognitive) and of designation (natural and cultural entity, body parts, action, artifacts, time and space location and people's names) were counted by occurrence. According to the studies by Lee & Rescorla (2002) and Perkins et al (2006), the number of different psychological state terms was also counted, besides its total occurrence.

The results have shown that, of the total assessed variables the ones with larger number of correlations were: MLU-words, verbs, GM1, MLU morphemes and proportion of interpersonal communicative acts.

MLU-words was the item with the largest number of correlations. MLU-words may be an indicator of the grammatical development as well as of the phrasal extension. However, they point out that, since it doesn't differentiate structure and morpho-syntactic complexity, MLU-words may be better used as a linguistic development indicator.

The grammatical variables associated with MLU-words were: type 1 Grammatical Morphemes (nouns, verbs and articles), MLU-morphemes and the word classes of adverbs, adjectives and verbs. Except for the grammatical variables the other variables seem to reflect rather the communicative use than the linguistic system. The MLU-words was larger in subjects with better pragmatic abilities and more social-emotional engagement during communicative exchange.

Generally MLU-words presented more associations with pragmatic variables than with lexical abilities. On the two first moments (1 and 2) when there was more use of the verbal communicative mean and of interpersonal communicative acts, the MLU-words was also larger. On the last two moments (2 and 3), larger numbers of communicative acts per minute and more use of communicative space are associated with larger the MLU-words. The association with the verbal communicative mean is not surprising once this is the main mean of utterance. However, the association to interactive factors is visible on the occupation of the communicative space and on the number of communicative acts per minute.

In what refers to the pragmatic variables, the second moment seems to have a transition role. On the first moment all the variables referred to each child's own performance, with internal parameters (number of communicative functions and number of interpersonal communicative acts). On the third moment the two variables referred to the child's performance in relation to an external parameter (acts per minute, where the parameter is the time and communicative space, where the parameter is the other). The second moment presented both types of parameters and seemed to function as a rehearsal to the third moment. That is, on the second moment the association between phrasal extension and performance factors with external and internal parameters coexists.

The strong statistical significance observed in the associations between lexical, grammatical and pragmatic aspects indicates the mutual influence of different aspects of language. Therefore, the language diagnosis must take all these aspects into account. The fact that the grammatical variables were the ones with the largest number of correlations may suggest that the formal aspects of language mediate the associations between meaning and function. However, any positive conclusion demands further investigation, with larger number of subjects and with users of different languages. Generally grammatical variables presented more associations with pragmatic variables then with lexical abilities. The positive correlations between grammatical variables and pragmatic abilities seem to reflect rather the communicative use of language than the linguistic system.

The spontaneous speech analysis showed the communicative functionality of the studied individuals and indicated that there was association of two types of variables of the same corpus. These results reinforce the use of samples of spontaneous communication as a useful alternative to the assessment of children of the autism spectrum, especially in situations where there are no language-specific tests available. The number of subjects imposes a limit to the generalization of the findings of this research and further research with larger more homogenous sample is desirable. But the analysis of the correlations between grammatical, lexical and functional aspects of language offers information to the determination of individual profiles of abilities and inabilities and therefore provides information to the clinical intervention in language therapy for children of the autism.

The consistency of results along the intervention period indicates that the results obtained reveal the profiles of abilities and the associations among them are not random observations, but close reports of each child's profile that were useful in the intervention process.

These results agree with other studies reported in the literature that demand careful consideration. The correlations with strong statistical significance show the association between lexical, grammatical and pragmatic aspects. As reported by Toppelberg & Shapiro (2000), the language components are linked and function harmonically, although independently.

The association between MLU-words and occupation of the communicative space shows the important role of the verbal communicative mean to the symmetry of the interactive setting, although they have been shown to be independent factors (Fernandes, 2000b).

The correlations regarding grammatical class also cannot be taken as a causal relation; a strong correlation suggests that the variables have important common ground (Bates & Goodman, 1999). Children do not learn the meaning of new words only by time-space contiguity clues; they focus on clues about the speaker's intentional references such as gaze direction (Bloom, 1997). Considering that verbs convey less evident meaning then most nouns, a larger use of verbs seem to indicate more attention to other people, what may suggest better social abilities not just in more attention to other people but also in more interactive interpersonal communication. While many nouns refer to concrete objects, verbs may refer to transient events or to complex changes with multiple organizational principles. The concepts conveyed through verbs can be more complex than those conveyed by nouns (Goldfield, 2000).

In most languages the nouns are apprehended by object concept mapping while the knowledge about verbs is language-specific. The role of self-other interaction is important in learning and using verbs and factors such as verbal meaning, social-pragmatic clues and input (frequency, positional salience and syntactic structural diversity on which they are used) have important influence on the order of verbal acquisition (Naigles & Hoff-Ginsberg. 1998).

Befi-Lopes et al (2007) in their study about the use of different kinds of verbs by Portuguese speaking Brazilian children stated that the evolution on the use of verbs agrees with the hypotheses that acquisition is based on the use and attention do contextual and semantic-syntactic clues.

Negative associations with the gestural mean may indicate one of two things: either the use of gestures is replaced by verbalization or the use of verbal utterances doesn't exclude the gestural delay that is observed even in children with better linguistic abilities. Perkins et al (2006) stated that even before the first year of life autistic children present delayed gestural communication that is a better diagnostic factor than word production or comprehension.

The third more frequent correlations observed in the study by Miilher & Fernandes (2009) involve MLU-morphemes, type 1 grammatical morphemes (GM-1) and the proportion of interpersonal communicative acts. MLU-morphemes presented correlations on the first and third moments with artifacts and with the total of designative terms. Artifacts are words that express entities that are dependent on the human action, as clock, house or others (Perkins et al 2006) and in several cases they are expressed by words that refer to objects. These words are included in the category of nouns whose maximum score is three points (morphemes that express gender, number and degree) and are the grammatical class with higher scoring possibilities on MLU according to Araujo & Befi-Lopes (2004) criteria. The study by Tager-Flusberg et al (1990) showed high correlation indexes with syntactic productivity and lexical diversity measures.

Nouns, verbs and articles are the basic phrasal components in Portuguese; this way the link between artifacts and designative terms and the use of the verbal communicative mean is not surprising. Besides this link with the language it is possible that the association with designative terms and artifacts is related to the fact that autistic children tend to speak about less complex, more concrete, events (Eigst et al, 2007) and therefore use more words that designate real objects as the artifacts. The correlation with interactivity indicates that the intention in socially participate in communicative situations is essential to the effective use of linguistic knowledge. The idea that the communicative effectiveness depends on the aspects of form and use (besides content) becomes clear through this association (Toppelberg & Shapiro, 2000; Hertzroni & Tannous, 2004).

The linguistic idiosyncrasies that are widely reported in literature (Eigst et al, 2007) may hide the fact that autistic children present communicative intent. Wetherby & Prutting (1984) reported that these individuals use interactive communicative acts, but that most of them have environmental consequences and the communicative acts with social consequences are less frequently used. The association of interpersonal communicative acts with other variables shows that there is a link between linguistic and social-pragmatic abilities as reported by several authors (Ninio & Snow, 1988; Bates & Goodman, 1999; Bishop, 2000). The correlation analysis do not determine the association path; that is, if the use of interactive communicative acts favors the use of certain lexical terms or larger MLU or if certain lexical terms and more complex utterances favor communicative interactivity. What can be stated is that there is an association and that it may be related to social-pragmatic structures that function as language facilitators (Bates & Goodman, 1999) or it may be a mechanism of reciprocal influence (Marcos, 2001; Garcia-Perez et al, 2008).

Therefore, the association between the various aspects of language (especially grammar, syntax and pragmatics) demands careful and sometimes individual analysis. The use of spontaneous interaction samples and language-specific criteria may provide significant data to the determination individualized of intervention proposals.

3. Specific assessment situations and groups

Language and communication are socially-related abilities and thus the child's communicative and linguistic performance is frequently socially influenced. Language assessment may have different purposes: it may be important to determine an ASD child's best possible performance or it may be useful to identify the specific difficulties that an ASD adolescent faces in a group situation. Therefore the communicative situations and interlocutors proposed to the language and communication assessment must be appropriate

to its purpose. Different settings can be used, as peer-group or individual situations with the speech-language pathologist or with the mother or a sibling. Frequently the use of more than one situation provides the most significant results.

Three studies aimed to investigate different issues of language assessment: the identification of differences between verbal and non-verbal children; the analysis of different interlocutors and materials assessing language in ASD children and the language assessment of adolescents with ASD.

3.1 Communicative functionality of verbal and non-verbal autistic children

In this study (Amato & Fernandes, 2010) mothers were included in the data gathering process in order to identify the usual communicative context available to each child. The subjects were 20 autistic children with ages varying from 2:10 to 10:6, 17 of male gender and 3 females. They were all divided in two groups (verbal and non-verbal) filmed just once before the language assessment. The inclusion criteria in the verbal (V- 10 subjects) or in the non-verbal (NV- 10 subjects) groups was the medical report included in the referral documents. None of the subjects had prior speech and language assessment or intervention. All subjects were filmed for 30 minutes during a spontaneous play situation with their mothers that didn't receive any special instructions.

The results were considering regarding each child to allow better analysis of the results of a procedure that included mothers as the communicative interlocutor. The proportion of occupation of the communicative space didn't reveal significant differences between groups while the number of communicative acts produced per minute did. In both groups the gestural communicative mean was the most frequently used. This was the only communicative mean that didn't present significant differences between the groups. The results referring to the interpersonal communicative functions expressed, that is, the proportion of communication interactivity. Although there is a significant difference between the groups, the low proportion of interactive communicative acts in the communication of autistic children is an issue that must be carefully considered.

The analysis of the occupation of communicative space and of the number of communicative acts produced per minute by the subjects of this research shows variations in both aspects. The occupation of the communicative space indicates a certain balance in the mother-child communication. However, when the production of communicative acts is considered in relation to the sample's duration the data about both groups are different, suggesting that the reciprocity between mother and child forms the base from which communication develops. In the first aspect, communicative space occupation, the mother seems to be the agent of the balance.

The difficulties presented by autistic children with the interactive use of communication reinforces the notion that isolated and specific social and cognitive elements evolve together with the linguistic and non-linguistic communication development and there is a mutual interference in the process. The option of conducting the data gathering in communicative situations with the mothers provided a familiar interlocutor that probably allowed each child's best performance. The characterization of the functional communicative profile confirmed the areas of larger difficulties. The presence of large individual differences demands other studies comparing more homogeneous groups.

The interactive situation is a privileged one because each child has his/her own mother as a communicative partner. Knowing the child's communicative needs the mother works as a facilitator to the communication and places the child as the central focus of her attention (at

least during the data gathering period). Prior studies (Chawarska et al, 2007; Clifforf & Dissanayake, 2008; Davis & Crter, 2008; Ruser et al, 2007; Scheeren & Stauder, 2008; Solomon et al, 2008) point out to the mother's important role as a communicative partner to the communication development process and eventually in the assessment processes. The mother represents a preferred partner to the child, determining an affective association that will generate symmetric communication patterns (Wachtel & Carter, 2008; Williams et al, 2005). Mothers use simple, repetitive speech, grammatically and semantically adjusted to the child's understanding and interest levels (Grindle et al, 2009). In this sense, the largest data dispersion referring to the non-verbal children with more than 3 years of age shows how difficult is this process undertaken by the mother, of building a symmetric communication and therefore of building her own role as a communicative partner.

Another research (Benson et al, 2008) studied the communication of autistic children in different contexts and observed variations in the use of the different communicative means according to the communicative partner. According to the authors when the interlocutor is less efficient (in the case of this study, a group situation without an adult's facilitation) the use of redundant communicative means is necessary, and so the gestural means may support what is conveyed by the verbal mean, for example. It follows the same principle identified in the present study.

The analysis of the use of the interpersonal communicative functions provides data about the child's interactive competence and the data presented show the autistic children's impairment in this domain. This observation confirms prior studies (Grindle et al, 2009) that concluded that autistic children are less responsive to interactive attempts and have less spontaneous communication. Other studies (Bara et al, 2001; Davis & Carter, 2008; Laugeson et al, 2009; Reed et al, 2007) report the severe impairment of autistic children in the interactive use of communication to specific functions.

3.2 Communicative profile with unknown interlocutors and materials

The knowledge about ASD children's performance with a trained speech and language therapist but unknown communication partner may provide information about the performance with new partners, adaptation to new situations and eventual generalization of learned abilities to unknown situations. This way of measuring, controlling and standardizing variables of spontaneous production from the therapeutic context to different situations is essential to provide objective data for language assessment and intervention with autistic children.

Therefore, the aim of this study was to determine the communicative performance of individuals of the autistic spectrum in non-familiar situations (with unknown material and communication partner) for a period of 15 minutes of interaction in free-play situations (Moreira & Fernandes, 2010). Subjects were 20 children and adolescents with ASD, with mean age of 9:7 years, were filmed during 15-minute free-play situations with an unknown speech therapist and unfamiliar toys and games and the results were compared to the ones obtained from sessions of free play with the therapists and familiar material.

The comparison of the variables analyzed has resulted in statistically significant differences between the Familiar (FS) and the Non-Familiar (NS) Situations regarding the number of communicative acts per minute and the number of responses, with higher results in the familiar situation.

There were no significant differences in what refer to the communicative means and to the interpersonal communicative functions. Just two non-interpersonal communicative

functions (Play and Non-Functional) were expressed with different frequencies during the different situations.

The comparison between the two different situations has shown few differences between the familiar and the non-familiar situations. The familiarity of the interlocutor and the material seems to interfere very little on the performance of ASD children. However, despite the small differences the familiar situation was the most effective since it has leaded to the occurrence of the largest number of communicative acts per minute and the greatest proportion of responses. Therefore if the aim of the assessment is to identify the best performance of the ASD child, the spontaneous, familiar situation with a known interlocutor seems to be the best alternative.

3.3 Assessment of adolescents in different situations

Another study was conducted, aiming to verify the communicative functional profile and the social-cognitive performance of adolescents with ASD in three different communicative situations: individual speech-language therapy, group activity with and without coordination during a 12 months period and to verify the associations between the results. Five low functioning adolescents with ASD, with ages varying from 12:4 years to 16:3 years, with no previous language therapy were selected. The communicative situations were determined and the communicative contexts varied according to the individual or group activities proposed by the adult or chosen by the subjects. During a twelve-month period two recording sets were performed, initial and final, for each subject. Each recording set was carried out in three different situations, lasting 30 minutes each. Situation I involved individual speech-language therapy; Situation II refers to a group with a coordinating adult (not the speech-language therapist) and in Situation III the group didn't have the adult's coordination.

In what refer to the communicative situations, it was possible to observe that the subjects presented similar communicative behaviors in the three of them. There was an increase in the number of communicative acts, differing only in relation to the average of occurrence, probably due to the dispute for the communicative space in group situations. Initially, the percentage of interpersonal communicative functions was lower in situation III, however in the end of the 12-month period this position was reversed with some participants presenting maximum scores. It is also possible to observe in situation III that the diversity of communicative functions used decreased while in the other situations (I and II) it didn't occur in the same way.

The results demonstrated that the performance throughout the different situations studied during the 12-month period presented variations in all analyzed items. When the functional communicative profile was investigated, the variable number of communicative acts may be once more confirmed as an interesting focus of assessment (Cardoso & Fernandes, 2003; Fernandes, 2003). The decrease of the variability of communicative functions verified in situation III may show the focus on communicative effectiveness, since in the other situations the same participants could experiment and exercise their communicative abilities, but in the situation with a symmetric interlocutor only more effective strategies were appropriate. It was also observed an association between the functional communicative profile and the social-cognitive performance, showing a strict correlation between language and cognitive development (Anderson et al, 2007; Cardoso & Fernandes, 2006; Fernandes & Ribeiro, 2000).

It could be observed that these adolescents seem to understand differences of each communicative situation and are able to adapt to them, changing the functional communicative profile according to the demands. In all situations there were changes in either the functional communicative profile and in the social-cognitive aspects, being possible to verify the association between the participants' performance in these two aspects. It is important to stress that the changes in the performance may be considered interconnected, however nonlinear.

Another aspect that should be considered is that the subjects of this study were low functioning adolescents without previous therapy, and the assessment criteria and instruments were appropriate to this specific group.

4. The use of objective measures to analyze spontaneous language samples

Due to autistic children's characteristics such as lack of social engagement, the use of spontaneous speech samples may provide important information about their functional linguistic performance especially when environmental variables such as familiarity and cognitive demand are controlled. Besides, this method also reflects language use productivity. The use of objective measures to analyze spontaneous communicative samples may lead to important and meaningful results. The Functional Communicative Profile (FCP) may be based on a 15 minute sample of filmed interaction and includes the analysis of the number of communicative acts expressed and the communicative functions they expressed. These communicative functions are divided in more interpersonal and less interpersonal. The FCP also considers the communicative means used to express each communicative act: verbal, vocal and gestural. Among the grammatical measures used to assess spontaneous speech, Mean Length of Utterance (MLU) presents a large number of correlations with other measures and is considered a useful way to assess grammatical abilities.

A more detailed description of these assessment suggestions is presented bellow.

4.1 Functional communicative profile

The communicative acts are the minimal units of analysis in the assessment of the Functional Communicative Profile (adapted from Wetherby & Prutting, 1984). A communicative acts starts when the interaction is initiated and ends when there is a shift on the attention focus or on the communicative turn.

The communicative means used to express each communicative act are divided in:
- Verbal (VE): emissions with more than 75% of the correct form,
- Vocal (V): emission with less than 75% of the correct form and
- Gestural (GE): facial and body movements.

The communicative functions considered (Fernandes, 2004) are 20 alternatives specifically described and that can be divided, according to Fernandes & Galinari (1999) as interactive (or interpersonal) and non-interactive (or less interpersonal):
- Interactive communicative functions: Object Request, Action Request, Social Routine Request, Consent Request, Information Request, Protest, Recognition of Other, Comment, Labeling, Expressive, Narrative, Joint Play, Protest Expression and Showing Of.
- Non-interactive communicative functions: Self Regulatory, Performative, Protest, Reactive, Non-Focused and Exploratory.

4.2 Linguistic complexity

A useful way to assess the linguistic complexity of non collaborative individuals is to analyze the Mean Length of Utterance (MLU) of samples of spontaneous communication. This is not a simple or effortless task but its applicability in several and different contexts, without any specific material, is undoubtedly a great advantage.

The analysis of MLU-w (mean length of utterance in words) identifies the medium number of words per utterance on a sample of 100 utterances. The analysis of MLU-m (mean length of utterance in morphemes) identifies the medium number of morphemes per utterance on a sample of 100 utterances. Obviously in situations where the subject produces very little oral language, the proportional number should be calculated.

Another important aspect to be considered is the need of specific parameters for each language and eventually for different groups, once grammatical differences interfere enormously on the number of morphemes of each utterance, regardless of its meaning (Befi-Lopes et al, 2007).

To the assessment of the Mean Length of Utterance (MLU) the same videotaped therapy sessions used to the analysis of the FCP can be used, providing the necessary 100 speech segments. Singing and delayed echolalia should be excluded from the analysis since they don´t represent the individuals grammatical performance.

The grammatical classes considered usually are: adverbs, adjectives, articles, conjunctions, prepositions, pronouns, nouns and verbs. And the Grammatical Morphemes (GM) can be divided in two sub-groups: GM1 (nouns, verbs and articles) and GM2 (prepositions, conjunctions and pronouns). The total sum of GM1 and GM2 constitutes the Total-MLU. The ratio of MLU-words and MLU-morphemes can also be determined.

4.3 Vocabulary

The analysis of formal aspects of autistic children's communication is still a challenge. Very few studies describe the lexical performance of ASD children and language- or group-specific parameters are also essential in this aspect of the overall language assessment. There are already general normality parameters in Portuguese (Andrade et al, 2000) and one study that analyzed ten ASD children aimed to describe their performance on a vocabulary task involving five semantic categories (clothing, animals, food, transport and household items) and has shown that the ASD children didn't relate to any parameter.

There is a clear need for more studies about the best way to access vocabulary in this population as well as about language- and group-specific parameters. Apparently the use of computer generated images facilitate the children's participation but the answers on a controlled situation do not always express the performance in real communicative situations.

5. Associations between language and communication and other aspects of development in ASD

Considering the associated areas of development, the complete language assessment of ASD children should include information about social and cognitive abilities as well. Therefore, aspects such as social-cognitive performance, social-communicative adaptation and meta-representation should be part of the procedure.

5.1 Social-cognitive performance

It is suggested that the social-cognitive aspects can be analyzed according to the criteria proposed by Molini & Fernandes (2003), adapted from Wetherby & Prutting (1984). The situation to determine the child's best performance in seven domains can vary according to the examiner's intentions and demands:

- Spontaneous situations: have the advantage of allowing repetitions as frequent as needed, but eventually to not include opportunities that demand the best performance.
- Use of pre-determined material: demands some time interval between assessments, but the selected material may facilitate the occurrence of behavior that otherwise wouldn't appear in spontaneous situations.
- Use of a pre-determined set of material and attitudes by the adult: demands a time interval of at least 1 year and sometimes the substitution of some of the material, but prompts behaviors in all the targeted areas.

The analysis identifies the children's best performance in the following areas:

Gestural Communicative Intent (GCI):

1. The child examines or manipulates objects and does not report to the adult.
2. The child expresses emotional reactions to objects/events, including clapping, smiling, making a face and hitting.
3. The child emits signs that are contiguous to the goal, to the child's own body or to the adult's body; the child reports to the adult.
4. The child repeats the same gesture until the purpose is achieved; the child reports to the adult.
5. The child modifies the gesture shape until the purpose is achieved, that is, the child repeats the gesture with an extra element; the child reports to the adult.
6. The child emits ritualized gestures that are not contiguous to the goal, to the child's body or to the adult's body, that is, the same gesture must be used in at least two occasions in the same communicative context to be qualified as a ritual; the child reports to the adult.

Vocal Communicative Intent (VCI):

1. The child vocalizes while he/she manipulates or examines an object or while ignores an object and does not report to the adult.
2. The child expresses emotional reactions to objects/events, including screams, laughs, crying.
3. The child emits vocal signs referring to an object or to the adult; the same sing must be used in at least two different communicative contexts.
4. The child repeats the same vocal sign until the purpose is achieved; the child reports to the adult.
5. The child modifies the vocal sign until the purpose is achieved, that is, the child repeats the gesture with an extra element; the child reports to the adult.
6. The child emits ritualized sounds, that is, the same sign must be used in at least two occasions in the same communicative context to be qualified as a ritual; the child reports to the adult.

Tool Use (TU):

1. The child uses a familiar instrument contiguous to the object as a way to obtain it.
2. The child uses a familiar instrument not contiguous to the object as a way to obtain it.

3. The child uses an unfamiliar instrument contiguous to the object as a way to obtain it.
4. The child uses an unfamiliar instrument not contiguous to the object as a way to obtain it.

Gesture Imitation (GI):

1. The child imitates familiar action schemes.
2. The child imitates complex gestures composed by familiar action schemes.
3. The child imitates unfamiliar visible gestures.
4. The child imitates unfamiliar invisible gestures and reproduces the adult's model in the first attempt when the model is no longer present.

Vocal Imitation (VI):

1. The child imitates familiar vocal sounds.
2. The child imitates familiar words.
3. The child imitates unfamiliar sound patterns.
4. The child imitates unfamiliar words and reproduces the adult's model in the first attempt when the model is no longer present.

Combinatory Play (CP):

1. The child uses simple motor schemes in objects.
2. The child manipulates physical features of the objects.
3. The child relates two objects.
4. The child relates three or more objects without sequential order.
5. The child combines at least three objects with sequential order.
6. The child combines more than three objects with sequential order.

Symbolic Play (SP):

1. The child uses simple motor schemes in objects.
2. The child manipulates physical features of the objects.
3. The child uses conventionally the realistic objects; he/she may or may not use invisible substances, applies the schemes only to him/herself.
4. The child uses miniatures conventionally; he/she may or may not use invisible substances, applies the schemes only to him/herself.
5. The child uses objects conventionally with invisible substances; applies the schemes to him/herself and to others.
6. The child uses one object by the other; applies the schemes to him/her and to others.

Wetherby & Prutting (1984) concluded that autistic children certainly present a delay in the acquisition of social-cognitive abilities and therefore present the behavioral, interactive and communication disorders that are typical of this syndrome.

Autistic children also present individual variations, that is, levels of social-cognitive performance vary within the pathology, but all of them present some kind of communicative intent, wheatear it is expressed by verbal, vocal or gestural means. Therefore it is essential to include these data in the discussions about the SLPs communicative attitudes during language therapy (Molini & Fernandes, 2003). The authors also report that there is a certain point of difficulty in the use of social cognitive abilities. The study has shown that autistic children seem to understand how the world functions but lack the ability to share their knowledge and use it spontaneously in every-day-life situations.

The social cognitive performance scores also clearly indicate associations with functional aspects of communication. Although there isn't a typical developmental pattern of autistic children the existing theories reaffirm the verbal and non-verbal language disorders and their associations with social and cognitive inabilities.

5.2 Social-communicative adaptation

The identification of each child's social-communicative adaptation may provide important information to support clinical decisions about intervention models and focus.

A useful proposal to determine the social-communicative adaptation of ASD children differentiates 4 levels with 4 stages each (Gutstein & Sheely, 2002):

- Level I: Beginner – stages: attuning, social reference, apprentice-guide and social adjustment.
- Level II: Apprentice – stages: variation, adaptation, synchronization and considering others.
- Level III: Challenger – stages: collaboration, co-creation, improvisation and shared perceptions.
- Level IV: Explorer – stages: perspectives, shared imagination, sharing ideas and friends.

According to this proposal the information can be obtained through interviews with parents or teachers or with the use of a questionnaire.

5.3 Meta-representation

The concept of meta-representation or "Theory of Mind" (ToM) describes the ability to assign thoughts and feelings to others with the objective of predicting and explaining behaviors (Frith, 1994).

There are no formal tests of meta-representation and probably the variety of the assessment procedures is the reason of the different results reported in the literature (Sparrevohn & Howie, 1995).

It is suggested that the failures in meta-representations are responsible for the inappropriate behavior of autistic children when interacting with others (Frith, 1994). The development of representational abilities would contribute to the improvement of experience exchanges and role variations (Beatson & Prelock, 2002).

It follows an example of the possible associations between functional communicative profile, social-cognitive performance, vocabulary and meta-representation in ASD children.

Subjects were 20 children between 6 and 13 years (mean age 8.9) and the procedures included the identification of the communicative profile and the best social-cognitive performance, through the analysis of 30 minutes of filmed interaction; the application of an expressive vocabulary test (specially constructed for Brazilian children) and four theory of mind tasks (as suggested by Sparrevohn and Howie, 1995), through the presentation of pictures on a computer screen.

Results involved the comparison of data of all subjects. It was possible to observe that, on most of the subjects, less than half of all communicative acts expressed had interpersonal functions. Children that expressed more interpersonal communicative acts also performed better at meta-representation tasks and social-cognitive abilities; they presented the greatest proportion of verbal use and less episodes of non-designation on the vocabulary test.

The sole comparison criteria in which it was possible to identify strong consistency on the correlation between data is the proportion of use of verbal mean of communication. It was

possible to identify a certain linearity that can be summarized by the notion that "the more verbal the autistic child is, the better his/her performance on the areas of social cognitive development, communicative functionality, lexical development and meta-representation". Individual data analysis, however, points to specific variations and correlations that cannot be overlooked.

Statistical analysis points to significant correlations (at 5%) that can be synthesized as follows:

- Greater proportion of use of verbal communicative means is positively correlated to greater proportion of interpersonal communicative functions expressed, better performance on verbal communicative intent and more usual verbal designations.
- Greater proportion of interpersonal communicative functions expressed is positively correlated to better performances on symbolic play and usual verbal designations.
- Better performance on verbal communicative intent is positively correlated to better performance on tool used and on combinatory play.
- Better performances on gestural imitation and on tool use are positively correlated to combinatory and symbolic play.

Autistic children's difficulties with the interactive use of communication, as mentioned by Stone & Caro-Martinez (1990) could also be observed in this study, since just 35% of the subjects expressed more than 50% of interpersonal communicative functions.

Despite the fact that data involving meta-representation didn't lead to statistical significance, they allow some interesting discussion. For example, although the complete false belief task was the most complex and the one that produced the greater number of wrong answers, it was also the one that generated the smaller number of non-answers. It may be due to the fact that it was the only task on which the material presented was concrete and not pictures, and it may be associated to the ideas of Bara et al (2001) that suggested that these children's difficulties are related to attention deficits that can be reduced by the use of concrete elements.

Data show that, of the 17 subjects that responded to any of the meta-representation tasks, none of them presented the right answer to all the questions. This data agree with the literature that suggests to a great difficulty of autistic children on theory of mind (for example, Frith, 1994; Leslie & Thaiss, 1992; Sparrevohn & Howie, 1995).

In respect to the correlation between the various results, the statistical analysis identified two strong correlations involving the increase on the proportion of use of verbal communication: the decrease on use of gestural communicative mean and the increase of usual verbal designations. This data correspond to the expected, as more verbal communication decreases the necessity of gestures, since for this subjects, the redundancy of communicative means doesn't increases the efficacy of communication. On the other side, various researches suggest that there is no correlation between communicative competency and the morphological abilities of these children (for example: Wetherby & Prutting, 1984; Bara et al, 2001).

The association between social-cognitive performance, functional communication profile and lexical abilities indicated that:

1. better results on vocal communicative intent were associated to greater proportion of verbal expression and less use of gestures, agreeing with the notion that communicative performance tends to be better when there is communicative intent (Carpenter & Tomasello, 2001);
2. better performance on combinatory play was related to less use of vocal communicative mean, a result that can be associated to the fact that both areas involve motor abilities, that can be altered in just some of these children (Mundy & Stella, 2001);

3. better results on symbolic play were related to greater use of interpersonal communicative functions, what seems to reinforce the use of these situations during language therapy with autistic children, as suggested by Gutstein & Sheely, 2002 and larger numbers of usual verbal designations, greater proportions of interpersonal communicative functions expressed and smaller proportions of the use of gestures were associated – this data can be due to the relation between lexical performance and language use, as proposed by Befi-Lopes, 2007.

The relatively small volume of statistically significant results should not lead to the depreciation of obtained data. Careful and detailed individual analysis is essential to the determination of consistent and efficient therapeutic procedures (Koegel, 2000; Wetherby & Prizant, 2001; Greenspan & Wieder, 2001).

Analysis of the aspects of vocabulary and meta-representation in children of the autistic spectrum may provide important information to the determination of therapeutic processes, when related to the functional communicative profile and social-cognitive performance. This data may help on the identification of each child's greater difficulties and better abilities.

6. Conclusion

The purpose of this chapter was to discuss the assessment of various aspects of language, once it is an essential diagnostic feature in ASD. The common impairment observed in individuals with ASD is in the functional use of communication, but MLU and vocabulary should also always be assessed. Specific groups (verbal and non-verbal individuals; children and adolescents) and situations (individual or group, familiar or non-familiar) should be specifically considered. Samples of spontaneous communication may provide data to objective measures of functional communicative profile, linguistic complexity and vocabulary that can be considered in the overall diagnosis as well as in intervention planning. The associations between the functional communicative profile and domains such as social-cognitive performance, meta-representation and social communicative adaptation have also been subject of several studies, as well as the best way to prompt the better performances during testing procedures. The results of these studies may support evidence-based proposals for language therapy with ASD children and the objective assessment of their outcomes.

The language assessment of ASD children may include the use of the protocols and criteria described or others suggested in the literature. Especially when dealing with a non-English speaking population the speech and language pathologist is frequently faced with challenges involving his/her practice consistency. Language assessment criteria, tools and procedures must be strictly adjusted to the language-specific characteristics and group differences and therefore demand careful consideration of weather it is appropriate to specific needs and demands.

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A Comprehensive Book on Autism Spectrum Disorders

Edited by Dr. Mohammad-Reza Mohammadi

The aim of the book is to serve for clinical, practical, basic and scholarly practices. In twentyfive chapters it covers the most important topics related to Autism Spectrum Disorders in the efficient way and aims to be useful for health professionals in training or clinicians seeking an update. Different people with autism can have very different symptoms. Autism is considered to be a "spectrum" disorder, a group of disorders with similar features. Some people may experience merely mild disturbances, while the others have very serious symptoms. This book is aimed to be used as a textbook for child and adolescent psychiatry fellowship training and will serve as a reference for practicing psychologists, child and adolescent psychiatrists, general psychiatrists, pediatricians, child neurologists, nurses, social workers and family physicians. A free access to the full-text electronic version of the book via Intech reading platform at http://www.intechweb.org is a great bonus.

How to reference

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