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Language development in Down syndrome: literature analysis

Desenvolvimento da linguagem na síndrome de Down: análise da literatura

Desarrollo del lenguaje en el síndrome de Down: análisis de la literatura

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Abstract

Introduction: Down syndrome is a genetic condition resulting from the presence of an extra chromosome 21, which can generate several health problems during the development of the subject. One of these changes is the delay in language development and cognition in the child, who presents a greater deficit in expressive language than in comprehension. Therefore, early speech therapy is essential for the promotion of a better communication ability of the subject with the syndrome. **Objective:** This study aims to analyze the national scientific production about the development of language and communication in Down syndrome and early interventions in this population. **Method:** A search of databases of articles, theses, and dissertations was conducted using the "language", "Down syndrome", and "language development" descriptor combination. **Results:** A total of 106 publications were obtained, and their titles and abstracts were analyzed. After this initial analysis, it was identified that 20 studies contemplated the researched topic, and these studies were integrally analyzed. **Conclusion:** It was found that there is a consensus regarding the presence of a deficit in language development in children with Down Syndrome compared to the process of children with typical development; that there is greater use of gestural productions in this population, which may favor lexical acquisition; and that speech-language intervention is effective in language development in Down syndrome.

Keywords: Speech, Language and Hearing Sciences; Language; Language Development; Down syndrome.

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Resumo

A síndrome de Down é uma condição genética resultante da presença extra de um cromossomo 21, que pode gerar diversos problemas de saúde durante o desenvolvimento do sujeito. Uma dessas alterações é o atraso no desenvolvimento da linguagem e cognição da criança, que apresenta um déficit maior na linguagem expressiva do que na compreensiva. Por isso, a intervenção fonoaudiológica precoce é essencial para a promoção de uma melhor habilidade comunicativa do sujeito com a síndrome. Nesse sentido, este estudo objetivou analisar as produções científicas nacionais acerca do desenvolvimento da linguagem e comunicação na síndrome de Down e intervenções precoces nessa população. Para isso, foi realizada uma busca em bases de dados de artigos, teses e dissertações, utilizando a combinação dos descritores "linguagem", "síndrome de Down" e "desenvolvimento da linguagem". Foram obtidas 106 publicações que tiveram seus títulos e resumos analisados. Após essa análise inicial, foi identificado que 20 estudos contemplavam a temática pesquisada, estes foram analisados integralmente. Constatou-se que é consensual a presença de um déficit no desenvolvimento da linguagem, quando comparado com o processo de crianças com desenvolvimento típico; que há um maior uso das produções gestuais nessa população e isso pode favorecer a aquisição lexical; e que a intervenção fonoaudiológica é eficaz no desenvolvimento da linguagem na síndrome de Down.

Palavras-chave: Fonoaudiologia; Linguagem; Desenvolvimento da Linguagem; Síndrome de Down.

Resumen

El síndrome de Down es una condición genética que resulta de la presencia adicional de un cromosoma 21, que puede generar varios problemas de salud durante el desarrollo del sujeto. Uno de estos problemas es el retraso en el desarrollo del lenguaje y de la cognición del niño, con un mayor déficit en el lenguaje expresivo que en la comprensión. Por eso, la intervención fonoaudiológica temprana es esencial para la promoción de mejores habilidades de comunicación de los sujetos con el síndrome. Este estudio tuvo como objetivo analizar la producción científica nacional sobre el desarrollo del lenguaje y de la comunicación en el síndrome de Down y las intervenciones tempranas en esta población. Para esto, se realizó una búsqueda de artículos en bases de datos de periódicos, tesis y disertaciones, utilizando la combinación de las siguientes palabras clave: "lenguaje", "síndrome de Down" y "desarrollo del lenguaje". Se obtuvieron 106 publicaciones que tuvieron sus títulos y resúmenes analizados. Se identificó que 20 estudios contemplaban el tema investigado, éstos fueron analizados en su totalidad. Se encontró que el consenso es la presencia de un déficit en el desarrollo del lenguaje, en comparación con el proceso de niños con desarrollo típico; que esta población usa mas las producciones gestuales y que eso puede favorecer la adquisición del léxico; y que la intervención fonoaudiológica es eficaz para el desarrollo del lenguaje en el síndrome de Down.

Palabras claves: Fonoaudiologia; Lenguaje; Desarrollo del lenguaje; Síndrome de Down.

Introduction

language development is a continuous process and subject to variations, in which change in the child's state from no form of linguistic expression to appropriation of the language of the child's community can be observed. Studies in this area can be focused on both the process of the language acquisition of children considered to have typical development (TD) and some organic, social and educational condition that may interfere in the development of the child.

One of these conditions is Down syndrome (DS), a chromosomal disorder generated by the presence of an extra chromosome 21 in the subject's cells, which causes a specific set of physical, clinical, and mental manifestations that can affect individuals of different races, ethnicities, and socioeconomic conditions[1].

To date, the causes that would lead to the birth of a baby with the syndrome are not defined. However, the main risk factor for DS is advanced maternal age, with an exponential increase in the incidence of DS in mothers from 35 years of age,

reaching 1 case for every 30 live births in mothers over 45 years of age. However, this factor does not rule out the possibility of incidence of the syndrome in infants of younger mothers[1].

Studies show that DS causes changes in children's language acquisition, particularly in the development of expressive verbal language, which has repercussions for social communication, and verbal comprehension associated with gestural expression is a developed area[1-3].

Two hypotheses can explain this difference between oral production and comprehension of children with DS: the first relates to the difficulties in the motor planning necessary for speech control, and the second relates to short-term memory deficit, which would make it difficult to retain immediate information[4].

The delay in language development in children with DS can occur due to multiple factors, such as the cognitive and neurological changes inherent to the syndrome; a lack of adequate stimuli during mother-infant interaction; a delay in neurological and psychomotor development; respiratory, heart, and hearing problems; and changes in the stomatognathic system[3].

Thus, speech-language intervention is an effective aspect in promoting the language development of children with DS, and the earlier this intervention is initiated, the greater the potential of the therapeutic process.

Thus, for the construction of an effective speech-language intervention aimed at children with DS, it is important to know the characteristics of the development of this population and other findings relevant to the professional's performance. Therefore, this study aims to conduct a survey of the national scientific production about the process of language development and the communication of children with DS as well as interventions in this period.

Description

To characterize national research on the process of language acquisition in DS, a survey of articles, theses, and dissertations indexed in the Lilacs, SciELO, and Periódicos da CAPES databases was conducted. For the survey of this research, the "Down syndrome", "language", and "language development" descriptor combinations were used.

The study summaries were then read to identify whether they included the inclusion/exclusion criteria of the present research and to eliminate duplicate publications. The inclusion/exclusion criteria adopted were a) being national studies available in the databases searched; B) addressing aspects of the linguistic, communicative, and symbolic development of children with DS and of interventions in this population during this specific phase; (C) being national studies available up to the year 2015; and D) being original article or case studies. After this initial analysis, the studies that met the criteria were directed to a more in-depth analysis of the complete texts.

In the initial search, 106 productions were obtained, with 32 being theses and dissertations and 74 being articles, and after the analysis of the inclusion criteria of the research, 20 studies were obtained, which were directed to the integral analysis of the content, with seven being theses and dissertations and 13 being articles (Figure 1).

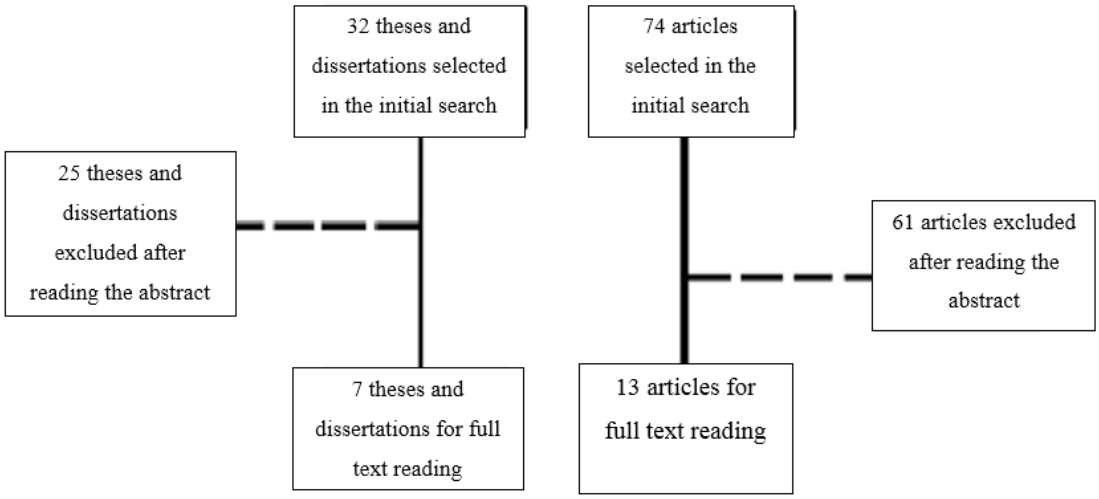

Figure 1. Synthesis of the selection process of the studies for analysis

In this analysis, the following information was obtained in the thesis and dissertations (Table 1) and articles of periodicals (Table 2): the purpose of the study, the methods used to collect the data, and the main results obtained.

Language development in DS is a subject that is little discussed, considering that only 20 studies – 13 articles and seven theses and dissertations – were selected from a total of 106 publications. The scarcity of research on this subject is worrisome because publications of scientific studies are the most used resource to legitimize and register the advancement of knowledge, with the journal being the most used means for this type of publication[5].

The performance of analyses such as that presented above is essential so that it is possible to evaluate the quality of knowledge in certain areas to increase the resources that promote research and scientific production in our country[6].

In addition, when analyzing the studies by concentration area, we observed that: of the seven theses and dissertations, five were from health sciences programs, mainly from Speech Therapy, one was from a psychology program, and another was from linguistics. Of the 13 articles analyzed, nine were published in audiology journals, three in education journals, and one in a psychology journal.

The area of linguistics was that which contained the least publications on the subject. No article in this area was found in the databases, which can be explained by two hypotheses: 1 - this is a topic that is still little discussed in linguistics; and 2 - linguistics has fewer periodicals indexed in the databases than other areas because it has a greater tradition of publication of studies in books.

It was also verified that speech therapy was the area that conducted the most studies on the subject of language acquisition and DS because understanding these aspects helps promote more evidence for the clinical performance of the human communication professional.

It was observed that there is a preference for performing language evaluations in this population and comparing the results of this population to those of children with TD. Few studies have evaluated the therapy of children, evaluating the influence of the therapeutic process for the language development of the subject. In these studies, it was found that therapy benefits the language development of the child with DS and that all moments of the session are important to ensure a good result, which highlights the importance of good therapeutic planning.

A study that aimed to analyze the production of knowledge in communication disorders from 2000 to 2005 observed that studies aimed at performing evaluations were more frequent in articles on speech-language pathology[5].

It was also verified that the studies confirm that children with DS present a deficit in linguistic development compared to children with TD. It was observed that children with DS have a greater

Table 1. Research on language development and communication in Down syndrome – theses and dissertations

Research in Theses and Dissertations			
Study	**Objectives**	**Method**	**Main results**
IEVY, 1988[12]	To analyze the dialogic relationship established by a child with DS in therapeutic sessions.	Observation and filming of speech, physical, and occupational therapy sessions.	– The therapist's dialogical relationship with the child was not effective because the speech of the therapists was observed to contain the presupposition of a not very capable partner and the expectation of a language rich in forms, rules, and verbal products, to the detriment of very frequent and low valued alternative resources – gestures, laughter, and expressions.
PRIETO, 2002[13]	To evaluate the development of the behavior of the child in the first year of life in Brazilian children with DS.	Application of the Scale of Development of Child Behavior in the First Year of Life (PINTO, VILANOVA, VIEIRA, 1997) from January 2000 to June 2001.	There was no difference in behavioral development between the group of children with and without associated clinical situations, which could be explained by early diagnosis and treatment. The boys presented a significantly greater delay of the spontaneous communicative axial behavior (sound emission, repetition of words) and spontaneous non-communicative appendicular (fine motor coordination) behavior.
CALÇADA, 2004[14]	To investigate the development of language in individuals with DS, evaluated in the Fernandes Figueira Institute (Instituto Fernandes Figueira – FIOCRUZ) during the 1999-2001 period.	Evaluation of subjects based on the following instruments: the Preschool Language Scale (PLS-3), Developmental Diagnosis – Gesell, the Gesell Preschool Test (GPST), and the Peabody Picture Vocabulary Test (PPVT).	Up to two years of age, the language developed approximately according to chronological age. However, from this age onward, this difference increased significantly, and all individuals over two years of age presented with severe language disorder.
ANDRADE, 2006[15]	To verify in the child with DS: the emergence of oral language and its relationship with verbal communication; the evolution of gestures and their qualification; and the effectiveness of speech therapy in language development.	All subjects were evaluated three times over a 12-month period: initial, at six months, and at 12 months. In addition, after the initial evaluation, the children began to be seen weekly by the speech therapist researcher for a period of 12 months.	– In the child with DS, gestures developed before oral language but took longer. – Children with DS who presented simultaneous oral language and gesture communication decreased the number of gestures as they expanded their vocabulary. In turn, others expanded the quantity and variety of gestures to the detriment of oral language development.
MELO, 2006[16]	To investigate the development of the mother-baby communication system in dyads in which the child has DS.	– Interview with each mother to learn the story of the child. – Filming of the interaction of the dyad from three months to one year of age of the child through weekly monitoring in a laboratory situation.	– The dynamics of communication system development of the mother-infant dyad containing a child with DS was found to be different from that observed in dyads with a baby with TD. – A pattern of interaction marked by the mother's directivity and the responsiveness of the baby was found, observing a mutual adaptation between the partners, to stimulate the baby and help him engage in the communicative process. – The evolution of the system requires changes in this pattern over time, so that the mother's attitudes are continuously attuned to the baby's needs.

Research in Theses and Dissertations			
Study	**Objectives**	**Method**	**Main results**
FERREIRA, 2010[17]	1. To verify and analyze the receptive and expressive vocabulary performance with DS; and 2. To compare the receptive and expressive vocabulary performance of children with DS and children with TD, mental age, and paired sex.	– Evaluation of children based on the inventory of the development of MacArthur Communicative Development - First words and gestures; – Observation of communicative behavior in semi-directed filmed situations, in which the participants had a session with playful and interactive activities. – Application of the Peabody Picture Vocabulary Test (PPVT), the *ABFW* Child *Language Test -Vocabulary Part B,* and the Denver II Developmental Screening Test	- It was found that children with DS present inferior performance in receptive and expressive vocabulary, with distinctions in their response patterns, compared to the performance of children with TD.
FLABIANO, 2010[18]	Study I 1. To characterize the process of the constitution of representation in children with DS; and 2. To investigate the relationship between cognitive development and oral language development in children with DS compared to children with TD.	– The participants were submitted to monthly filmed sessions of observation of cognition and expressive language according to the *Protocol* for *Expressive Language* and *Cognitive Development Observation* - revised version (PELCDO-r)	– Children with DS go through the same stages of cognitive development observed in TD but have a slower pace; – The constitution of the representation and the beginning of expression through oral language were found in both groups, but the children with DS present less linear correlations due to the lower diversity and complexity of the verbalizations produced.
	Study II 1. To characterize the process of expressive language development in the child with DS; 2. To investigate the relationship between the use of gestures and the emergence of oral language in the child with DS; and 3. To investigate the transition process of gesture and word combinations for two-word combinations in children with DS.		– Differences were found in relation to the diversity of the verbalizations produced between the groups at the end of the observation period; – The gesture and word combinations preceded and were predictive of the emergence of two-word combinations in both groups, but children with DS presented difficulties in this process.

Table 2. Research on language and communication development in Down syndrome – journal articles

Research in articles			
Study	**Objectives**	**Method**	**Main results**
SILVA; SALOMÃO, 2002[19]	To analyze the interactions between mothers and children with DS and between mothers and children with TD, emphasizing the communicative aspects.	– Filming of the interaction of dyads in the context of play in their homes.	– To help their children perform activities, the mothers of children with DS used physical contact more than the mothers of children with TD; – Children with DS responded less to verbal requests from their mothers than did children with TD.
LAMÔNICA et al., 2005[20]	To evaluate the semantic performance of the language of children with DS.	– Anamnesis with the mothers; – Application of a questionnaire to the mothers about the comprehension of the vocabulary of their children.	– As age progressed, there was an improvement in the children's verbal emission during the evaluation. – The mothers' responses to the communicative performance of their children were consistent with the results of the evaluations.
SILVA; DESSEN, 2006[21]	To describe some of the dimensions of the parental relationships of families with children with DS and those with children with TD.	– Filming of the interaction of the triads in their homes, in contexts of free activities.	– The most frequent activities were situations of games with objects. In the DS triads, there was a high frequency of socialization and storytelling activities. – The activities of the triads with TD became more synchronous and friendly (in relation to the dynamics of the family interaction) as age advanced, which was not observed in the DS triads, which remained stable and at a lower level.
ANDRADE; LIMONGI, 2007[3]	To qualitatively and quantitatively study the different forms of communicative expressions in children with DS.	– All children were evaluated three times: at the beginning of the study, after six months, and after 12 months; – Four children with DS participated in 40 therapeutic sessions.	– In the three evaluations, the children with TD changed from the use of gestural communication (GC) to simultaneous oral language and gestural communication (linguagem oral e comunicação gestual simultâneas – LOCGS) until they used only oral language (OL); – In the DS group that underwent speech therapy, half evolved from GC to LOGCS and the other half continued in GC, making use of greater gestural variability; – The DS group that did not go through the therapy performed similarly to the group that participated in the therapy but in a slower and more delayed manner.
PORTO et al., 2007[22]	To identify the timing and footage of the interaction situation best suited to perform the pragmatic analysis of children with DS.	– Footage of a 30-minute interaction between therapists and children; – Analysis of the dyads throughout the video, in the initial 10 minutes, in the middle 10 minutes and in the final 10 minutes.	– No difference between the form of interaction of the dyads in the analysis periods of the videos was observed. – Any time and moment can be used to analyze the communicative profile of individuals with DS, without prejudicing the quality and reliability of the data.
PORTO-CUNHA; LIMONGI, 2008[2]	To verify the performance of children with DS regarding the communicative mode (verbal, vocal, and gestural) used in the spontaneous interaction with an adult in a play situation.	– Filming of children's play situation with caregivers and therapists.	– Children aged two to six years and five months used more gestural means to communicate; Children over the age of six and a half used verbal means more; – In play with the caretaker, there was a greater balance between the means of communication; Additionally, in the play with the speech-language pathologist, the gestural means were deprecated in all ages.
BELINI; FERNANDES, 2008[23]	To investigate the development of gaze and eye contact in a baby with DS.	– Filming of the interaction of dyads in a family context during the first five months of the baby's life.	– The development of gaze and eye contact in a baby with DS occurred in a manner similar to those with TD, with the evolution of the frequency of gaze to different targets according to age.

Research in articles			
Study	**Objectives**	**Method**	**Main results**
FLABIANO; BUHLER; LIMONGI, 2009[2]	To describe the cognitive and expressive language development of a child with DS and his twin.	– Subjects were followed for 12 months in biweekly 45-minute sessions, and data were recorded monthly on video.	– DS and prematurity associated with very low birthweight are conditions that have negatively interfered with the cognitive and expressive language development presented by the pair of twins studied.
ANHÃO; PFEIFER; SANTOS, 2010[25]	To verify and analyze the social interaction of children with DS and children with TD in the regular network of early childhood education.	– Filming of children in situations of social interaction in the school that they attended.	– Social interaction mediated by the verbal and nonverbal language of children with DS did not differ significantly from that presented by children with TD. – Children with TD established initial contact with others more frequently than those with DS. - Children with DS experienced greater mocking of other children than those with TD.
CICILIATO; ZILOTTI; MANDRÁ, 2010[26]	To characterize the symbolic abilities of a group of children with DS.	– Interaction footage between therapists and children; – Evaluation of children based on the Behavioral Observation Protocol.	– Delayed development of the symbolic abilities of children with DS.
SILVA et al., 2010[27]	To verify the emergence of simple and combined symbolic schemes and their respective subtypes in very low-weight premature children, children with DS, and children with TD.	– Initial assessment of all children, followed by six observation sessions (filmed) of the children handling and interacting with different objects.	– Children with DS and premature infants with very low birth weight presented a delay in the emergence of symbolic abilities.
FERREIRA; LAMÔNICA, 2012[28]	To verify the lexical, receptive, and expressive performance of children with DS and to compare it to the lexical performance of children with TD paired by gender and mental age.	- Evaluation of the receptive and expressive vocabulary of children using the Peabody Picture Vocabulary Test (PPVT) and the ABFW Child Language Test - Vocabulary Part B.	– The receptive and expressive lexical performance of children with DS was found to be lower than that of children with TD, even when matched by mental age.
LAMÔNICA; FERREIRA-VASQUES, 2015[29]	To verify the expressive communicative and lexical performance of children with DS and to reflect on how the understanding of interfering factors in the learning process can contribute to a better adaptation of these children in the school environment.	– Interview with family members, observation of communicative behavior, and the *ABFW* Child *Language Test -Vocabulary Part B*.	– The expressive lexical and communicative performance of children with DS was lower than that of children with TD, particularly in the following categories: production of words and phrases, narratives, and adequate attention time. – Children with TD used the verbal designation more frequently, and those with DS used the gestural designation.

preference for the use of gestures to communicate and that they can use different types of production according to their interlocutor and context. According to one of the studies analyzed[2], young children with DS prefer the use of gestures and make greater use of them in more atypical contexts of interaction.

In addition, studies on symbolic skills in this population are emphasized because they reinforce the need to assess and intervene early so that these abilities, which are considered predecessors of social development and language, of children with DS are potentiated and some difficulties and lags are overcome or minimized[26-27].

Accordingly, it is necessary to conduct further studies on language development in DS because they can provide more evidence for the promotion of family orientations and clinical and educational practice for professionals who address these subjects, particularly the speech pathologist.

Early speech-language stimulation aims at the development of brain structures that will favor the performance of psychomotor activities and their improvement, which occurs gradually. Stimulation of the motor, sensorial, and speech functions[7] contemplates this intervention in DS, thus promoting brain plasticity and adaptive capacity/ability to modify the structural and functional organization

of the central nervous system, and is influenced by the quality, duration, and the form of stimulation that the individual receives to develop himself.

Thus, the early stimulation of language in DS is crucial to promote spaces for the cognitive-linguistic development of the child because the speech-language pathologist will develop contextualized language practices that are sensitive to the conditions of the child with DS and that favor the pre-verbal and verbal development of symbolism, reading, and writing, thus facilitating the social, educational, and occupational insertion of the subject with DS.

It is also important to maintain a good relationship with the families of children with DS and that there is mutual feedback on the child's behavior in the therapeutic process and in the other spaces in which he circulates because it is verified that the child can use different communicative resources in each context.

In addition, it is interesting that the child's linguistic production be stimulated considering all communicative modes. Gestures and speech should not be conceived of as antagonists during the development of language, and during the child's communication, they are part of the same matrix of linguistic production, meaning, and representation; thus, they must be worked on together in the speech-language clinic.

The presence of gesture in the interactions of children with DS, during language development, promotes the presence of oral production because gesture and speech come from the same linguistic matrix[30]. This, in the long term, will promote the increase of the lexicon[9-10].

Therefore, gestural productions should be stimulated in early stimulation programs, aiming to improve the interactive skills of children with DS[11], to enable children's communication to be effective even before oral language emerges.

Final considerations

Language plays an essential role in the life of any subject. In its various modalities, it helps in the interaction with the other and in the insertion and participation of social activities and practices, among other possibilities. Thus, studying the development of the language of children with DS favors the scientific growth of an important period that is subject to several intrinsic alterations to the syndrome to cultivate educational, clinical, and social practices with this population.

From the survey on the production of national knowledge about language development in DS, 20 studies were found on this topic, which signaled some implications:

Children with DS have a deficit in the development of language and symbolism; however, there is an evolution of these aspects with the advancement of age and with speech-language stimulation. Thus, early speech therapy is important to favor optimal linguistic and cognitive development.

There is a predominance of the use of gestures in the process of language development, and preference for the use of gestural productions in atypical contexts and verbal productions in contexts that are familiar to the child is observed. Therefore, it is important to stimulate language and promote all types of linguistic production so that the subject with DS becomes a more autonomous and participatory communicator in any environment into which he enters.

There are no differences between the social interactions of children with DS and with TD, but those with DS have more difficulties in establishing initial contact. Therefore, it is necessary to adjust the dialogic activity to guarantee the interaction of the child with DS. Thus, their interactional subjects should be concerned about this and think of strategies that facilitate this process.

Children with DS have more difficulties responding to verbal requests only. Thus, subjects in interaction with the child with DS should use varied forms of communication, not only verbal forms, to promote a better understanding by the individual with the syndrome.

The interaction between the family and the child with DS tends not to improve with the advancement of age. Therefore, the speech therapist should guide the families and caregivers of the subject with DS, providing explicit subsidies and instructions that favor the improvement of family-child interaction and the continuity of speech-language intervention in the family environment.

Therefore, it is essential to conduct more scientific research that culminates in publications that address language development in DS, aiming to strengthen the action of the speech-language pathologist with this population to provide better communication, social participation, and quality of life to these subjects.

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