Influences of the Parent-Child Relationship on the Severity of Symptoms in Children with Apraxia of Speech

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Abstract

Childhood apraxia of speech (CAS) is considered an impairment of motor control in speech or praxis. Most researchers agree that the basic deficit for children with CAS is a reduced or degraded ability to convert abstract phonological codes into motor vocal commands, called motor planning and/or programming. The objective of our study is identifying possible differences in the severity of symptoms in children with apraxia of speech depending on the dynamics of the parent-child relationship (conflict, positive aspects and dependency). To achieve this objective, questionnaires were developed and administered to parents of children with CAS. The results revealed statistically significant differences, $p<0.05$. Our results can be used within complex intervention programs.

Keywords:

childhood apraxia of speech; children; clinical profile; severity of symptoms; parents-children relationship.

Introduction

Childhood apraxia of speech has been associated with a wide variety of diagnostic descriptions and has been shown to involve different symptoms during successive developmental stages (Maassen, Nijland,

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& Terband, 2010). There is ongoing debate about the clinical features and precise origin of this condition in children, but researchers and clinicians agree that it is primarily a motor speech disorder with a central deficit in the planning and/or programming of the spatiotemporal parameters of movement sequences (American Speech-Language-Hearing Association [ASHA], 2007; Hall, Jordan, & Robin, 2007; Maassen et al., 2010; Shriberg, 2010). Several hypotheses have been put forward regarding the predictive factors of verbal apraxia in children. The first is that speech normally develops in interaction with other psycholinguistic and cognitive functions (Locke, 1994), and the speech of a child with apraxia of speech may present different clinical manifestations and features during speech development (Maassen, 2002; Maassen et al., 2010). Not only are verbal-motor and phonological skills closely related to the severity of the symptomatology of this condition, but other functions such as verbal short-term memory, attention, and general motor planning skills also show interactions with impaired speech functions in childhood verbal apraxia(Anghel et al., 2023; Budisteanu et al., 2022; Kvetenska & Myska, 2017; Lincă, 2019; Lincă & Matei, 2023; Rad et al., 2022)**.** For example, it has been shown that the efficiency of speech encoding influences verbal short-term memory and that auditory short-term memory is a prerequisite for speech (e.g., Bishop, 1997). In addition, deficits in the storage and retrieval of speech representations, in addition to those in planning/programming and representation/encoding, have been demonstrated in children with CAS (Shriberg, Lohmeier, Strand, & Jakielski, 2012), and a recent series of studies has found that in several generational families with a history of CAS, affected members exhibit a central deficit in sequential processing (Button, Peter, Stoel-Gammon, & Raskind, 2013; Peter, Button, Stoel-Gammon, Chapman, & Raskind, 2013; Peter, Matsushita, & Raskind, 2012; Peter & Raskind, 2011). A second argument for looking beyond the functions of speech in studies of childhood apraxia of speech is the growing body of neurobehavioral and neurophysiological evidence that "cognition exerts powerful influences on motor control, such that speech or any motor behavior is best viewed as a cognitivemotor achievement" (Kent, 2004, p. 3). Parents play an important role in the healthy development of children. Among the responsibilities of parents is to

guide their children in establishing an adaptive and protective system for their children's talents and potentials. Parents must also develop their children's talents, ensure the necessary socialization appropriate to their children's chronological age, help their children meet their needs, establish a physical and mental environment necessary for the family's well-being, and establish effective communication with their children (Akbaba, 2010; Karaca & Sarı, 2017). In order to develop a positive self-perception among children, it is important for family members to have good relationships with each other and for parents to have a soothing and tolerant approach towards their children (Körükçü, 2004). Considering all of the above, there is a need for a comprehensive study that takes into account both personal and environmental factors in an attempt to explain the emergence of different levels of severity of apraxia of speech symptomatology.

Research methodology

Objectives and hypotheses

Based on the predetermined goal, we formulated the following research objective:

O1. Identifying possible differences in the severity of symptoms in children with apraxia of speech depending on the dynamics of the parent-child relationship (conflict, positive aspects and dependency).

To achieve the objective, the hypothesis was formulated:

I1. It is assumed that there are statistically significant differences in the level of severity of symptoms of children with apraxia of speech depending on the dynamics of the parent-child relationship (conflict, positive aspects and dependency).

Sample

30 parents and 30 children with apraxia of speech, diagnosed by a pediatric neurologist, from Pitești were selected, whose demographic and/or clinical characteristics are described below.

The 30 parents were between 31 and 45 years old, with a mean age of 38.6 years and a standard deviation of 4.2. 25 had higher education, and 5 had secondary education, 19 were male and 11 were female. 27 of the participants worked in the real field and 3 in the socio-humanistic field.

The children diagnosed by the pediatric neurologist with apraxia of speech were between 5 and 6 years old, with a mean of 5.1 years and a standard deviation of 1.66. All participants were male.

12 of the children are severely affected, 7 of them have a moderate degree of severity of symptoms of verbal apraxia, and 11 are mildly affected.

Regarding the level of development of general motor skills, most of the participants had 33 delayed motor skills (11 participants) and 7 delayed skills (12 participants), 12 delayed motor skills (8 participants) or 11 delayed skills (7 participants). 8 of the children diagnosed with apraxia of speech in our sample developed normally from a motor point of view, managing to correctly perform 31 items, and 4 participants solved 33 items correctly.

Visual attention developed well below the expected level for 7 of the participants, below the expected level for 7 participants, borderline for 16 participants.

Auditory attention and visuomotor precision developed well below the expected level for 11 of the participants, below the expected level for 7 participants, borderline for 12 participants.

Comprehension of instructions developed well below the expected level for 14 of the participants, below the expected level for 4 participants, borderline for 4 participants, and at the expected level for 8 of the participants.

Phonological processing developed well below the expected level for 11 of the participants, below the expected level for 3 participants, and borderline for 16 participants.

Phonemic hearing developed well below the expected level for 11 of the participants, below the expected level for 15 participants, and borderline for 4 participants.

Working memory developed well below the expected level for 11 of the participants, borderline for 11 participants, and at the expected level for 8 of the participants.

Instruments

Severity of symptoms was assessed using the Dynamic Evaluation of Motor Speech Skill (DEMSS) scale described below (Strand et al., 2013).

Overall Articulatory Accuracy Score

0 = Immediate correct repetition.

1 = Immediate (no fumbling; trial and error); accurate speed and movement, but consistent error. Must have normally acquired vowels, and developmental substitution error should be consistent and predictable (e.g., f/t; w/r; w/l). This does not include a final consonant deletion (or any sound deletion), which should be indicated. Score children with phoneme collapse (using one or two sounds to represent most substitutions) as 1, as this represents a consistent error. Of course, if the child also exhibits vocal distortions, fumbling, or other errors, it will be a 2, 3, or 4.

2 = First attempt incorrect.

Score a 2 if the child is able to produce the word after an additional model of the item (the clinician draws attention to the therapist's face and provides the model slightly more slowly). Also score a 2 if the child gets the correct response on the first attempt, but with more time or more fumbling and/or trial-and-error behavior.

3 = Needs cues, such as slow, simultaneous production, and/or gestural or tactile cues (correct in three or four additional attempts). Do not exceed four attempts with cues.

4 = No correct response with repeated attempts.

5 = Refusal/inattention/no attempt.

Vowel Scoring—Score on First Trial Only

0 = Immediate correct repetition of the vowel in that co-articulatory context

1 = Mild distortion

2 = Severe distortion

Always score the vowel on the first trial. If a word has two or more vowels (e.g., banana), score the vowel in the stressed syllable. If the child self-corrects on the first trial, without prompting from the clinician, score the self-correction.

Prosody (lexical stress) Score—Score on First Trial

0 = Correct prosody

1 = Incorrect prosody (lexical stress errors such as segmentation, equal stress, or misstress).

Use appropriate lexical stress as a model, especially for sections where prosody is scored (e.g., do not segment syllables or use equal stress in an effort to achieve better accuracy). The stressed syllable is bold.

Consistency score
0 = Consistent
1 = Inconsistent
When scoring consistency, have the child repeat the statement in succession, without intervening on the test items. If any two responses during the cue are different, then it is an inconsistent score. Use a 0 for consistent and a 1 for inconsistent.
The severity of the symptoms can be scored from 0 to 8 and can be in the ranges: 0-2p (severe), 3-4p (severe), 5-6p (moderate), 7-8p (mild). Therefore, we can score on a 4-point scale, where 1 represents severe severity and 4 represents mild impairment.
This grid was translated by 3 specialists in the fields of speech therapy, pediatric neurology and pediatric psychiatry, then it was given to a translator. Based on the translator's observations, changes were made in such a way that all methodological provisions were respected. A consensus was reached by comparing all the variants and taking into account the translator's observations.
The parent-child relationship was assessed by applying the Child-Parent Relationship Scale (Pianta, 19992). This questionnaire includes 3 subscales (Conflict, Positive Aspects and Dependence) with predefined answers from 1 - total disagreement to 5 - total agreement. A total score can be calculated, but also a score for each subscale separately.
The total score can take values between 30 and 150, in the following ranges 30-70 low score, 71-110 medium score and 111-150 high score.
For the Conflict subscale the scores take values from 14 to 70, where scores in the range 14-32 are low scores, 33-51 are medium scores, 52-70 are high scores.
For the Positive Aspects subscale, scores from 12 to 60 are recorded in the ranges: 12-28 low scores, 29-44 medium scores, 45-60 high scores.
For the Dependence subscale, scores can range from 4 to 20, where a score in the range 4-9 represents a low score, a score between 10 and 14 represents a medium score, and a score between 15 and 20 represents a high score.

The reliability index of this scale was equal to 0.89 at validation, and the test-retest index had a value of 0.77, which is why we also use this instrument in our research.

Data collection procedure

The questionnaires were distributed to parents online via the Google Form. Before these scales were disseminated, the researcher together with 3 other specialists in the field of speech therapy and pediatric neurology independently translated the scale and then agreed on a final version of the document. At the same time, a translator adapted the scale to the specifics of the Romanian language, then, based on his observations, the final form found by the specialists was revised.

After all this, the questionnaire together with the informed consent were disseminated online, to groups of parents with children with special needs throughout the country.

On the other hand, at the level of Pitești, children with apraxia of speech were selected from the office where the researcher works. Before these children were tested, their parents were asked for their consent through informed consent.

It should be noted that the research complied with all national and international ethical provisions in force, that none of the participants' lives were endangered, and that no personal data such as: name, surname, address, CNP was collected.

Analysis and interpretation of the research data

I1. It is assumed that there are statistically significant differences in the severity of symptoms of children with apraxia of speech depending on the dynamics of the parent-child relationship (conflict, positive aspects and dependency) is supported by the collected data.

The Kruskal Wallis test indicates:

- Conflict ($W=23.24$, $p<0.05$);
- Positive aspects ($W=3.38$, $p<0.05$);
- Dependence ($W=7.40$, $p<0.05$) (Table 1).

Tabel 1 *Test Kruskal Wallis*[a,b]

	Dependence	Positive aspects	Conflicts
Chi-pătrat	23,246	3,387	7,401
df	2	2	2
p.	,0001	,047	,025

a. Kruskal Wallis Test
b. VI: severity of simptoms

For a clear picture, we also analyzed tables 2 and 3. Thus, we can see that for the conflict variable, the minimum value is 36 and the maximum is 55, for the positive aspects variable the maximum and minimum values are 9 and 52 respectively, and for the dependency variable, the maximum and minimum values are 9 and 20. The severity of the symptoms takes values between 2 and 4.

Tabel 2 *Descriptive statistics*

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles 25th	50th (Median)	75th
Dependence	30	15,63	3,023	9	20	13,00	15,00	19,00
Aspecte pozitivPositive aspectse	30	34,23	12,005	9	52	31,00	36,00	42,75
Conflict	30	45,70	5,046	36	55	42,00	46,00	49,50
Severity ofsymptoms	30	2,97	,890	2	4	2,00	3,00	4,00

Regarding the level of conflict, positive aspects and dependency in the parent-child relationship with apraxia of speech, the table below shows that the dynamics change depending on the increasing severity of the symptoms.
Thus, regarding conflict, those with moderate severity have the lowest predisposition to conflict, followed by those with mild and then severe symptoms (means being equal to 12.07, 12.25 and 21.23).
Regarding the positive aspects, children with mild symptoms have a very good relationship with their parents, and they are followed by those with moderate symptoms and those with severe symptoms (means being equal to 18.33, 16.57 and 11.73).

The degree of dependency is higher depending on the increasing severity of the symptoms. Thus, the less affected a copy paste is, the more autonomous it will be (the averages being equal to 7.5, 14, 29 and 25) (Tables 3).

Tabel 3 *Ranks*

	Severity of symptoms	N	M Ranks
Dependence	2	12	7,50
	3	7	14,29
	4	11	25,00
	Total	30	
Positive aspects	2	12	18,33
	3	7	16,57
	4	11	11,73
	Total	30	
Conflict	2	12	12,25
	3	7	12,07
	4	11	21,23
	Total	30	

Conclusions

In this study, we aimed to verify the existence of relationships between environmental and personal factors to explain the severity of symptoms in children diagnosed with apraxia of speech.

All objectives were achieved, while also noting that depending on the level of impairment, these children adapt more easily or more difficultly to the various contexts they face, and the parent, knowing that they have a child with special needs, hyper-protects him.

In conclusion, the results of the present study indicated a deficient development of complex sensory-motor functioning and sequential memory in the group of children with CAS, which was significantly correlated with the severity of symptoms. In addition, children with CAS presented a delay in the development of other cognitive functions. These results suggest that CAS involves a complex of symptoms that not only encompasses errors in sequencing speech movements, but also entails comorbidity in non-verbal sequential functioning in most children with CAS.

In order to maintain a relationship with as many positive aspects as possible, parents should teach their children to be autonomous. In

addition, this fact re-educates the degree of conflict between parent and child, and the latter will learn in a concrete way what adaptation to all levels of life entails.

The originality of this study lies not only in the validation of an essential scale in identifying environmental factors closely related to apraxia of speech, but also in identifying personal factors that would be directly involved in explaining the occurrence of the degree of impairment given by the severity of the symptoms of apraxia of speech in children.

A possible limitation of the study would be the small number of participants due to the rarity of this condition, but also the conduct of the research project during the pandemic, when restrictions prevented travel and therapies.

A possible future direction in research would be to conduct longitudinal studies to reveal the predictive factors of the severity of the symptoms of apraxia of speech in children.

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