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Risk Factors for Speech-Language Pathologies in Children

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Abstract

Risk factors are understood to encompass “aspects of individual behavior or lifestyle, environmental exposure, hereditary or congenital characteristics that are associated with a health related condition”. These are conditions that increase the chances of the child presenting speech-language disorders and that can be avoided, controlled, or treated. Risk is defined as the chance of a child exposed to certain factors (environmental or biological) to acquire or develop speech-language disorders. The objectives of the present study were: to identify the risk factors for speech-language disorders in children up to five years of age and to verify the relationship between risk factors and speech-language diagnostic hypotheses. The aspects of being male gender, prematurity, shyness, being an only child or youngest child, presenting deleterious oral habits, having a family history of speech-language disorders, and use of licit or illicit drugs during pregnancy seem to be the factors that should draw the attention of the health professionals in child development. Therefore, the monitoring of children who have these risk factors should be performed in order to promote the necessary stimulation and the construction of healthy environments.

Keywords: risk factors, language development, child development, language development disorders, speech disorders

1. Introduction

Speech therapy, as a communication science, has a broad perspective on health systems and services at the three levels of care (primary, secondary, and tertiary). Practices in the aspects of language, voice, hearing, and oral motricity should be addressed to people and social

groups, not only with a clinical perspective, but also through the development of promotion, prevention, attention, and health education actions, which are aligned with the indicators of quality of life and health of the population for which the care proposal [1] will be elaborated.

To this end, rather than planning models for identifying the prevalence and incidence of language disorders in children, one must identify the risk factors for these disorders. In the national literature, it is possible to find studies with this theme, but often associated with a specific pathology, such as stuttering and phonological disorders [2, 3].

Risk factors are understood to encompass “aspects of individual behavior or lifestyle, environmental exposure, hereditary, or congenital characteristics that are associated with a health related condition” (Health Sciences Descriptors, DECS) [4]. These conditions that increase the chances of the child presenting speech-language disorders and that can be avoided, controlled, or treated. Risk is defined as the chance of a child exposed to certain factors (environmental or biological) to acquire or develop speech-language disorders [5].

Pre-, peri-, and post-natal events, such as prematurity, low birth weight, complications in pregnancy and childbirth, are considered biological risks for these disorders. Among the environmental risk factors, low socioeconomic status, schooling, and fragility in family ties are mentioned. There is often a concomitance of the two types of risk, causing a cumulative effect [5, 6].

For the identification of risk factors, understanding as essential for the design of care processes for the population, the Protocol for the Identification of Risk Factors for Language and Speech Disorders (PIFRAL) was proposed [7]. This protocol consists of a form with 29 items administered to parents/guardians of children (Annex A) and includes sociodemographic issues (age, gender, declared race and schooling of the child, age, schooling and profession of parents, place of residence), about the family information (number of siblings, birth order, twinning, time spent with the children, language used at home), on pre-, peri-, and post-natal periods, and temperament of the child [7]. The results of the pilot study indicated that the PIFRAL can be used as a tool to identify the risk factors for speech-language disorders. The main factors identified in the population were family history, intercurrents during pregnancy, prematurity, low birth weight, prolonged hospitalizations, being an only child, male gender, and deleterious oral habits. The authors of the study mentioned above pointed out the need to carry out a new analysis with the increase of the sample of children with speech-language alterations, in order to observe if the results will be maintained or if there will be changes in the frequency of occurrence of risk factors for speech-language disorders in children [7].

The objectives of the present study were: to identify the risk factors for speech-language disorders in children up to five years of age and to verify the relationship between risk factors and speech-language diagnostic hypotheses.

2. Methods

Descriptive, retrospective, and prospective study, developed with the children attending the Laboratório de Investigação Fonoaudiológica em Atenção Primária à Saúde (Laboratory

of Speech and Language Research in Primary Health Care, LIFAPS) of the Department of Physiotherapy, Speech-Language and Hearing Science and Occupational Therapy of the School of Medicine of University of São Paulo (FMUSP), from March 2010 to July 2014.

The study was approved by the Research Ethics Committee of FMUSP, process n° 057/11, and by all parents/guardians that signed the Free and Informed Consent Form (consent form).

The study involved 238 children and their parents and/or guardians, who searched for speech and language therapy at the referred school-clinic. The inclusion criteria were age group up to five years old and with established diagnostic hypothesis in the areas of hearing, voice, speech, language, and myofunctional orofacial system. Children whose parents did not sign the consent form and/or whose medical records had incomplete information were excluded.

In the clinical care routine of the LIFAPS, where speech-language screening occurs, the parents/guardians of the children enrolled were asked to respond to the PIFRAL [7] form, individually by interviews with the speech-language therapist.

The diagnostic hypothesis was established through the evaluation of the language (phonology, fluency, pragmatic, and semantic), cognitive, hearing, communicative, voice, and orofacial myofunctional abilities.

The diagnostic hypotheses (DH) were categorized into: language disorder typical of the autism spectrum (LDAS); language disorder (acquisition and/or development of receptive and/or expressive language (LD)); phonological disorder (PD); oral-motor disorders (OD); language disorder characteristic of neurological impairment or syndrome (LDNS), voice disorder (VD); fluency disorder (FD); and language impairment due to hearing loss (LIHL).

Descriptive statistics were used to analyze the sociodemographic profile and frequency of occurrence of risk factors and diagnostic hypothesis; the Student's t-test was used to analyze the relationship between risk factors and diagnostic hypotheses.

3. Results

3.1. Sociodemographic profile

The predominant age group of the participating children was between 2 and 5 years of age, of the male gender, of the race declared as white and of the socioeconomic level C. The informant was most often the mother (**Table 1**).

Most of the children participating in the study enrolled school (78.2%) and the majority of mothers (85.1%) and parents (73.1%) had completed high school (**Table 2**).

3.2. Factors related to family

Of the 238 children, 156 had siblings. In most cases, the participating child was the youngest son (**Table 3**).

Demographic information	Classification	N	%
Age group	0–12 months	01	0.4
	1–2 years old	13	5.5
	2–5 years old	224	94.1
Gender	Male	171	71.8
	Female	67	28.1
Race	White	158	66.4
	Yellow	03	1.3
	Brown	50	21.0
	Black	27	11.3
Degree of relatedness of the informant with the child	Mother	213	89.5
	Father	19	8.0
	Grandmother	05	2.1
	Aunt	01	0.4
Socioeconomic level (ABEP) [30]	A1	03	1.3
	A2	08	3.4
	B1	18	7.6
	B2	52	21.8
	C1	60	25.2
	C2	41	17.2
	D	47	19.7
	E	08	3.4

Table 1. Description of the 238 children who participated in the study.

Level of education	Classification	n	%
Mother	Until EMI (municipal elementary school)	40	16.8
	From EMC (middle and higher education)	194	85.1
	Was not able to inform	3	1.3
	Did not attend	1	0.4
Father	Until EMI	47	19.7
	From EMC	174	73.1
	Was not able to inform	16	6.7
	Did not attend	1	0.4

Table 2. Level of education of the 238 parents.

Position among siblings	Total n (%)
First born	26 (10.9)
Middle child	18 (7.6)
Youngest	112 (47.1)
Only child	80 (33.6)
Not informed	2 (0.8)
Total	228

Table 3. Distribution of the subjects according to the position among the children.

Only 4.2% of the children were twins; and the vast majority were Brazilian Portuguese speakers (98.7%). Parents spent between 4 and 8 hours per day with the children (**Table 4**).

3.3. Factors related to child's health

The categorization of the frequency of risk factors was performed according to the period of occurrence: pre-, peri-, or post-natal (**Table 5**). The occurrence percentages were lower than 40%, except for the presence of deleterious oral habits (51.3% of subjects).

In the pre-natal period, the predominant risk factor was the presence of family history (39.5%) and interurrences during pregnancy (37.0%) (**Table 6**).

In the peri-natal period, the predominant risk factor was prematurity (18.1%) (**Table 7**).

In the post-natal period, the predominant risk factor was deleterious oral habits (51.3%). It is interesting to note that in 39% of the children there was only one risk factor (**Table 8**).

There was, therefore, a higher concentration of the occurrence of risk factors in the peri-natal period.

The temperaments affective (53.8%) and shy (19.7%) had the highest frequency (**Tables 9 and 10**). All types of temperament were explained to parents and they should choose only one, which best describes the child.

Hours/day	n	%
None	1	0.4
Less than 4h	33	13.9
From 4 to 8h	119	50.0
From 8 to 16h	85	35.7

Table 4. Descriptive distribution of the time parents spend with children.

Period	Risk factors	No		Yes		Was not able to inform	
		n	%	n	%	n	%
Pre-natal	Family history (language change)	142	59.7	94	39.5	2	0.8
	Use of drugs, medicines, alcohol, or tobacco during pregnancy	184	77.3	53	22.3	1	0.4
	Intercurrences	148	62.2	88	37.0	2	0.8
Peri-natal	Prematurity	191	80.2	43	18.1	4	1.7
	Low birthweight	112	47.1	20	8.4	106	44.5
	APGAR below 4 in the 1st min and below 6 in the 5th min	90	37.8	4	1.7	144	60.5
Post-natal	Hospitalizations	156	65.5	82	34.5	0	0
	Genetic syndrome	213	89.5	25	10.5	0	0
	Neurological or psychiatric pathology	197	82.8	41	17.2	0	0
	Chronic disease	201	84.5	37	15.5	0	0
	Exposure to some type of violence	201	84.5	37	15.5	0	0
	Oral habits	116	48.7	122	51.3	0	0

Table 5. Information on the risk factors in the pre-, peri-, and post-natal periods of the 238 children.

Pre-natal factors	n	%
Name	77	32.4
Family history (language disorder)	94	39.5
Substance use	53	22.3
Complications	88	37.0
Background + substances	21	8.8
Background + interurrences	35	14.7
Substances + interurrences	31	13.0
All	13	5.5

Table 6. Distribution of the occurrence of pre-natal risk factors.

Peri-natal factors	n	%
None	188	79.0
Prematurity	43	18.1
Lowweight	20	8.4
APGAR	4	1.7
Prematurity + low weight	15	6.3
Prematurity + APGAR	2	0.8
Low weight + APGAR	1	0.4
All	1	0.4

Table 7. Distribution of the occurrence of peri-natal risk factors.

Post-natal factors	n	%
None	48	20.2
Hospitalizations	82	34.5
Genetic syndrome	25	10.5
Neurological or psychiatric pathology	41	17.2
Chronic disease	37	15.5
Exposure to some type of violence	37	15.5
Oral habits	122	51.3
Two factors associated	63	26.5
Three factors associated	19	8.0
Four factors associated	15	6.3

Table 8. Distribution of the occurrence of post-natal risk factors.

Temperament	N	%
Hard	31	13.0
Affective	128	53.8
Fearful	20	8.4
Agressive	25	10.5
Shy	47	19.7

Note: There was a significant statistical difference between the majority of DH and the male gender: more boys presented speech-language disorders than girls. There was no significance in the DH fluency disorder to hearing disorder (Table 10).

Table 9. Occurrence of subjects' each type of temperament.

	Gender		Student t-test
	Male	Female	p value
LDAS	16	3	<0.001*
LD	67	34	<0.001*
PD	43	10	<0.001*
OD	16	3	<0.001*
LDNS	4	9	0.006*
LIHL	2	0	0.02*
FD	3	2	0.21
VD	4	2	0.09
More than one DH	16	4	<0.001*
Total	171	77	<0.001*

*Significant values for the confidence interval of 5%.

Table 10. Association between the diagnostic phonoaudiological hypothesis and the gender.

3.4. Relationship between the diagnostic hypotheses and the study variables

In the association between DH and socioeconomic level, there was no statistical significance in four HD; however, there was a significant difference between the two groups of socioeconomic level: those who were at the lower levels had more speech-language disorders than those at the higher levels (Table 11).

In the group, there was a bigger occurrence of children with one or more siblings presenting speech-language disorders when compared to the "single child" category (Table 12).

For the comparative analysis between DH and number of risk factors, the 238 children were divided into 3 groups: a group with up to 3 risk factors, a group with 4–7 risk factors and a

	Socioeconomic level		Student t-test
	A or B	C, D, or E	p value
LDAS	10	9	0.17
LD	20	80	<0.001*
PD	21	31	0.003*
OD	10	9	0.17
LDNS	4	9	0.006*
LIHL	1	1	0.5
FD	3	2	0.21
VD	3	3	0.5
More than one DH	8	12	0.01*
Total	80	156	<0.001*

*Significant values for the confidence interval of 5%.

Table 11. Association between the diagnostic hypothesis and the socioeconomic level.

group with 8 and 9 risk factors. There were no children with more than 10 risk factors. The different DH were related to each other, in an association with a number of risk factors.

For up to three risk factors, the hypotheses that presented significant relation were: LDNS and PD, LDNS and LD, OD and PD, and OD and LDNS (**Table 13**).

	Number of siblings		Student t-test
	None	One or more	p value
LDAS	7	11	0.04*
LD	35	66	<0.001*
PD	16	37	<0.001*
OD	5	14	0.001
LDNS	6	7	0.17
LIHL	2	0	0.02*
FD	3	2	0.21
VD	1	5	0.008*
More than one DH	5	15	<0.001*
Total	80	157	<0.001*

*Significant values for the confidence interval of 5%.

Table 12. Association between the diagnostic hypothesis and the number of siblings.

Up to three risk factors							
	PD	LCNS	FC	AADREL	AMOS	ALPA	AV
LDAS	0.37	0.18	0.44	0.49	0.49	0.35	0.45
PD	–	0.02*	0.44	0.12	0.003*	0.23	0.49
LDNS		–	0.06	0.02*	0.02*	0.34	0.10
FD			–	0.43	0.42	0.19	0.46
LD				–	0.49	0.31	0.44
OD					–	0.29	0.43
LIHL						–	0.09
VD							–

*Significant values for the confidence interval of 5%.

Table 13. Comparative analysis of the number of risk factors (up to three factors) according to the diagnostic hypothesis through the Student t-test.

In the group of children with four to seven risk factors, there was a significant association between: LDNS and LDAS, PD and LD, PD and OD, PD and LDNS, LDNS and OD (**Table 14**).

In the group of children with eight and nine risk factors, no significant relationships were observed between the different DH.

From four to seven risk factors							
	PD	LDNS	FD	LD	OD	LIHL	VD
LDAS	0.31	0.04*	0.49	0.42	0.44	0.31	0.43
PD	–	0.03*	0.40	0.05*	0.004*	0.22	0.37
LDNS		–	0.12	0.06	0.04*	0.4	0.05
FD			–	0.43	0.45	0.32	0.5
LD				–	0.39	0.27	0.09
OD					–	0.28	0.25
LIHL						–	0.19
VD							–

*Significant values for the confidence interval of 5%.

Table 14. Comparative analysis of the number of risk factors (four to seven factors) in relation to the diagnostic hypothesis through the Student t-test.

4. Discussion

4.1. Sociodemographic characterization

The sample analyzed for the current study had a 40% increase in participants compared to the pilot study [7]. The sociodemographic characterization presented some changes in relation to the sample

of the mentioned study, but the risk factors for speech-language disorders related to the family, the child's health and the environment remained, reaffirming what are the risk factors that deserve attention of health professionals during child development. The characteristics that persisted in the current study in relation to the previous study [7] were age range, male gender prevalence, and shy and affective temperament. These data corroborate previous studies [8–13].

Boys are more likely to have speech and language difficulties compared to girls though scientists are undecided as to why. Research works are still being carried into the reasons for this distinction between the sexes. Boys are 2.6 times more likely to be identified with language disorders than girls, indicating the strong gender discrepancy found consistently in epidemiological studies [12].

One point that differed to the previous study was the socioeconomic level of the family members who sought speech and hearing care. The highest frequency of search was of individuals in class C2 (25.2%), followed by B2 (21.8%), and D (19.7%). The socioeconomic level is a factor that may increase the risk for speech-language disorders. There was a significant relationship between language disorders and social disadvantage. Children with high socioeconomic disadvantage were 2.30 times more likely to have language disorders than children with low levels of socioeconomic disadvantage [12]. Of the environmental factors, both parents' education and social class correlated positively with the child's language comprehension in a previous study [14]. Regression analyses showed that the mother's social status had predictive value on the child's language comprehension at 36 month of age. This result is in agreement with earlier reports [15, 16]. The father's educational level and social class was also correlated with the child's language comprehension; however, these factors did not reach predictive value at the population level [14].

The higher the family income, the better the phrasal structure elaborated by the child. Family income may also be associated with the quantity and quality of stimuli provided by the parents to the child [17]. It is now established that the quality of early parent-child relationships does have an influence on later child cognitive and language development [18]. More remains to be learned, however, about the mechanisms of this effect, the interplay between the parenting relationships and what aspects may be most amenable to intervention [19]. As well as mother-child, the importance of father-child relationships has become increasingly evident [20]. One study found that the child's lexical skills were higher when the father was at home at least part-time during the early developmental years [14]. Extant studies [21] have shown that fathers use more questions and require clarification when talking with their young children, which may partly explain the results. Furthermore, the authors found that the father's social status and working from home were predictive factors for children's lexical development. The results may emphasize the changing and less stereotyped role of the father as a supportive and active person in their children's development [14].

4.2. Frequency of occurrence of the risk factors studied

Regarding behavior, we highlight the greater occurrence of shy and affective temperaments. Research studies characterize affective temperament as being more conducive to development, although further studies are still necessary so that this correlation can be effectively considered;

and, the data suggest that the shyness may be a reflection of the speech-language disorder itself [22]. Studies have also indicated a link between positive temperament traits and vocabulary. For instance, children rated as high in positive affectivity had larger receptive vocabularies at 13 months of age than children who scored lower on this trait [23]. Similarly, high levels of affect—extraversion at 2 years of age—have been found to predict advanced language skills into middle childhood [24]. Other studies, however, have not found the same strong support for the link between temperament and language development. In a study of Swedish infants, for example, researchers found no relation between difficult temperament and vocabulary or shared book reading [25]. Furthermore, whereas some studies have indicated that traits like shyness may be related only to productive vocabulary, and so may be more related to performance than actual ability [26], others have found associations between temperament and receptive, but not expressive, vocabulary [27]. Thus, whether and how temperament in young children is related to their language abilities remain unclear. One reason for these mixed findings may be that other characteristics, such as cognitive ability, moderate role of temperament in language development [28].

There was a greater occurrence of youngest children, followed by single children. The effect of a child's birth order on emerging language seems to be still under debate. While birth order, laziness, and bilingualism are all commonly believed to lead to speech and language delay, their contributory role has never been proved [29]. Mothers report larger receptive and expressive vocabularies in their first-borns. However, standardized testing and direct observation showed that there was no difference in either receptive or expressive vocabulary between first-borns and second-borns [30]. One study found that first-born children reached the 50-word milestone earlier than later born children. However, they found that after children had reached this 50-word milestone, there were no differences in vocabulary production between the first- and later born children. The authors concluded that it seems that the effect of birth order is limited to the onset of language production [31]. Other hypotheses considered for these results are the division of attention that the parents need to do with the birth of the youngest son and his infantilization for a longer time comparing to the oldest [7–13]. We can observe the possible relation between the treatment of the parents with the youngest child and the only child.

In the peri-natal period, there was a higher occurrence of the prematurity risk factor and may impair aspects of neural plasticity, which interferes with development as a whole, including language [7].

In the pre-natal period, family history and drug use (licit or illicit) were the most prevalent risk factors. It is known that there is a correlation between the family history and the occurrence of speech-language disorders in the following generations [2]. As for drug use, there is interference in the development of the fetus, interfering in the development of language.

In the post-natal period, the most frequent risk factors were deleterious oral habits, corroborating previous studies [32, 33] and hospitalizations for extended periods of time. Regarding the hospitalization, it is important to emphasize that the emotional state of the child and all biological factors affected in this process for a long period are related to the development of language [34].

4.3. Diagnostic hypothesis and risk factors

The different diagnostic hypotheses (DH) were related to each other, in an association with a number of risk factors. The majority of the study population presented up to three risk factors, where the following relationships were observed: OD and PD, LDNS and OD, LDNS and PD, and LDNS and LD.

The children with LDNS presented statistically, in proportional values, a greater occurrence of risk factors than the others.

Associations between OD and PD may be linked to risk factors involving deleterious oral habits, repetitive otitis, respiratory disorder [35], besides eating disorders and family aspects [36].

When correlating LDNS and OD, it can be emphasized that in several syndromes described in the literature [37, 38], one of the alterations found is in the myofunctional orofacial system. Regarding the risk factors, both pathologies presented a high index of risk factors, although LDNS had a higher incidence of these factors in general. For LDNS, the predictive factors permeated the pre- and peri-natal, whereas for OD, the environmental risks, such as deleterious oral habits, stood out.

For the correlation between LDNS and PD, we can highlight the etiological factor preponderant in relation to the population with LDNS and the environmental factors and alterations in the phonoarticulatory organs in the population with PD, already described in this study [39, 40].

As for the relationship between LDNS and OD there is a distinction between biological and environmental risks, in the correlation between LDNS and LD this also occurs. It is possible to highlight the high occurrence of biological factors (especially pre- and peri-natal) for LDNS and environmental factors for LD (such as opportunities offered by the environment).

For the range of subjects with four to seven risk factors, the following relationships were observed: LDNS and LDAS (language disorder characteristic of the autism spectrum); PD and LD, PD and OD, PD and LDNS, and LDNS and OD, the last three being also present in the population with up to three risk factors.

When thinking about the relationship between LDAS and LDNS, the etiological aspects can be highlighted. The population with LDNS presented a higher number of risk factors compared to LDAS. Children with a diagnosis of LDNS were the ones with the highest pre- and peri-natal risk, which corroborates with etiological studies of several syndromes [39, 40]. On the other hand, the diagnostic hypothesis of LDAS does not have a defined etiology, which could explain the low occurrence of risk factors in these individuals [41].

The LD population had a higher number of risk factors than those with PD. Studies indicate that in what concerns the occurrence of LD, children depend on the opportunities offered by the environment, in addition to genetic inheritance, nutrition, and social aspects [35]. As for risks for the development of PD, there are recurrent otitis, respiratory alterations, alterations in auditory processing, as well as socioenvironmental aspects, besides family members [2].

For eight to nine risk factors, no statistically significant relationships were observed.

It has not yet been possible to identify how many risk factors are related to each diagnostic hypothesis, although it can be affirmed that they may be different for each diagnostic hypothesis.

It is of great importance that this instrument can be validated, in a comparative study with the application of the protocol in parents of typical development children, since it can be a facilitating factor to encourage in practice the expanded clinical concepts determined by the Unified Health System (SUS). Being a protocol of easy application, the PIFRAL can be a potentiator of the matrix support, which aims at the qualification of interdisciplinary actions with bigger appropriation of the knowledge of the several areas, in an interdisciplinary team [42].

5. Conclusion

The aspects being male gender, prematurity, shyness, being an only child or youngest child, presenting deleterious oral habits, having a family history of speech-language disorders, and use of licit or illicit drugs during pregnancy seem to be the factors that should draw the attention of the health professionals in child development. Therefore, the monitoring of children who have these risk factors should be performed in order to promote the necessary stimulation and the construction of healthy environments.

ANNEX A

Protocol of risk factors for language disorders

Number:

1. **Age:**
2. **Gender:**
3. **Race:**
4. **Speech-language complaint:**
5. **Onset age of speech-language complaints:**
6. **Are there cases of family members with the same difficulty or other hearing or communicative alterations? Which?**
7. **Child's education:**
8. **Parent's education:**

9. Parent's profession

10. Number of siblings and their ages

11. Order of birth:

12. Twinning:

13. Parents age:

14. Maternal age at birth:

15. Native language and language spoken at home:

16. Time that parents spend with their children:

17. Child's temper:

18. Neighborhood:

19. Socioeconomic status:

20. Did the mother present pre-natal complications??

21. Did the mother use drugs, medication, alcohol, or tobacco during pregnancy?

22. Was the child born premature and/or underweight?

23. Was the Apgar score less than 4 in the first minute and less than 6 at 5 minutes in life?

24. Did the child have to be hospitalized?

25. What are the child's health conditions? Does he/she have any diagnosed diseases?

26. Has the child ever had an auditory test? Does he/she have difficulty hearing?

27. Does the child have difficulty feeding or facial motor problems?

28. Does the child has or has ever presented habits? For how long?

29. Has the child ever witnessed or experienced any type of violence? (assault, fights, disappearance of relatives, abuse, neglect, etc.)

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