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Comparative analysis of the expressive vocabulary of preterm and full-term children

Análise comparativa do vocabulário expressivo de crianças nascidas pré-termo e a termo

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ABSTRACT

Purpose: To compare the performance of preterm and full-term children in the expressive vocabulary assessment. **Methods:** The vocabulary was assessed through the ABFW – Child Language Test in 40 two- to four-year-old children – 20 preterm and 20 full-term, matched for age and gender. The proper statistical tests were used, adopting the significance level lower than 5%. **Results:** A statistical difference between the preterm and full-term groups was observed in the usual word designations (in the conceptual fields of clothing, furniture and appliances, and professions), in the no designations (in professions and places), and in the substitution processes (in clothing, professions, places, and shapes and colors). **Conclusion:** A possible relationship between premature birth and difficulties in vocabulary development is suggested. The importance of early intervention in these cases is highlighted, to avoid or minimize consequences to language development and school achievements.

Keywords: Language development; Child language; Child development; Language tests; Premature birth

RESUMO

Objetivo: Comparar o desempenho de crianças nascidas pré-termo e a termo na avaliação do vocabulário expressivo. **Métodos:** A avaliação do vocabulário foi realizada por meio do ABFW – Teste de Linguagem Infantil, em 40 crianças, na faixa etária de 2 a 4 anos, sendo 20 nascidas pré-termo e 20 nascidas a termo, pareadas conforme idade e sexo. Foram aplicados os testes estatísticos pertinentes, adotando-se o nível de significância menor que 5%. **Resultados:** Observou-se diferença estatística entre o grupo pré-termo e a termo nas designações por vocábulos usuais nos campos conceituais: vestuário, móveis e utensílios e profissões; nas não designações, nos campos: profissões e locais e nos processos de substituição nos campos vestuário, profissões, locais, formas e cores. **Conclusão:** Sugere-se uma possível relação entre o nascimento prematuro e dificuldades no desenvolvimento do vocabulário. Destaca-se a importância da intervenção precoce nesses casos, a fim de evitar ou minimizar repercussões no desenvolvimento da linguagem e na fase escolar.

Palavras-chave: Desenvolvimento da linguagem; Linguagem infantil; Desenvolvimento infantil; Testes de linguagem; Nascimento prematuro

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INTRODUCTION

According to the World Health Organization (WHO), preterm newborns are those born alive before completing 37 weeks of gestation; full-term, those born between 37 weeks and 41 weeks and six days; and post-term, those whose gestation extends to 42 weeks or more. Brazil is among the 10 countries with the highest rates of premature births in the world[1].

The preterm (PT) children are more likely to present global developmental delays when compared with full-term children. Such vulnerability may be related to the biological immaturity and psychosocial risks inherent to the context to which the child belongs[2,3]. Developmental complications can hinder the expressive and receptive language acquisition[4].

There are reports of delayed language acquisition and smaller expressive vocabulary in two-year-old preterm children in comparison to the full-term ones in all semantic categories[5]. Another study investigated the lexical performance and short-term memory skill in premature four- to five-year-old schoolchildren. When compared with their full-term peers, there was a similar performance regarding vocabulary and short-term memory loss[6]. Concerning development, the child's productive vocabulary is expected to grow significantly from 16 to 18 months old, so that they have dozens of words in their active vocabulary[7].

As the size of the vocabulary reaches 20 to 50 words, in most cases the subsequent ones are acquired increasingly faster. As they grow up, the expected vocabulary is supposed to occur more often, whereas while they are younger there will be more unnamed items[8]. There are theories to explain vocabulary development; in general, it expands with age, in a relationship permeated with the child's experiences[9].

Approximately, one in every four two-and-a-half-year-old preterm children and one in every three three-and-a-half-year-old preterm children have significant language development alterations, characterized by limited grammar production, and slow lexical development, besides cognitive alterations[10]. When comparing the linguistic skills of seven-year-old preterm and full-term children, it was verified that the PT group had a significantly worse performance than the full-term group in all the language subdomains tested, namely: phonological awareness, semantics, grammar, speech, and pragmatics. Linguistic alterations in schoolchildren suggest continuous difficulty with consequences to the teaching and learning process. Hence, the adequate development of vocabulary stands out in its importance for both the acquisition of other linguistic levels and the schooling of the child[11].

In general, there is a consensus in the national and international literature regarding the prematurity's influence on language acquisition[1-3,5,6,10,11]. The early perception of neurodevelopmental alterations allows children to be included in specific intervention programs in an attempt to minimize the risks of irreversible dysfunctions and improve their quality of life. The expressive vocabulary is one of the important milestones in typical development. Given the above, this study aimed to describe and compare the performance of preterm and full-term children in expressive vocabulary assessment.

METHOD

This study was approved by the Research Ethics Committee of the *Secretaria da Saúde do Estado da Bahia* (Bahia State Department of Health – Sesab), under evaluation report no. 310.813/13, and complied with the human research ethics guidelines in the Resolution CNS 466/12. After being instructed and agreeing to participate in the study, the parents/guardians signed the Informed Consent Form (ICF), through which they authorized the child to participate in the research.

This is an observational, cross-sectional study. Its sample comprised 40 two- to four-year-old children – 28 females and 12 males; eight of them were two years old, 12 were three years old, and 20 were four years old; 20 were preterm (preterm group – PTG), and 20 were full-term (full-term group – FTG), matched for age and gender. The gestational age of the PTG children ranged from 26 to 36 weeks, with a median of 32 weeks; their birth weight ranged from 530 to 2,310g, with a median of 1,647.5g.

The inclusion criteria for the PTG were the availability of information on gestational age, birth weight, and any perinatal complications; absence of brain lesions and/or any other pathology that kept them from performing the tasks proposed, or that justified a possible language alteration. As for the FTG, full-term children with adequate birth weight and matching the PTG for age and gender were selected. Any information unavailable in the day care center record was obtained from the initial interview with the mothers at the end of the school term.

For the PTG selection, 200 medical records of the *Centro Estadual de Prevenção e Reabilitação da Pessoa com Deficiência* (State Prevention and Rehabilitation Center for People with Disability – Cepred), in Salvador, Bahia, Brazil, were analyzed. The Cepred is a unit of the *Sistema* Único *de Saúde* (Brazilian public health care system – SUS), accredited as a Specialized Rehabilitation Center (CER III). It is a statewide reference in secondary prevention, rehabilitation, and assistance to the people with physical, auditory, and intellectual disabilities and with ostomies. Its multiprofessional team offers comprehensive care with an interdisciplinary approach. After excluding the children whose medical records did not meet the inclusion criteria, the remaining ones were contacted by phone to schedule the assessment. After this stage, 20 children attended the institution for vocabulary assessment. Lastly, they were organized in groups according to prematurity classification – extremely preterm, very preterm, moderate-to-late preterm[1]. The three-to four-year-old PTG children attended day care centers or schools. The two-year-old ones stayed at home, mostly with their mother and/or siblings.

The FTG was selected after the PTG had been assessed to ensure they matched. This group comprised full-term children with adequate birth weight and no alterations that hindered language development. They were enrolled in a municipal day care center, in Salvador, Bahia, in the same region where the Cepred is located. The children were selected by the day care coordinator, who was aware of the inclusion criteria, and were individually assessed at the day care center.

First, the child's record was consulted to check whether they met the inclusion criteria. After the sample had been selected, the parents/guardians were invited to the initial interview, when they were informed about the research and the child's assessment. The vocabulary test in the ABFW Child

Language Test[12] – which is used in national research to study different populations, including children with or without typical language development – was used to assess the children's lexical competence. All the assessments were conducted individually, and recorded in video and audio, to be posteriorly transcribed and analyzed.

The ABFW[12] vocabulary verification test assesses nine conceptual fields: clothing, animals, foods, means of transportation, furniture and appliances, professions, places, shapes and colors, and toys and musical instruments. The fields were assessed following the picture presentation sequence proposed by the test[12]. Thus, three types of answers could be given: usual word designations (UWD), no designations (ND), and substitution processes (SP). The data collected were analyzed according to the parameters proposed by the test[12].

The assessment procedure was rigorously maintained. It was administered individually, in an appropriate, well-lit room, with no competing visual and/or auditory stimuli, or other distracting factors that might impair the assessment. In the analysis by age group, the corrected age was not considered, as the children comprising the sample were over two years old and had already reached the level full-term children reach during gestation, in the first years of life, after the central nervous system has matured – which is in agreement with other authors[13,14].

To verify whether there was an association between the gestation time of the PTG children and their performance in the vocabulary test, the data of the PT sample were organized in groups, according to the prematurity classification proposed by WHO (extremely preterm, very preterm, moderate-to-late preterm)[1]; there were eight extremely preterm, five very preterm, and seven moderate-to-late preterm children. The percentages found were compared with the test's reference values, per age, regarding whether the performance was adequate or below the expected. Then the two groups of children, preterm and full-term (PTG and FTG), were compared.

The data were entered and processed in spreadsheets developed in the SPSS software, version 20.0. The Mann-Whitney test was used to analyze the comparison between the PTG and FTG regarding the usual word designations, no designations, and substitution processes of the nine conceptual fields. The Kruskal-Wallis test was used to verify whether there had been a relationship between gestational time and performance in the vocabulary assessment in the PTG. The level of statistical significance considered was $p < 0.05$.

RESULTS

After the analysis of the nine conceptual fields with the Mann-Whitney test, statistical differences were observed between the PTG and FTG in the UWD means in the conceptual fields of clothing (0.007), furniture and appliances (0.023), and professions (0.031). The differences observed in the other conceptual fields highlighted the better performance in the FTG (Table 1).

Regarding the ND, statistical differences were observed between the means of the following conceptual fields: professions (0.003), and places (0.044), with higher medians in the PTG (Table 2). There was a statistical difference between the means

Table 1. Comparison of the usual word designations between the preterm and full-term groups

Conceptual field	Preterm group - PTG			Full-term group - FTG			p-value
	Median	1st Quartile	3rd Quartile	Median	1st Quartile	3rd Quartile	
Clothing	30	20	40	50	38	63	0.007*
Animals	47	32	80	66	47	87	0.356
Foods	40	18	63	50	33	68	0.272
Means of transportation	45	27	82	64	54	73	0.082
Furniture and appliances	40	33	63	67	54	67	0.023*
Professions	10	8	20	20	20	10	0.031*
Places	8	0	17	17	8	17	0.052
Shapes and colors	10	0	60	10	0	48	0.680
Toys and musical instruments	41	18	45	55	36	64	0.051

Mann-Whitney test; *Statistically significant values ($p < 0.05$)
Subtitle: PTG = preterm group; FTG = full-term group

Table 2. Comparison of the no designations between the preterm and full-term groups

Conceptual field	Preterm group - PTG			Full-term group - FTG			p-value
	Median	1st Quartile	3rd Quartile	Median	1st Quartile	3rd Quartile	
Clothing	0	0	10	0	0	10	0.974
Animals	0	0	20	0	0	13	0.512
Foods	13	0	28	20	7	33	0.555
Means of transportation	14	0	27	5	0	18	0.361
Furniture and appliances	17	4	26	8	4	18	0.145
Professions	25	0	40	0	0	10	0.003*
Places	33	0	54	8	0	17	0.044*
Shapes and colors	40	10	80	70	18	90	0.382
Toys and musical instruments	18	7	39	9	0	20	0.208

Mann-Whitney test; *Statistically significant values ($p < 0.05$)
Subtitle: PTG = preterm group; FTG = full-term group

Table 3. Comparison of the substitution processes between the preterm and full-term groups

Conceptual field	Preterm group - PTG			Full-term group - FTG			p-value
	Median	1st Quartile	3rd Quartile	Median	1st Quartile	3rd Quartile	
Clothing	60	50	70	45	30	60	0.037*
Animals	33	20	47	23	13	40	0.462
Foods	40	20	53	27	25	33	0.188
Means of transportation	23	18	55	27	16	36	0.500
Furniture and appliances	35	25	42	29	25	30	0.199
Professions	50	48	73	70	60	80	0.042*
Places	58	40	60	75	67	83	0.003*
Shapes and colors	25	8	40	0	0	10	0.009*
Toys and musical instruments	36	27	48	36	27	45	0.762

Mann-Whitney test; *Statistically significant values ($p < 0.05$)
Subtitle: PTG = preterm group; FTG = full-term group

Table 4. Analysis of the usual word designations, no designations, and substitution processes in relation to gestational time in the preterm group

Conceptual field	UWD		ND		SP	
	K-W χ^2(2 df)	p-value	K-W χ^2(2 df)	p-value	K-W χ^2(2 df)	p-value
Clothing	0.56	0.755	0.22	0.897	0.55	0.761
Animals	2.52	0.284	3.79	0.150	4.24	0.120
Foods	0.28	0.869	0.14	0.932	0.87	0.648
Means of transportation	0.73	0.696	1.05	0.592	1.23	0.542
Furniture and appliances	0.96	0.953	0.05	0.976	1.04	0.595
Professions	0.72	0.699	0.06	0.970	2.30	0.317
Places	3.26	0.196	3.12	0.210	1.38	0.501
Shapes and colors	1.18	0.553	2.75	0.253	1.83	0.400
Toys and musical instruments	0.29	0.867	0.36	0.833	2.29	0.318

Kruskal-Wallis test
Subtitle: UWD = usual word designations; ND = no designations; SP = substitution processes; K-W = Kruskal-Wallis; df = degrees of freedom

of the substitution processes concerning clothing (0.037), professions (0.042), places (0.003), and shapes and colors (0.009). Higher medians were observed in clothing, shapes, and colors in the PTG, and in professions and places in the FTG (Table 3).

Kruskal-Wallis test was used to verify whether there was a relationship between the gestation time of the PTG children – extremely preterm (n = 8), very preterm (n = 5), moderate-to-late preterm (n = 7) – and their performance in the vocabulary test. There was no statistical difference between the UWD, ND, and SP means for any of the nine conceptual fields in the PT children (Table 4).

DISCUSSION

This study observed a difference in the performance of the PTG and FTG regarding semantic skills. This finding may be related to prematurity, which agrees with the other authors[5,6]. The age group investigated in this study represents the time when important changes take place in the child's process of language acquisition – which points to the importance of verifying and comparing the development of this skill between PT and full-term children.

The characterization of the children's performance in the ABFW vocabulary test[12] enabled the identification of the conceptual fields they dominated better or worse, as well as the perception of the resources they used in the attempt to name the pictures. Language acquisition deviations are common in this population, with effects on their childhood (in the first years at school) and adolescence, even when there are no brain lesions. There is also a greater probability of their having an atypical development when compared to full-term children, which emphasizes the continuity from pre- and perinatal life to the posterior development[15-17].

It was demonstrated that the PTG children presented UWD similar to those of the FTG – except for the conceptual fields of clothing, furniture and appliances, and professions, in which the PTG obtained a lower median. Differences in ND were observed in professions and places, as well as in SP, in clothing, professions, places, and shapes and colors. In the literature, there is evidence that the conceptual fields of professions and places are the ones presenting the lowest naming percentage in UWD[18,19]. Nevertheless, in this study, places did not differ statistically in the UWD analysis between the groups. The lower naming rate may be justified by cultural, developmental, and visual input factors, as the picture naming involves visual, semantic, and phonological information. The presence of word substitution processes in the child's speech results from the attempt to name a target word that is not in their lexicon. The good performance in professions and places requires greater knowledge since these concepts demand representation and abstraction capacity to be acquired[19]. Is should be highlighted that the child's presenting more SP does not mean a greater loss in vocabulary acquisition. Using more substitution processes does not always imply greater difficulties, as the child can use more specific terms than those

used as the target in the test; hence, it does not necessarily mean a restricted lexical repertoire.

The findings in this study demonstrated that when the concepts of the pictures are not acquired, the children may not name them, or give them names of other objects with which they are familiar and which are visually similar to the one presented, or yet look for similar words in their semantic repertoire, in case they know the object but are unable to find the right word to name it. However, the influence of cultural and developmental factors on the performance of these skills during the assessment cannot be dismissed. The literature states that premature birth interferes negatively with the speed of lexical processing. Thus, the slower language processing of PT children can impair the acquisition of more complex lexical and grammar representations, possibly being the cause of results below the expected in the language assessment[20].

Another comparison study revealed that the PT group had a worse performance in lexicon and grammar production. Hence, they demonstrated a greater risk of lexical delay and/or absence of word combination when compared with the full-term group. The study demonstrated that the lexical repertoire of the PT children was smaller than that of the full-term ones, in all lexical categories[21]. The PT children presented a vocabulary slightly smaller than that of the full-term ones. There was a difference in the proportions of the word categories used – e.g., PT individuals used more social terms and fewer predicates and function words[7].

The expressive vocabulary has been a good predictor of future development. It has a central role in language development, as the acquisition of words is an essential step towards future syntactic progress, besides representing the first possibility of effective oral communication. The literature reports that children have an easier time acquiring open-class words, such as nouns, verbs, and adjectives, due to their more concrete meaning and more frequent occurrence in the language[22].

Children with language development alterations present a smaller lexical repertoire – a difficulty that tends to persist throughout their development[23]. In the comparison of school performance between PT schoolchildren groups and the full-term group, another study demonstrated that the PT children had greater difficulties in general in school than the full-term children. Also, they had more specific reading, orthography, and math problems[24].

It is known that the initial lexical acquisition of children with typical development takes place progressively as they grow up; in this period, gender does not influence the linguistic production[25]. There is in the literature a report that two-year-old PT children presented altered language performance, characterizing them as risk population for deviations in the acquisition of linguistic skills[14].

Lexical development is related to children's socio-interactional experiences. Vocabulary acquisition is complex, influenced by the environment and social relations to which the child is exposed – such as the family dynamics, the interaction with their parents, the immediate social environment, and the stimulus they are given in the first years of life[18] –, as well as their personal characteristics regarding cognitive skills, executive functions, and memory[26].

The PT children may not fully recover the developmental delay, which has consequences that affect their academic performance as well. A medium- and long-term follow-up before they get into school is a means of identifying possible losses and prevent their consequences to school learning[27]. In general, the literature points to the effects of prematurity in relation to the acquisition of language. These effects could either be comorbidities of other clinical conditions associated with prematurity or be related to the prematurity itself, as a biological risk factor[28,29], with impairments in lexical[7,18,20], phonological[11,30], semantic and pragmatic skills[11].

It is important to emphasize that the word types investigated, how they are used, how the pictures are set in the test, and the shapes and colors used can have a direct influence on the children's performance. Such factors as the familiarity and frequency of the objects to be named influence the process of naming them, activating the access to the lexicon. Despite these limitations, the analysis of the children's answers in the ABFW vocabulary test[12] was relevant, as it enabled the semantical-lexical acquisitions of the population studied to be characterized.

This paper demonstrated that there can be a relationship between premature birth and the difficulties in semantical-lexical development, corroborating the consensus in the national and international literature[14,18,20,21,24]. The data observed highlight the need for methodological and standardized assessments, with the purpose of early detecting impairments in oral language development, since they can have future consequences in the teaching and learning process. Identifying alterations, especially before they start going to school, makes the treatment start earlier and minimizes the damages, favoring learning. Therefore, it is necessary to develop effective follow-up strategies, such as the assessment and monitoring of the child's linguistic development. This study presented limitations related to the absence of analysis of both group's birth weight, as well as the PTG's schooling.

The findings also highlight the relevance of including vocabulary analysis in the clinical assessment procedures with premature children. Moreover, the importance of early intervention in these cases is highlighted, to avoid or minimize the consequences to language acquisition and, posteriorly, their school achievements.

CONCLUSION

Statistical differences were verified in the UWD of the PTG and FTG in the conceptual fields of clothing, furniture and appliances, and professions. The differences observed in the other conceptual fields highlight the better performance in the FTG. In picture naming by semantic category, the PT children's results differed from the full-term children especially in professions and places (regarding the ND), and clothing, professions, places, and shapes and colors (regarding the SP). A relationship between premature birth and difficulties in vocabulary development was verified. Hence, this study calls attention to the importance of an early assessment of expressive vocabulary. The early identification of linguistic deviations is essential to improve these children's functional results. Longitudinal studies need to be conducted to verify the occurrence of semantical-lexical deviations in preterm children.

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