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Oral language of school-aged children born pretermaturely: a population-based analysis from Madeira Island, Portugal

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Abstract. Premature birth and low birth weight are very important factors in neurodevelopment. Current research in this population focuses on children born prematurely, with no underlying complications in the post-natal period, who are likely to develop specific disorders with their language development and consequently with their learning capabilities too. This study aims to analyse the oral language skills of prematurely born children in comparison to their school-aged peers. The children were assessed in the respective schools, 27 preterm children (16 under 32 weeks and 11 with 32 or more weeks of gestation) and 49 term paired by gender, age, and school year. Tests including simple and complex structures for assessing semantics, morphosyntax, and phonology were used, as well as a test of verbal memory. Preterm born children, regardless of their prematurity grade, showed significantly lower results than their peers, and more than a half of them, 52%, presented low scores in all language tests simultaneously, showing an important language deficit. In contrast, in the term born children group only 14% showed low scores simultaneously in all tests. Verbal memory ability proved to be lower than that of their term peers, regardless of the gestational age and birth weight of preterm children. As a result of this analysis we consider that the evaluation of the linguistic development of these children, even in cases of moderate to late prematurity, should be monitored in order to identify earlier the existence of deficits and prevent psychosocial and learning problems.
Keywords: oral language, premature, learning, school-aged children

[es] El lenguaje oral de los niños en edad escolar nacidos prematuramente: un análisis basado en la población de la isla de Madeira, Portugal

Resumen. El nacimiento prematuro y el bajo peso al nacer son factores muy importantes en el neurodesarrollo. Las investigaciones actuales en esta población se centran en los niños nacidos prematuramente, sin complicaciones subyacentes en el periodo postnatal, que son propensos a desarrollar trastornos específicos en el desarrollo del lenguaje y, en consecuencia, también en sus capacidades de aprendizaje. Este estudio pretende analizar las habilidades lingüísticas orales de los niños nacidos prematuramente en comparación con sus compañeros de edad escolar. Se evaluaron en las respectivas escuelas, 27 niños prematuros (16 con menos de 32 semanas y 11 con 32 o más semanas de gestación) y 49 a término emparejados por sexo, edad y curso escolar. Se utilizaron pruebas que incluían estructuras simples y complejas para evaluar la semántica, la morfosintaxis y la fonología, así como una prueba de memoria verbal. Los niños prematuros, independientemente de su grado de prematuridad, han demostrado resultados significativamente inferiores a los de sus compañeros, y más de la mitad de ellos, el 52%, presentaron puntuaciones bajas en todas las pruebas lingüísticas en simultáneo, enseñando un importante déficit lingüístico. Al contrario, en el grupo de niños nacidos a término solo el 14% mostró puntuaciones bajas en simultáneo en todas las pruebas. La capacidad de memoria verbal resultó inferior a la de sus compañeros a término, independientemente de la edad gestacional y el peso al nacer de los niños prematuros. Como resultado de este análisis, consideramos que la evaluación del desarrollo lingüístico de estos niños, incluso en los casos de prematuridad moderada o tardía, debe ser objeto de seguimiento para identificar antes la existencia de déficits y prevenir problemas psicosociales y de aprendizaje.
Palabras clave: lenguaje oral, prematuro, aprendizaje, niños en edad escolar

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Introduction

In the last three decades, advances in neonatology have promoted an increase in the survival of preterm (PT; gestational age below 37 weeks of gestation) and low birth weight new-borns (weight at birth below 2500 gr.) (Instituto Nacional de Estatística, IP, 2020). In Portugal, in the last five years, the number of births has been decreasing sig-

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nificantly, contrary to the fact that we are faced with an increase in preterm births, making this condition, in itself, a reason to better understand the impact of prematurity on neurodevelopment at different ages. This concern has motivated several different types of research, in order to understand whether gestational age and birth weight are risk factors for neurodevelopment disorders in this population.

The results of an important meta-analysis and systematic review involving 64,061 children, which aimed to quantify the performance of preterm children in different areas of neurodevelopment at different ages, indicate that there is a strong relationship between gestational age and cognitive abilities, both in very preterm children and those with moderate to late prematurity. Deficits in different areas of neurodevelopment observed in early childhood and school age persist beyond the 1st cycle in all domains. Premature children, compared to their term peers, had a lower performance in terms of cognitive, language, motor, and academic abilities. At the behavioural level, they obtained higher scores indicative of a diagnosis of attention deficit hyperactivity disorder (Allotey, et al., 2017).

One of the findings reported in several studies has been language disabilities, manifesting themselves as the most common difficulties encountered in preterm (PT) born infants (Guarini, et al., 2009). However, the existence of neurodevelopmental disorders in cases of moderate and late prematurity (from 32 to 37 weeks of gestational age) are not sufficiently clarified.

Some studies have analysed the cognitive performance of PT children with low relevance risk factors and PT children with high risk factors for neurodevelopment. A wide heterogeneity in the neuropsychological profile of children born prematurely was observed, dependent on the interaction of several factors: the degree of neonatal immaturity, medical complications, neurological changes, environmental, and social factors (Aylward, 2002; D'odorico, Costantini, & Cassibba, 2010). It was found that the most frequent deficits in children born prematurely, are not severe neuromotor deficits, but rather minor neurosensory disorders (Allen, 2008)

The development profile of a PT child can be considered atypical and not just "delayed" in different areas of neurodevelopment (Sansavini, Guarini, & Caselli, 2011). Even premature children with low risk factors may have specific cognitive deficits due to prematurity, such as: motor-eye coordination disorder; explicit and auditory memory disorder, and when achieving school-age, may present learning difficulties related to higher executive functions (attention, work memory and reasoning) (Bhutta, Cleves, Casey, & Anand, 2002; Schirmer, Portuguez, & Nunes, 2006; Woodward, Thompson, Inder, & Edgin, 2005)

From the age of 6, when formal learning of basic skills such as reading, writing and arithmetic begins, the main concern in relation to neurodevelopment is the schooling process. As it is quite complex, this process requires a series of skills that are pre requisites for academic skills to develop. As a result of the possibility of an atypical trajectory of neurodevelopment in PT children, it is not surprising that the lack of these prerequisites is reflected in their academic performance (Allen, 2008; Clark, et al., 2013; Odd, Evans, & Emond, 2019).

To assess the effects of prematurity on language development and the acquisition of reading and writing, some authors have sought to identify specific language difficulties that persist at school-age. They observed that school-age PT children present greater difficulties with complex language functioning (Noort-van der Spek, Franken, & Weisglas-Kuperus, 2012) because at the age of eight, during the language consolidation phase (grammar understanding, lexical production and phonemic fusion) and in the initial phase of literacy consolidation (reading and writing), their performance is significantly lower than that of their term peers (Guarini, Sansavini, Fabbri, Faldella, & Karmiloff-Smith, 2010).

A systematic review and meta-analysis to determine the developmental course of language functions in preterm-born children from 3 to 12 years of age has demonstrated that the preterm born children score significantly lower compared with term born children on simple, as well as on complex, language function tests throughout childhood, even in the absence of major disabilities. For complex language function, group differences between both preterm and term born children significantly increased from 3 to 12 years of age. These results suggest that complex language function might be a more useful index of language functioning in preterm born children than simple language function. From a linguistic perspective, this finding could be explained by the fact that complex language function depends more on higher order semantic and syntactic knowledge, entailing integration across language domains and having a significant working memory component (Noort-van der Spek, J. P. Franken, & Weisglas-Kuperus, 2012).

These difficulties can be explained by the changes in brain areas linked to language abilities observed in studies based on neuroimaging, such as: changes in microstructures of the arched fascicle (Salvan, et al., 2017) and specific properties of the white substance found in the brains of children born PT (Acheson, Hamidi, Binder, & Postle, 2011). It has also been found that the size of the adolescent's brain is smaller and shows a significant correlation with the intelligence quotient, with the digit span and with the reading abilities shown for that age (Feldman, Lee, Yeatman, & Yeom, 2012; Peterson, et al., 2002). The presence of deficits in complex language functions in school age preterm children could be an indication that the plasticity of the developing brain is limited (Noort-van der Spek, J. P. Franken, & Weisglas-Kuperus, 2012).

The main objective of this study is to analyse the influence of prematurity in the various domains of oral language and to verify whether there are differences in linguistic performance between children born prematurely and their peers born term. The aim is to analyse this performance according to the degree of prematurity of children according to the classification of the World Health Organisation (WHO, 2018): a) Extremely preterm (<28 weeks); b) Very preterm (28 to <32 weeks), and c) Moderate to late preterm (32 to <37 weeks).

Methods

Participants

All children in the study were attending primary school in public and private schools in the Autonomous Region of Madeira, Portugal. The study includes 27 children born preterm (PT) in 2007 and 2008, between the ages of 7 and 8, without neurological pathology (cerebral palsy and related neurological diseases) and without being diagnosed with intellectual deficit. This number corresponds to the total number of children born in the public hospital network of Madeira in the years indicated, and who fulfilled the required characteristics. The contrast group includes 49 children and was formed taking into account the following requirements: for each child born prematurely, 2 term born (T) were selected in the same calendar year, of the same gender, attending the same classroom, and with no diagnosed language and/or learning difficulties. In 5 cases only one contrast child could be recruited per each PT child. There were no statistically significant differences in age between the two groups (t=1.916, df=74, p=.06) (Table 1). All children attended school between the 2nd to the 4th grade (Table 1).

Table 1. Characteristics of pre-term (PT) and term (T) children.

	PT	T
Age M ± SD	9.1 ± 0.5	8.8 ± 0.8
Gender Male Female **Total**	 16 11 **27**	 29 20 **49**
Gestational age M ± SD Range	 33.7 ± 4.2 26 - 36	 40.2 ± 1.7 37 - 44
Birth weight	1 583.9 ± 520.5 814 – 2 700	3 357.3 ± 305.3 2 710 – 3 960
School Year 2º year 3º year 4º year	 7 12 8	 10 23 16

Regarding the descriptive measures of the variables gestational age (GA) and birth weight (BW), it was found that in the PT group the mean GA was 33.7 weeks and the mean birth weight was 1583.9 g. In the term group, the mean GA was 40,2 weeks and the mean BW was 3357.3 g (Table 1).

In the PT children, all preterm subcategories are represented (Table 2), although the extremely preterm category (GA<28 weeks) is only represented by three children and the very preterm (28 to <32 weeks) by 13 children. The total of these two subcategories is 16 children, most of whom are male. As for the birth weight, the majority of children were born below 1500 gr. In the group of moderate to late preterm children, composed of 11 children, the majority are also male, and all of them had a birth weight above 1500 gr.

Table 2. Subcategories of preterm birth based on gestational age (GA).

GA	Gender		Birth Weight (gr)		Total
	Male	**Female**	**<1500**	**≥1500**	
	N	**n**	**n**	**n**	**n**
Extremely Preterm (< 28 weeks)	2	1	3	0	3
Very preterm (28 to <32 weeks)	8	5	8	5	13
Moderate to late preterm (32 to <37 weeks)	6	5	0	11	11
Total	**16**	**11**	**11**	**16**	**27**

Instruments

For the oral language evaluation, the tests used were measured for the Portuguese population, with normative reference data for the different age groups. For the generic assessment of oral language skills, a language test was used for school children (*GOL-E; Grelha de Observação da Linguagem – idade escolar*) (Sua-Kay & Santos, 2014), which aims at assessing abilities at the level of semantic structure (definition of words, semantic categorisation and naming of opposites), morphosyntax (recognition of agrammatical sentences, coordination and subordination of sentences, word ordering and derivation of words), and phonology (auditory discrimination of words and pseudo-words, identification of rhymes and syllabic segmentation). Maximum score: 122.

The assessment of complex abilities in semantics was carried out through a specific test for this purpose (*TAS; Teste de Avaliação Semântica*) (Sua-Kay, Santos, & Tavares, 2014), with tasks concerning syntagmatic relations, lexical field, synonymy/antonymy, and paronyms. Maximum score: 98.

For verbal memory analysis was used a verbal memory span test (*TMP; Teste de Memória de Palavras*) (Teixeira & Santos, 2016), which aims to observe the capacity of verbal memory through tasks of repeating word sequences (3,4,5 and 6 words) in three attempts. Maximum score: 54.

When testing, the rules of application set out in the manual for each test were taken into account. Data was collected in the morning, individually and in the same manner for all children. The order of the application of the tests was as follows: TAS, TMP and GOL-E, so that the most complex tasks were carried out at the beginning of the assessment. The 76 children were assessed between February and March 2018 in their respective schools.

Procedures

For general information about the child, such as personal history (pregnancy, childhood, schooling), and possible impairments, was consulted the interview protocol of medical history used in the hospital unit where the children were born. The missing data was collected from the respective parents/carers. All parents/carers gave their informed consent before the evaluation process, and confidentiality relating to participants and data was guaranteed. The study was authorised by the Ethics Committee of the Regional Health Service of the Autonomous Region of Madeira.

Data Analyses

The statistical treatment of data was based on the use of descriptive methods and methods of statistical inference. The methods associated with statistical inference allowed assessing the differences between the study groups, term and preterm, through parametric tests, the T-Student test for independent samples, or non-parametric tests, without normality restrictions, such as the Mann-Withney test. The normality of the variables under study was assessed by the Kolmogorov-Smirnov or Shapiro Wilk tests, depending on the sample size to be tested. For paired samples, the significance of the difference between the two paired measurements was assessed using the Wilcoxon Test, used as a non-parametric alternative to the T-Student test when the assumption of normal distribution of the variable in the two measurements is not verified.

After conducting all the tests, a detailed descriptive analysis of the results obtained was carried out and a general comparison of the results obtained between the study group (PT) and the contrast group (T) was made through the t-Student test for paired samples, using the mean obtained by each pair of contrast children. We also compared the results according to the degree of prematurity by creating two groups of PT children: group A which included 16 children (3 extremely preterm and 13 very preterm) and group B which included 11 children (moderate to late preterm). Thus, in order to understand whether the gestational age and birth weight influence the results obtained within the group of premature children, an analysis using the non-parametric Mann-Whitney test was carried out for two subgroups of premature children: group A and group B. For the analysis of the influence of birth weight, a weight below 1500 gr and equal to or above 1500 gr was considered, in the total of the group of PT children. Pearson's correlation coefficient was applied to determine whether there was a correlation between the different linguistic domains evaluated in these children.

Results

The results are grouped according to the results obtained in each assessment test, starting with a comparison of the performance of the preterm group with the term group and then analysing the preterm children according to gestational age and weight at birth.

1. Generic language assessment (GOL-E) – preterm and term children

Significant differences were observed between the two groups in all linguistic structures - semantics, morphosyntactic and phonology - with premature children always underperforming in the total results of all tests (Table 3).

Table 3. Results on general language tasks (GOL-E).

GOL-E		Group			
		PT	T	t (df)	P
Semantics	M ± SD	24.78 ± 6.46	28.28 ± 2.76	-2,65 (26)	.014
	Range	11.00 – 34.00	23.00 – 35.00		
Morphosyntax	M ± SD	33.11 ± 9.07	37.80 ± 4.26	-2,44 (26)	.022
	Range	16.00 – 46.00	26.50 – 46.00		
Phonology	M ± SD	36.33 ± 4.89	39.02 ± 1.58	-3.10 (26)	.005
	Range	18.00 – 40.00	36.00 – 43.00		
Total	M ± SD	94.22 ± 18.71	105.09 ± 6.00	-2.93 (26)	.007
	Range	49.00 – 120.00	91.50 – 115.50		

t-Student Test for paired samples.

1.1. Generic language assessment in PT children

The analysis of the performance of PT children according to the prematurity subcategory showed that there are statistically significant differences in language assessment (GOL-E), between the two groups, for the morphosyntactic component and for the total value that is, children extremely or very preterm present significant inferior performance in morphosyntactic tasks (table 4).

Table 4. Results of general language tasks (GOL-E) in preterm groups.

Preterm Groups		Semantics	Morphosyntax	Phonology	Total
Group A	M ± SD	23.5 ± 7.2	29.4 ± 9.1	35.3 ± 5.7	88.1 ± 19.9
	Range	11 – 34	16 - 46	18 - 40	49 - 120
Group B	M ± SD	26.6 ± 4.8	38.6 ± 6.0	37.9 ± 3.1	103.1 ± 13.1
	Range	18 – 34	25 - 46	31 - 40	77 - 120
Mann-Whitney U test	U	65.0	34.0	52.0	47.5
	p	.25	.008	.072	.045

Regarding the variable weight at birth, PT children under 1500 gr. had a significantly lower performance also in morphosyntactic tasks (M=28.64 ± 8.02 vs M=37.47 ± 7.23, p=.009) and for the total value of GOL-E (M=86.64 ± 19.09 vs M=101.93 ± 14.36, p=.043).

2. Assessment of complex semantic tasks (TAS) – preterm and term children

It was verified that there are statistically significant differences between the two groups in all the components of the semantic complex test (lexical field, syntactic relations, synonyms and antonyms, and paronyms) with the worst results being for the PT group (table 5).

Table 5. Results on Semantics tasks (TAS).

TAS		Group		t (df)	p
		PT	T		
Lexical field	M ± SD	12.07 ± 4.20	14.46 ± 2.33	-2,74 (26)	.011
	Range	5.00 – 21.00	9.00 – 17.50		
Syntagmatic relations	M ± SD	14.93 ± 5,66	18.41 ± 3.08	-3,28 (26)	.003
	Range	5.00 – 23.00	10.50 – 22.50		
Synonyms / Antonyms	M ± SD	12.37 ± 5.57	16.22 ± 2.94	-3,66 (26)	.001
	Range	0.00 – 23.00	6.00 – 20.00		
Paronymous	M ± SD	13.41 ± 5.37	17.07 ± 2.93	-2,98 (26)	.006
	Range	1.00 – 21.00	11.00 – 21.50		
Total	M ± SD	52.78 ± 18.26	66.17 ± 9.58	-3,71 (26)	.001
	Range	20.00 – 83.00	40.00 – 81.00		

t-Student Test for paired samples.

2.1 Evaluation of complex semantic tasks in PT children

When comparing the mean results of the semantic evaluation, by component, according to gestational age, the differences found were statistically significant for all of them. We observed that children extremely or very preterm show a significantly lower performance when compared to the group with moderate to late prematurity (table 6).

Table 6. Results on Semantics tasks (TAS) in preterm groups.

Preterm Groups		Lexical field	Syntagmatic Relations	Synonyms /Antonyms	Paronymou	Total
Group A	M ± SD	10.3 ± 2.7	13.3 ± 5.3	10.3 ± 2.2	11.7 ± 5.2	45.5 ± 11.7
	Range	6 – 15	5 – 22	7 – 15	1 – 21	22 – 61
Group B	M ± SD	14.7 – 4.7	17.4 – 5.5	15.4 – 7.5	15.9 – 4.8	63.4 – 21.3
	Range	5 – 21	7 – 23	0 – 23	7 – 21	20 – 83
Mann-Whitney U test	U	32.0	45.0	40.0	44-5	30.5
	p	.005	.033	.017	.031	.003

The differences regarding birth weight, are also statistically significant for all components: lexical field (M=10.09 ± 2.7 vs M= 13.80 ± 4.4, p=.023), paronyms (M=11. 73 ± 3.79 vs M= 15.47 ± 5.05, p=.033), synonyms and antonyms (M=10.27 ± 2.37 vs M=14.20 ± 6.72, p=.045) and for the total of the test (M= 46.18 ± 10.79 vs M= 59.67 ± 19.58, p=.035).

3. Verbal memory span (TMP) – preterm and term children

In the verbal memory evaluation, it was found that in the first two repetitions children from both groups gave identical answers, but in the third repetition the PT group performed less successfully, as well as performing less effectively in the total results of the testing (table 7).

Table 7. Results on verbal memory tasks (TMP) of preterm and term children.

Repetition		Group		t (df)	p
		PT	T		
1ª R	M ± SD	9.59 ± 2.87	10.64 ± 1.78	-1,50 (26)	.114
	Range	3.00 – 15.50	7.75 – 14.00		
2ª R	M ± SD	12.00 ± 2.86	13.29 ± 1.58	-1,99 (26)	.057
	Range	6.00 – 15.50	10.00 – 15.50		
3ª R	M ± SD	12.70 ± 3.41	14.81 ± 1.86	-2,76 (26)	.010
	Range	5.00 – 18.00	11.25 – 18.00		
TOTAL	M ± SD	34.30 ± 8.33	38.73 ± 4.62	-2,31 (26)	.029
	Range	15.00 – 44.50	30.50 – 46.25		

t-Student Test for paired samples

3.1 Verbal memory span in premature children

There were no statistically significant differences in word memory due to gestational age or birth weight in the group of PT children (Table 8).

Table 8. Results on verbal memory tasks (TMP) in preterm groups.

Preterm Groups		1ª R	2ª R	3ª R	Total
Group A	M ± SD	10.2 ± 3.2	11.7 ± 2.8	12,2 ± 3.3	34.0 ± 8.7
	Range	3.0 – 15.5	7.0 – 15.5	7.0 – 17.0	18.0 – 44.5
Group B	M ± SD	8.8 ± 2.3	12.5 ± 3.0	13.5 ± 3.6	34.7 ± 8.2
	Range	4.0 – 11.0	6.0 – 15.0	5.0 – 18.0	15.0 - 43.5
Mann-Whitney U test	U	58.5	70.0	65.0	86.5
	p	.143	.372	.255	.941

From the analysis made to the total values obtained in the three oral language assessments, it can be seen that PT children have a lower performance profile when compared to their term peers (Figure 1). The comparison between PT children with lower or higher prematurity showed that the overall performance is better in group B (Figure 2).

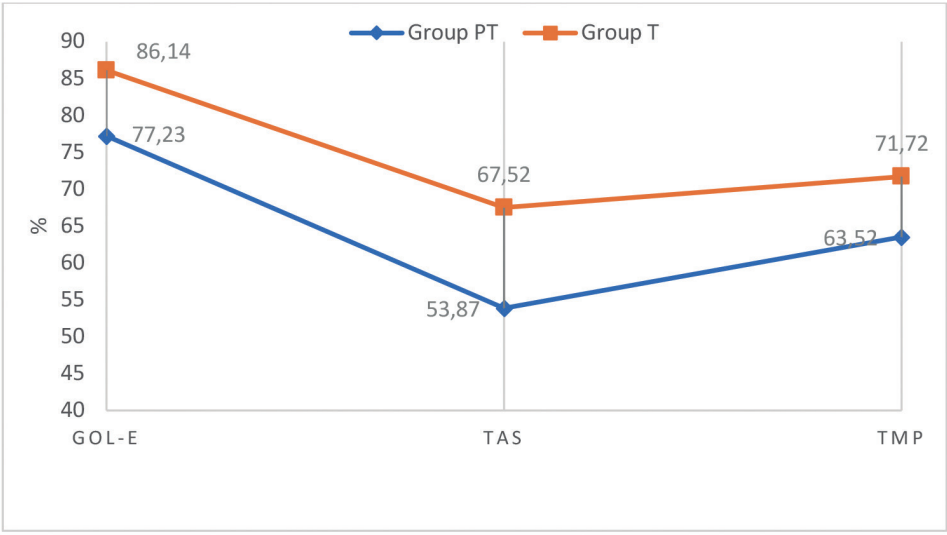

Fig. 1. Mean percentage score of right answers of preterm and term children on the language tests.

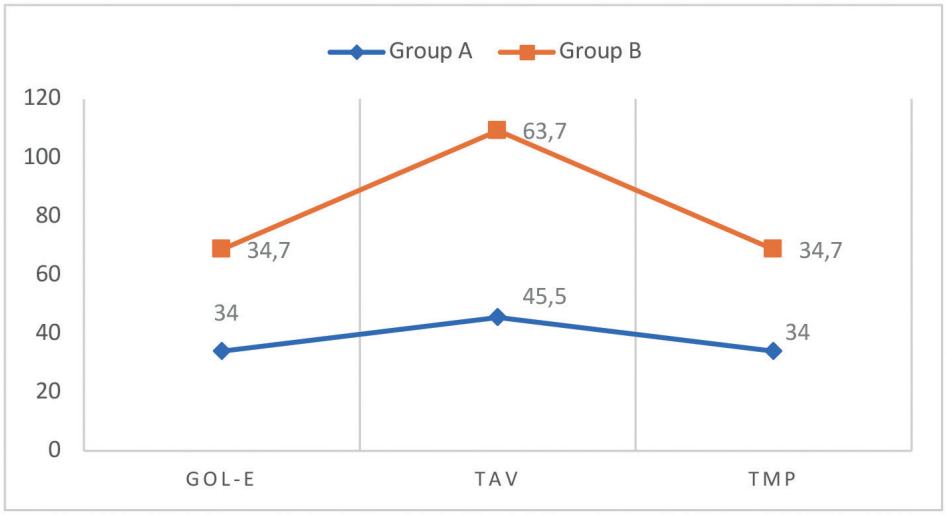

Fig. 2. Mean percentage score of right answers of preterm children on the language tests.

4. Overall results of the three language tests

There is a statistically significant association, represented by a positive linear correlation coefficient, between the results of the three language tests – GOL-E (general language components), TAS (complex semantics), and TMP (verbal memory) in PT children. The higher the value obtained in one of them, the higher the values in the other language tests (table 9).

Table 9. Correlation between language tests in preterm children.

Tests		TMP	TAS	GOL-E
TMP	Pearson Correlation Coefficient	-	.640**	.747**
	P	.	.000	.000
TAS	Pearson Correlation Coefficient	.640**	-	.863**
	P	.000	.	.000
GOL-E	Pearson Correlation Coefficient	.747**	.863**	-
	P	.000	.000	.

Of the 27 preterm children, 14 (52%) obtained scores below the mean values expected for their age in all language tests, thus distributed: extremely preterm to very preterm – 10 (out of 16); moderate to late preterm – 4 (out of 11). So, it is possible that a great part of preterm born children will have important language deficits in the future. In the contrast group of 49 children, only 7 (14%) obtained scores below mean values in all language tests.

Discussion

The literature review shows that the language level of children born prematurely can be lower when compared to their school-aged peers (Allen, 2008; Feldman, Lee, Yeatman, & Yeom, 2012). In the present study we confirmed this assumption and found that regardless of the degree of prematurity, many of these children may present language deficits in the future and a high probability of learning problems, since the teaching and learning process at school is based on oral language. We found results below the normative expected values for age in all the linguistic components (semantics, morphosyntax, and phonology) in more than a half of the observed subjects, especially in extremely and very preterm children. However, there were no differences between the results obtained on verbal memory tasks by preterm children, in average always below the results of the contrast group.

The preterm children do not show the improvement with the word repetition observed in their term peers when testing verbal memory. Scientific evidence shows that memory abilities, specifically those related to the temporary

storage of verbal information, are associated with language development (Snowlling & Nag, 2012) Prematurity is a potential biological factor that correlates with verbal memory ability and in turn with linguistic performance, specifically expressive language (D'odorico, Costantini, & Cassibba, 2010). The present study tends to validate these statements, as we found that premature children had lower results in comparison to their peers, in both expressive language and verbal memory. Contrary to what might have been expected, there were not many differences between children with a higher or lower degree of prematurity in general language tasks and in verbal memory. In both groups the results obtained differed only in morphosyntactic and in complex semantic tasks. However, these differences became somewhat more evident when comparing birth weight. An important aspect was that there was no influence on verbal memory of either gestational age or birth weight, which could be influenced by the fact that the group of extremely premature children included only 3 subjects.

If the existence of an adequate linguistic processing depends on the complex interaction of functions of the cognitive domain, where the attentional, mnesic and executive processes stand out, we may question as to whether the difficulties presented by PT children, may be compromised due to changes at the level of the different stages of the mnesic process, which are: acquisition/codification; retention/consolidation, and recovery/evocation (Aylward, 2002; Baddeley, 2003).

Another important aspect of the learning process is working memory. Based on the assumption that this is an important factor for the understanding of language, which intervenes in problem solving, in the performance of complex tasks and in the acquisition of new knowledge; it is evident that the results obtained in tasks of generic oral language, as well as, in tasks of semantic domain and verbal memory, proving that premature children are vulnerable in these areas, since atypicality is visible in linguistic development when compared with their term peers (Acheson, Hamidi, Binder, & Postle, 2011; Baddeley, Hitch, & Allen, 2009; Riva, Cantiani, Marini, Dionne, & Marino, 2017). An important factor that correlates with language performance in children born preterm is attention capacities. It is known that lower gestational age was significantly related to lower alerting attention capacities and lower receptive language functioning (Allotey, et al., 2017; Noort-van der Spek, Franken, & Weisglas-Kuperus, 2012; Snijders, Bogicevic, Verhoeven, & Van Baar, 2020;).

The results of this study show that children born prematurely, even those born of late to moderate prematurity, present a lower linguistic performance that is strictly related to verbal memory skills. Based on this assumption and taking into account the results of the literature review, it may be suggested that this performance may also be associated with attention difficulties, once it is also mentioned as a consequence of prematurity. These limitations may imply learning difficulties at school as it is based essentially on verbal skills (Snowlling & Nag, 2012).

Limitations

The small sample size of children born preterm is considered a limitation of this study. Due to the heterogeneity of the sample and its number, it was not possible to characterise the linguistic profile in all degrees of prematurity, considering gestational age and birth weight.

Conclusions

Preterm born children, regardless of their prematurity grade, showed significantly lower results than their peers, presented low scores in all language tests simultaneously, showing an important language deficit. Verbal memory ability proved to be lower than that of their term peers, regardless of the gestational age and birth weight of preterm children. As a result of this analysis we consider that the evaluation of the linguistic development of these children, even in cases of moderate to late prematurity, should be monitored in order to identify earlier the existence of deficits and prevent psychosocial and learning problems. Therefore, we defend a paradigm shift in the monitoring of these children, in pre-school and school level, who often do not show any disorders and are therefore not "flagged", reinforcing the need to intervene in time to allow for a more balanced development and successful learning.

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