

## The Relationship between Premature Birth and the Size of Expressive Lexicon in 18-36-month-old Children

Mahmood Bijankhan<sup>1</sup>, Hamid Reza Badeli<sup>2</sup>, Afagh Hassanzadeh Rad<sup>3\*</sup>, Zahra Hassanzadeh rad<sup>4</sup>, Elaheh Nouri<sup>5</sup>, Setila Dalili<sup>6</sup>

<sup>1</sup>Department of linguistics, Professor, University of Tehran, Tehran, Iran

<sup>2</sup>Pediatric Growth Disorders Research Center, Associate professor, 17 Shahrivar Hospital, Gilan University of Medical Sciences, Rasht, Iran

<sup>3</sup>Pediatric Growth Disorders Research Center, Ph.D Candidate of Linguistics, 17 Shahrivar Hospital, Gilan University of Medical Sciences, Rasht, Iran

<sup>4</sup>Ph.D Candidate of Linguistics, Payame Noor University, Tehran, Iran

<sup>5</sup>MA of linguistics, University of Mazandaran, Sari, Iran

<sup>6</sup>Pediatric Growth Disorders Research Center, Assistant professor, 17th Shahrivar Hospital, Gilan University of Medical Sciences, Rasht, Iran

\*Corresponding author: Pediatric Growth Disorders Research Center, Ph.D Candidate of Linguistics, 17 Shahrivar Hospital, Gilan University of Medical Sciences, Rasht, Iran

E-mail: afaghrad@ut.ac.ir

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### Abstract

**Introduction:** The acquisition of speech and language constitutes a dynamic part of two-year-old children's growth. Expressive lexicon is a key indicator of language ability in these children. Premature birth, birth before gestational week 37, is one of the most common risk factors associated with learning skill development. A review of literature suggests inconsistent results on the relationship between preterm birth and the size of expressive lexicon in children.

**Objective:** The present study was conducted to investigate the relationship between preterm birth and the size of expressive Lexicon in 18-36-month-old Persian-speaking children.

**Materials and Methods:** The present controlled analytical cross-sectional study recruited 18-36-month-old children presenting to 17 Shahrivar Hospital in Rasht, Iran. The study children were divided into the term and preterm groups. Before beginning the sampling, the children were assigned to three age groups of 13 each, including 18-24 months, 24-30 months and 30-36 months. The data collection tools comprised the 688-item MacArthur-Bates Communicative Development Inventory (CDI, form II), which was completed by the parents. Moreover, all the words were divided into four groups of social terms, common nouns, grammatical words and predicates, and the scores obtained for each category were compared among the groups. The data obtained were assessed using descriptive statistics of mean and standard deviation, and analytical t-test.  $P < 0.05$  was set as the level of statistical significance.

**Results:** The overall mean size of expressive lexicon was found to be  $352.48 \pm 177.11$  in the term children and  $240.28 \pm 135.93$  in preterm ones, suggesting significant differences between the two groups ( $P = 0.002$ ). Significant differences were also observed between the term and preterm 18-36-month-old children in terms of common nouns as a dimension of the tool ( $P = 0.01$ ).

**Conclusion:** Parents seem to play a key role in reducing preterm-birth associated lexicon differences at higher age by teaching their children.

**Keywords:** Premature Birth, Child Language, Child

## Introduction

The acquisition of speech and language is crucial for child development, in which social interactions play a key role. Theoretical data suggest positive relationships between language development and social skills [1], which are supported by different language acquisition theories and the interactive language model proposed by Clark. Language acquisition in this model comprises progressive mutual interactions between children's and parents' behaviors, and language developmental delays impair both the dynamism of these interactions and constructive social experiences [2]. Language acquisition constitutes a dynamic part of child development and expressive Lexicon is a key indicator of language ability at the age of two [3]. Researchers define a word as a fixed phonetic form that is used to point to an object or special events or to classify objects. A sudden increase occurs in the rate of learning Lexicon in 18-19-month-old babies [4]. During this Lexicon spurt, children's expressive Lexicon expands at a rate of five words a week [5]. Research suggests that the peak Lexicon spurt occurs in 20-22 month-old children and that the mean length of utterance is positively associated with the early Lexicon size in children [6]. Studies have shown that children with continued developmental delays in expressive Lexicon in the first three years will suffer deficiencies in phonetic, morphology and syntactic skills as well as in other language skills later in life, and language problems will continue and turn into specific language impairment (SLI) in 50% of these children [5, 7, 8]. Children with SLI are often incapable of communicating compared to their peers, and the inability of spontaneously combining words is the first delay observed at the age of 18-24 months. The emergence and development of grammar is associated with children's lexical development [9], which can be affected by

different factors, including preterm delivery, which is a common risk factor for learning skill development [10]. Immaturity is considered a key factor in infant mortality and morbidity [11]. A review of literature suggests contradicting results on the relationship between preterm birth and the size of children's Lexicon, ranging from no significant differences between preterm and term children [8, 12, 13] to significant differences in the size of Lexicon [14-16]. The present study was therefore conducted to determine the relationship between preterm birth and the size of expressive Lexicon in 18-36-month-old Persian-speaking children presenting to 17 Shahrivar Hospital in Rasht, Iran.

## Materials and Methods

The present controlled analytical cross-sectional study was conducted using convenience sampling. Group 1 comprised 39 premature 18-36-month-old children and the control group consisted of 39 term 18-36-month-old children presenting to 17 Shahrivar Hospital in Rasht. Based on the study conducted by Soraya et al. [17], who reported an overall mean size of Lexicon of  $411 \pm 188.88$  in term children and  $268 \pm 188.43$  in preterm children, and according to chronological age of the subjects, each group was subdivided into three 13-subject age groups including 18-24-month-olds, 24-30-month-olds and 30-36-month-olds.

The eligibility of 45 children in the control group and 40 in the case group was investigated and those having a history of genetic and congenital syndromes or genetic syndromes in their first-degree relatives, confirmed neurological problems, hearing problems and multilingual cases were excluded. The children's mothers were briefed on the data collection procedure and asked to sign informed consent forms before beginning the sampling. The controls were then selected from eligible candidates with stable health conditions and at their final

stage of treatment in non-intensive care units.

Kazemi et al. evaluated the face and content validity of the data collection tool, i.e. the CDI, forms II [18]. This 688-item inventory is the single tool standardized in Iran and is used as an efficient and valid instrument for measuring language development in early childhood. This tool embodies 22 lexical categories, 11 of which are dedicated to nouns associated with animals, furniture, toys, food and drink, clothes, body parts, household objects, rooms, outdoor objects, places and people, while other categories include games, daily routines, function words, adjectives, time words, pronouns, question words, prepositions, numerical values, articles, auxiliary verbs and conjunctions [18], which were reviewed and then completed by the parents. The items confirmed by the parents received a score of 1, and the total score ranged between 0 and 688. During the actual assessment, the parents were briefed on the importance and sensitivity of their responses and asked to complete the forms within 30-45 minutes. The mothers were asked to mark only the words that their children used spontaneously rather than those they copied. In addition, all the words were classified into four main categories of social terms, common nouns, grammatical words and predicates. The scores obtained from each category were compared between the study groups.

1- Social terms included environmental and animal sounds, games, daily routines and people. 2- Common nouns were associated with animals, vehicles, toys, food and drink, clothes, body parts, furniture and rooms, household objects, places and outdoor objects. 3- Grammatical words included time words, question words, pronouns, prepositions, situations, quantities and conjunctions.

4- Predicates included verbs, auxiliary verbs and modifiers. The normality of the data was confirmed using the

Kolmogorov-Smirnov test ( $P > 0.05$ ). The data obtained were analyzed in SPSS-19 using descriptive statistical tests of mean and standard deviation and analytical tests such as t-test.  $P < 0.05$  was set as the level of statistical significance and 95% as the confidence interval.

### Results

Of a total of seventy-eight 18-36-month-old children, 39 (50%) were male and 39 (50%) female. First-borns comprised 2.87% of the subjects, and no significant differences were observed between the two groups in terms of age and the number of children ( $P > 0.05$ ). The overall mean Lexicon size was found to be  $352.48 \pm 177.11$  in the term 18-36-month children and  $240.28 \pm 135.93$  in preterm ones, suggesting significant differences between the two groups ( $P = 0.002$ ).

Although the highest overall mean Lexicon size was found in 30-36-month-old children in both term and preterm groups, the differences were not significant ( $P = 0.41$ ); however, significant differences were observed in the overall mean Lexicon size ( $P = 0.001$ ), which was found to be  $403.69 \pm 95.15$  in term children and  $209.46 \pm 116.84$  in preterm children at the age of 24-30 months.

Significant differences were also observed between the term and preterm 18-36-month-old children in terms of common nouns ( $P = 0.01$ , Table 1); however, no significant differences were found between preterm and term children both at the age of 18-24 months and 30-36 months in terms of the overall mean Lexicon size and word categories ( $P > 0.05$ ), but common nouns was found to be significantly different in 30-36-month-old children (Table 2). Moreover, the preterm and term 30-36 month-old children were found to be significantly different in terms of the overall mean size of Lexicon, common nouns and social terms ( $P < 0.05$ , table 2).

**Table 1. Comparison of demographic characteristics and the mean size of expressive Lexicon in term and preterm 18-36-month-old children**

Variables	Frequency	18-36-month-old children	Sig.*
		Mean ± SD	
<b>Age</b>			
Preterm	39	27.53±5.71	0.65
Term	39	26.94±6.0	
<b>Gestational age at birth</b>			
Preterm	39	35.20±0.89	0.01
Term	39	38.51±0.64	
<b>Overall size of Lexicon</b>			
Preterm	39	240.28±135.93	0.002
Term	39	352.48±177.11	
<b>Social terms</b>			
Preterm	39	33.17±15.25	0.130
Term	39	42.94±18.41	
<b>Common nouns</b>			
Preterm	39	109.79±73.52	0.010
Term	39	197.87±101.00	
<b>Grammatical words</b>			
Preterm	39	29.33±14.11	0.593
Term	39	31.48±20.70	
<b>Predicates</b>			
Preterm	39	64.17±42.59	0.085
Term	39	82.79±51.11	

\* Independent T-Test

## Discussion

Significant differences were observed in the overall mean Lexicon size between the term and preterm children in both groups of 18-36-months and 24-30 months.

Mahmoudi-Bakhtyari et al. also reported statistically significant differences in the mean size of expressive Lexicon between the two groups at age 18-36 months; however, their pair wise comparison of different age groups, including 18-24 months, 24-30 months and 30-36 months, suggested no significant differences [19]. Isotani et al. reported smaller sizes of expressive Lexicon in preterm children

compared to in term children [14], which is consistent with the study by Jansson-Verkasalo et al. using CDI form II [12]. Furthermore, recent studies suggest language delay in preterm children compared to in term children [15, 16], while the study conducted on 2-year-old Finnish children using the CDI showed no significant differences between preterm and term children in Lexicon size [12]. Similarly, Stolt et al., who used the same tool, found no significant differences in Lexicon size between 66 preterm children and 87 term children [8], as was the case in a study in Italian children [15].

**Table 2. Comparison of demographic characteristics and the mean size of Lexicon in term and preterm children by their age group**

Variables	18-24-month-old children	Sig.*	24-30-month-old children	Sig.*	30-36-month-old children	Sig.*
	Mean ± SD		Mean ± SD		Mean ± SD	
<b>Age</b>						
Preterm	21.00±2.12	0.313	27.38±1.68	0.900	34.23±1.16	0.234
Term	20.07±2.52		27.46±1.50		33.50±1.78	
<b>Gestational age at birth</b>						
Preterm	35.30±0.94	0.010	35.15±0.80	0.001	35.15±0.98	0.001
Term	38.42±0.51		38.61±0.76		38.5±0.67	
<b>Overall size of Lexicon</b>						
Preterm	141.00±74.38	0.227	209.46±116.84	0.001	370.38±96.37	0.410
Term	197±148.13		403.69±95.15		477.66±147.80	
<b>Social terms</b>						
Preterm	23.69±12.67	0.368	30.53±11.45	0.001	45.30±13.43	0.499
Term	28.92±16.56		52.23±14.17		49.25±15.25	
<b>Common nouns</b>						
Preterm	64.38±34.09	0.680	95.07±72.83	0.001	169.92±65.33	0.001
Term	109.57±78.98		217.53±0.45		279.58±82.76	
<b>Grammatical words</b>						
Preterm	22.46±14.32	0.220	28.38±14.39	0.170	37.15±9.99	0.195
Term	15.78±15.14		36.07±13.30		45.58±20.28	
<b>Predicates</b>						
Preterm	32.69±23.29	0.347	55.23±33.68	0.06	102.07±37.34	0.67
Term	45.85±44.13		73.16±33.18		109.66±52.26	

\* Independent T-Test

The present study found the overall mean size of expressive Lexicon to be smaller in immature children compared to in term children, which is consistent with previous studies [15, 16, 18]. Research suggests severe delays in preterm children's early Lexicon growth and also negative relationships between the duration of mothers' pregnancy and the size of expressive Lexicon in newborns [15], which is inconsistent with the study by Stolt et al. on the mean Lexicon size in two-year-old children [8]. The present study found positive relationships between the overall mean size of expressive Lexicon and age, which is consistent with previous studies [16, 19]. Nevertheless, child growth, learning and the size of Lexicon seem to be normally associated with age. Given the insignificant differences found in the present study between the two groups in terms of the

overall Lexicon size in 30-36-month-old children, proper training of children may seem to help reduce the difference between age groups at higher ages, as suggested by Stolt et al., who reported highly parallel Lexicon developmental paths in preterm and full-term children as well as positive relationships between Lexicon development and age in both groups of children [8].

The present study found the highest Lexicon size to be associated with common nouns, which is consistent with the studies by Benedict [20], Jalilehvand [21] and Mahmoudi-Bakhtiyari et al., who found statistically significant differences in the Lexicon size of common nouns compared to social terms, grammatical words and predicates in 18-36-month-old children.

Researchers attribute this increase in the number of common nouns to the

usefulness of this group of expressive Lexicon in children's linguistic environment, possibly owing to the more frequent use of these words by their relatives, who then expect the child to express the same words, which is consistent with literature [19-21]. The present study found grammatical words to have the lowest application, as confirmed by Mahmoudi - Bakhtiyari et al. [19], Benedict [20] and Jalilehvand [21]. This reduced application seems to be caused by the limited use of this lexical category in the early stages of language development. Based on the results obtained, parents seem to be able to reduce preterm-birth associated Lexicon differences by teaching their children at older ages.

Failing to examine children in the earlier months of birth was a limitation of the present study. Children are therefore recommended to be monitored since their birthday and intervention studies are conducted on how to increase the Lexicon size and possibly prevent the negative effects of speech and language disorders on children.

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