Research Article

Acquiring the First Words by Persian Toddlers: A Longitudinal Study Using the MacAuthor-Bates Inventory

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A B S T R A C T

Introduction: A robust vocabulary improves all areas of communication. Vocabulary is critical to a child's success to think and learn about the world. Expanding a child's knowledge of words provides unlimited access to new information. This study describes the early development of comprehension and production vocabularies in a group of Persian-speaking toddlers.

Materials and Methods: The mothers of 33 typical, Persian-speaking toddlers during 6 months (from 12-14 months to 19-21 months) completed the Persian McArthur-Bates communicative development inventories 7 times per month. The collected data were analyzed via the SPSS software, version 21, through non-parametric tests.

Results: The results indicated that the only significant increase for both vocabularies was between 15 and 16 months (P comprehension=0.045 and P production=0.027). The development of phrase comprehension showed significant increases during six months (P<0.001). Further analysis of production vocabulary growth demonstrated the word spurt in each child (in different months and with different word levels). According to the figures, the composition of vocabulary production was different during the selected 6 months. Nouns were the largest group during the 50-, 100-, and 200-word stages; however, verbs presented a faster rate of development. Both genders showed significant changes during follow-ups (P<0.001) and there were no significant differences between the vocabularies of different genders (P>0.05).

Conclusion: Persian-speaking children follow commonalities of lexical development reported for different languages; however, few differences could be traced between these children and their peers from other languages.

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1. Introduction

Since 1992, numerous studies have examined early lexical development to recognize cross-linguistic variation using parent reports of vocabulary usually by the adapted version of the MacArthur-Bates Communicative Development Inventory (MCDI) [1]. Bleses et al. (2008), in a systematic cross-linguistic analysis of lexical development, summarized the findings of 18 studies regarding vocabulary development as follows: a) Numerous variability in the rate-of-word acquisition among children; b) An increase of size in lexicons with age; c) An acceleration in word acquisition in the second year of life; d) An asymmetry between the production and comprehension lexicons; e) Exceeding the comprehension vocabulary over the production vocabulary in early months of language development; and f) Different sizes of vocabularies in countries with similar languages [1, 2].

The wide individual differences in the rate-of-vocabulary development were probably the most challenging finding. While there are children who produce little or no meaningful speech before 1.4 years, there are others who express more than 300 words at the same age [3-6]. Gender has been considered a factor that might induce such differences and studies indicated that parents reported larger vocabularies for girls compared to boys [7]. Another subject that has been the focus of many studies and was not included in the summary of Bleses and colleagues is vocabulary composition (a subject that must be considered to define children's language style). Studies indicated that children's early lexicons contain words from different word categories; however, researchers are still working to recognize that the greater predominance belongs to nouns or other word classes in early vocabularies [3, 4, 6, 8-12]. For example, Hao et al. investigated the content of production vocabularies in 928 Chinese children who spoke Mandarin and realized that nouns were predominant in their production vocabulary and verbs tended to appear earlier compared to their English-speaking peers [11]. O'Toole and Fletcher (2011) provided similar findings as the nouns shaped the major part of Irish children's lexicon and closed-class words formed a smaller part of it. For some languages, such as Persian, these issues need to be reconsidered because the available resources cannot provide enough information [10].

The existence of the word spurt has been evaluated through studies in different languages [13-15]. These studies indicated that children tend to add one or two words per month in their first few months of vocabulary development; however, at the end of the one-word stage, word acquisition shows remarkable acceleration (a threshold of 50 words) [16]. Such a phenomenon has been attributed to the tendency of children who concentrate on acquiring names [13]. Accordingly, children who acquire different word classes more evenly may have slower vocabulary development. The claim that word spurt happens in children who are name lovers has been supported by studies in other languages, such as German, Italian, and Japanese [16-18]; however, Choi and Gopnik (1995) concluded that a word spurt has taken place in Korean-speaking children who did not have noun predominance in their early lexicons but later than English-speaking children [19]. More investigation of the word spurt in other languages, such as Persian, may help to provide further evidence on the universality of word spurt and its relationship with the process of language acquisition.

Few studies investigated early word acquisition in Persian-speaking children. Ebtedaei et al., in a cross-sectional study, assessed the early lexicons only at the age of 12 to 14 months [20]. In 2018, Zarei Mahmood Abadi and Zarifian administered a longitudinal study on the development of expressive vocabulary in a girl from 15 months to 34 months [21]. She was the first and only child of highly educated parents. She said her first word at 15 months old and reached 55 expressive words at 22 months old. At 22 months, most of the vocabulary consisted of nouns. She produced her first verb at 16 months. Adding verbs to her lexicon was accelerated by 26 to 28 months, while in the months before only 6 verbs every other month was added to the lexicon. The total number of words in her production vocabulary at 18, 20, 22, and 24 months was 6, 6, 55, and 110, respectively. Other available studies did not cover this age range and were not longitudinal or population-based to track the developmental course of vocabularies during 12 to 18 months [21-23].

Although there are confident similarities in cross-linguistic vocabulary development using MCDI, some cultural differences have been reported. Besides, studies used different statistical analyses and different procedures to report their findings. Such differences make it difficult to extract a definitive profile of vocabulary development from the current vocabulary studies. Thus, it is valuable to extend cross-linguistic vocabulary analysis to additional languages that are not yet studied using MCDI. Persian-speaking children may show some differences in word acquisition (rate or composition) compared to children with other languages when assessed on the MCDI. Thus, the current study aims to investigate the following items:

● Evaluate the phrase comprehension, first signs of understanding, and starting-to-talk behaviors;

● Investigate the vocabularies regarding sizes and compositions;

● Highlight the influence of gender on the developmental trend of vocabulary production;

● Define the individual differences in the developmental path of comprehension and vocabulary production;

● Investigate the possibility of word spurt in Persian-speaking children.

2. Materials and Methods

Study participants

The statistician calculated the sample size (n=28) by the G*Power software, version 3.1. However, 33 mothers who had children in the age range of 12 and 14 months consented to participate. The inclusion criteria were living in the urban area of Bardaskan, Khorasan Razavi Province, Iran, being monolingual in Persian, raising children in a Persian environment, being in total health condition, and having toddlers in the age range of 12 to 14 months. If in further assessment, mothers were scored as depressed on the Beck questionnaire or their child scored lower than their chronological age on the adapted version of the ages and stage questionnaire (a questionnaire that evaluates general development), they were excluded from the study.

According to the inclusion criteria, all mothers were invited to this study through the health centers in all 5 areas of the city (east, west, north, south, and center). A total of 128 mothers responded to the invitation letter, of which, 54 mothers were excluded because of their scores on the Beck questionnaire and 10 mothers because of their children's scores on the ages and stages questionnaire. Accordingly, 31 mothers withdrew from the study. For those who consented to participate in the research, the study conditions were explained. Mothers' health was checked by family physicians to exclude any possibility of depression, cognitive or neural disease, and issues that might prevent them to report their children's functions consciously and accurately. Children's health advisors, family physicians, and direct observation confirmed all children's health each month.

Study instruments

A demographic information sheet and the Persian version of MCDI were the main tools to collect information [24, 25].

The Persian MCDI has different parts: The first signs of understanding part include 3 yes/no items; the phrase part includes the comprehension of 28 common phrases, children's score would be a number between 0 and 28; the starting to talk phase consists of two questions that mothers report their child's imitation and naming behaviors through ordinal responses (never, sometimes, & always); and the vocabularies comprehension and production phase. This word checklist has 19 subdivisions of 397 typical words in young children's vocabularies. For the words that children understand but do not yet say, mothers place a mark in the first column (understands). For words that children do not understand and use, mothers place a mark in the second column (understands and says). If their children use a different pronunciation of a word, mothers should mark the word "anyway."

Study procedure

All mothers participated in a 1-h training session held by an experienced speech and language therapist who explained how to fill out the word checklist form. In this training session, the therapist used different materials to make the process clearer and simpler, such as video samples of Persian-speaking children in the age range of 12 to 18 months who understood or produced words. This training session was held on 3 different days, during different working hours and after-hours in which every mother could participate. Those mothers who failed to be a part of the group training received individual instructions at home.

Mothers monthly received the language assessment pack delivered by the same therapist who reviewed the whole process with each mother and assigned 3 three working days to complete the form. The therapist was in charge to collect the completed forms and check the missing data. The therapist kept using the first pack of language assessments until the children reached a ceil of vocabulary comprehension.

We calculated the total number of words produced by each child, according to the mother's report for each monthly assessment. The criterion of the first increase of 50 new words in any monthly interval was considered the index of the phenomenon of the word spurt. To compare children's vocabulary composition with studies in

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other languages, we mainly followed the procedure introduced by D'Odorico et al. [16] . Caselli et al. suggested excluding place words from the calculation; however, we added "words about time" and "places to go" words to the final category, named "adverbs" [16] as follows:

1. Percentage of common nouns, which include words that stand for concrete objects (animal names, vehicles, toys, food and drink, clothing, body parts, furniture and rooms, small household items);

2. Percentage of predicates, which was calculated from the combination of descriptive and action words;

3. Percentage of grammatical function words, which included pronouns, question words, prepositions, and locations, along with quantifiers;

4. Percentage of others, which consisted of sound effects and animal sounds, games, and routines, in addition to people;

5. Percentage of adverbs, which was calculated from the combination of 3 categories, namely outside things and places to go and words about time.

Statistical analysis

In addition to descriptive data analysis, analytical tests were used to find possible changes and differences in different months in boys and girls. These tests were the Shapiro-Wilk (data distribution review), the Friedman non-parametric test (monthly difference review), and the Mann-Whitney test.

3. Results

Demographic information

Table 1 demonstrates the demographic information regarding children and their mothers.

First signs of understanding

All 33 children from the first to the last follow-ups scored 3, which indicates that all reacted to their names as "no" and "there's mummy/daddy."

Phrases

The non-parametric Friedman test of differences among repeated measures was conducted and rendered a chi-square value of 72.23, which was significant (P<0.001).

Accordingly, the number of phrases that children understood increased with age (Table 2).

Starting to talk

Table 3 lists the number of mothers who used "sometimes" and "often" vs "never" increased with age regarding the starting-to-talk variable.

Vocabulary production and comprehension

Growth of vocabularies sizes

The Mean±SD of each vocabulary are presented in Table 4 for all children for 6 months. The comparison of the repeated measures was performed using the Friedman test, showing a statistically significant increase in comprehension ($\chi^2(4)=116.82$, P<0.001) and production ($\chi^2(4)=116.01$, P<0.001) between months 14 to 18. The post hoc analysis with adjusted P value showed that while increasing trends existed in the number of words in both vocabularies during all follow-ups, the only significant increase for both vocabularies was between 15 and 16 months (P comprehension=0.045 and P production=0.027).

Vocabulary compositions

Figure 1 displays the vocabulary composition at the different stages of the vocabulary size (10, 50, 100, and 200 words). The percentage of nouns has a smooth upward trend at all four stages but still has not included 50% of the produced words in the 200-word stage. The "others category" had a sharp decrease between the 10-word stage and 50-word stage, followed by a steady reduction in the last 2 stages. The third place as the most frequent lexical items belonged to the predicates with a sharp increase between the 10-word stage and the 50-word stage, followed by a steady increase in later stages. The other two categories showed steady increases during all 4 stages.

Gender and vocabularies

Based on the data presented in Table 5 and Table 6, boys and girls both had significant changes in their vocabulary sizes (P<0.001), even though the means for boys were greater compared to girls, there were no significant differences between genders (P>0.05).

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Table 1. Demographic information

Background Factors		Mean±SD/No. (%)
		Descriptive Statistics
Children's age at the start of the study (m)		12.46±0.76
Mother's age at the birth of the child (y)		27.88±4.68
Father's age at the birth of the child (y)		32.58±4.44
Mother's education (y)		13.61±2.99
Father's education (y)		12.36±3.13
Children's gender	Female	18(54.5)
	Male	15(45.5)
Mothers' job	Housewife	23(69.7)
	Employed	10(30.3)
Fathers' job	Self-employment	23(69.7)
	Employee	10(30.3)
Background Factors		No. (%)
		Median (Interquartile Range)
Child's birth order		1(1)
Number of family members		4(1)

Table 2. Development of phrases comprehension

Month	No.	Mean±SD	Median	IQR
12	22	20.00±4.07	19.5	5.5
13	28	21.82±4.36	23	6.75
14	33	23.18±3.26	22	7
15	33	24.45±3.60	25	7
16	33	26.15±2.55	27	3
17	33	26.91±1.70	27	1
18	33	27.42±0.97	28	1
19	11	27.82±0.60	28	0
20	5	27.40±0.55	27	1

IQR: Interquartile range.

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Table 3. The frequency of starting to talk behaviors

Month	No.	Imitation				Naming or Labeling			
		Never	Sometimes	Often	Mean Rank	Never	Sometimes	Often	Mean Rank
12	22	5	15	2	1.86	11	8	3	1.64
13	28	9	12	7	1.93	10	11	7	1.89
14	33	11	9	13	2.06	9	16	8	1.97
15	33	7	16	10	2.09	7	17	9	2.06
16	33	2	20	11	2.27	2	20	11	2.27
17	33	0	20	13	2.39	0	18	15	2.45
18	33	0	13	20	2.61	1	16	16	2.45
19	11	0	3	8	2.73	5	6	11	2.55
20	5	0	0	5	3.00	0	0	5	3.00

Note: Never: Rank 1; Sometimes: Rank 2; Often: Rank 3.

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Individual differences in vocabulary development

Figure 2 and Figure 3 illustrate that Persian-speaking children showed an acceleration in the developmental rate of vocabulary production during the second half of their second year and that there is considerable variation between children. The 50th percentile as the median in both figures divided the data sets in half and showed that the trends in both vocabularies were increasing. According to the first and the third quartiles, children showed a more spread pattern to acquire vocabulary comprehension than vocabulary production.

Table 4. Lexical growth during 6 months

Month	No.	Descriptive Index			
		Comprehension		Production	
		Mean±SD	Median (IQR)	Mean±SD	Median (IQR)
12	22	151.45±47.41	140(72)	13.64±11.60	12(9.75)
13	28	176.89±49.04	168(67)	20.14±17.39	15(13.5)
14	33	204.18±52.91	182(48)	28.82±17.38	26(17.38)
15	33	238.39±52.23	228(61)	48.24±43.03	40(22)
16	33	274.70±50.59	262(64)	69.09±47.44	56(45)
17	33	302.79±41.87	289(60)	95.03±50.50	80(39)
18	33	322.06±36.64	324(49.5)	126.45±47.82	120(58.5)
19	11	331.00±35.14	334(36)	150.91±85.37	121(128)
20	5	345.80±38.28	340(72.5)	199.00±112.15	161(164)

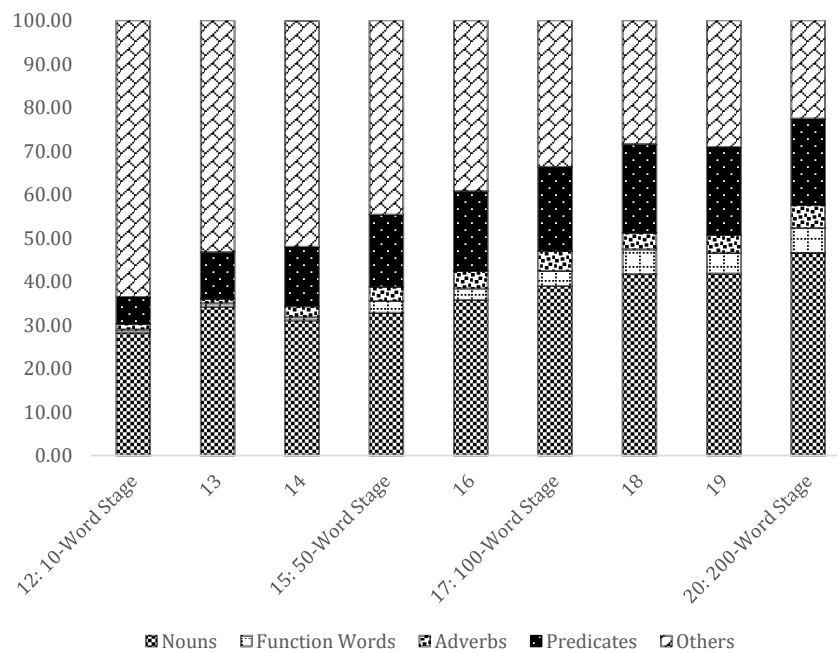SD: Standard deviation; IQR: Interquartile range.

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Figure 1. Percentage of different lexical items at different stages

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Possibility of word spurt

Running some statistics tests revealed that between 12 and 14 months and at 19 months, no child added 50 words to their vocabulary production. A total of 4 participants showed a 50-word increase when they were 14 months and their vocabulary production had a size of about 36 words. At 15, 16, and 18 months, 14 participants had a noticeable increase in their vocabulary production while their vocabulary sizes were 63, 50, and 89, respectively. Meanwhile, 15 participants (approximately half of the sample size) had a peak in their vocabulary production when they were at 17 months with a vocabulary production size of about 76 words.

Table 5. Size of comprehension vocabulary during 6 months in each gender

Month	Girls (n=18)			Boys (n=15)			P*
	No.	Mean±SD	Median (IQR)	No.	Mean±SD	Median (IQR)	
12	12	144.58±31.13	138.5(59)	10	159.70±62.62	143(95)	0.792
13	17	167.88±40.62	169(69)	11	190.82±59.18	167(77)	0.410
14	18	205.89±44.07	195(52)	15	202.13±63.50	179(55)	0.481
15	18	233.44±43.90	232.5 (59)	15	244.33±61.85	227(86)	0.914
16	18	275.11±39.61	264.5(54)	15	274.20±62.81	257(86)	0.928
17	18	306.78±29.88	298.5(42)	15	298.00±53.65	281(88)	0.169
18	18	320.17±21.08	324.5(35)	15	324.33±50.18	318(87)	0.857
19	6	338.17±25.21	335(33)	5	322.40±46.09	319(81)	0.465
20	1	321	321(0)	4	352±41.21	255(80)	0.480

SD: Standard deviation; IQR: Interquartile range.

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*Mann-Whitney test.

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Table 6. Size of vocabulary production during 6 months in each gender

Month	Girls (n=18)			Boys (n=15)		
	No.	Mean±SD	Median (IQR)	No.	Mean±SD	Median (IQR)
12	12	13.67±8.59	13(13)	10	13.60±14.97	9(11)
13	17	16.06±10.50	13(11)	11	26.45±23.84	16(22)
14	18	25.11±13.82	21(22)	15	33.27±20.48	29(14)
15	18	38.94±20.20	38(22)	15	59.4±59.10	44(32)
16	18	60.33±25.48	55.5(43)	15	79.60±64.33	63(46)
17	18	92.56±36.32	79.5(38)	15	98.00±64.88	80(39)
18	18	119.28±40.79	113.5(58)	15	135.07±55.37	125(67)
19	6	127.83±56.18	112(88)	5	178.60±111.89	122(200)
20	1	161	161(0)	4	208.50±127.15	161.5(220)

SD: Standard deviation; IQR: Interquartile range. **JMR**

4. Discussion

The present study was designed to outline the developmental trajectories that Persian-speaking children show in their vocabulary production and comprehension and some collateral areas compared with English-speaking peers. The Persian version of MCDI words and gestures for children 8 to 16 months have almost a similar number of words and categories compared to other adapted versions (397 items in 19 categories). However, the comparability between our study and other languages might be limited because of the differences in the sample procedures, sample sizes, and the reported measures.

The following of 33 children during 6 months supported the commonalities that Bleses et al. reported in their study [1]. We recognized numerous variabilities among our participants in the rate-of-word acquisition, upward trends for both lexicons, acceleration in adding words to production vocabulary, the asymmetry between vocabu-
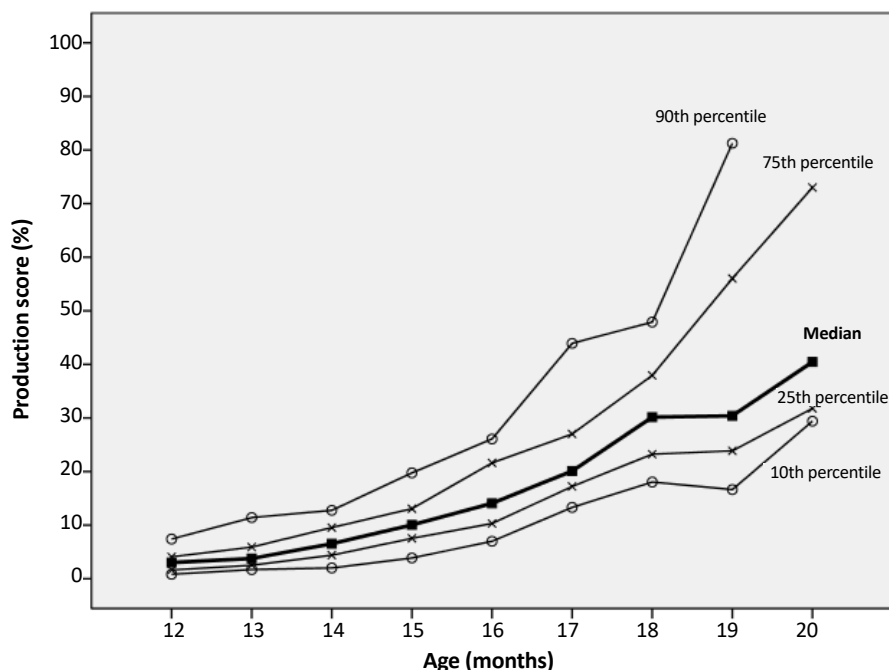

Figure 2. Observed comprehension vocabulary in Persian toddlers

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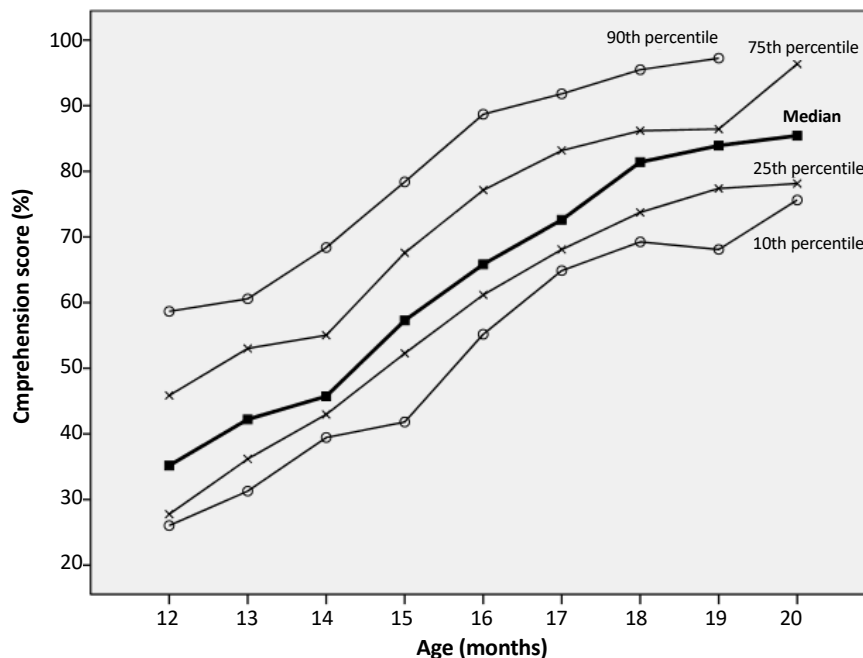
Figure 3. Observed production vocabulary in Persian toddlers

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lary production and comprehension, and the predominance of vocabulary comprehension over vocabulary production. Thus, our first conclusion from the findings is that Persian-speaking children follow more or less an equivalent word acquisition trend that children from other languages follow. Such findings support our previous findings that there are several similarities in the development of the earlier stages of language development from different language backgrounds.

The predominance of nouns in early vocabulary production is supported by different studies in different languages, such as English [13], Italian [16], Wichi [26], and Korean [27]. Although the present study reached a similar diagram for the composition of early vocabularies for different word stages, few differences could be traced between Persian-speaking children and children who speak other languages. For example, D'Odorico et al. (2001) found that almost half the vocabulary items at the 50-word stage were in the "others" category; however, at the next two stages, "nouns" were the most frequent lexical items [16]. Persian-speaking children used the "others" category more often at the 10-word stage (about 60% of their vocabulary) but less than 50% of their vocabulary production was devoted to "others" in later stages. The "predicate" category was another source of difference between the two studies because in Persian, "predicates" had a sharp increase from 10- to 50-word stages. Italian children showed such an increase between 100 and 200- word stages. Such differences might be

a result of language differences, the roles of frequency and positional salience in maternal language, maternal interaction styles, and the child's preferences for verbs or nouns in the acquisition of the first words [28-32]. Our data lend further evidence to the universality of noun-verb sequence.

Other signs of children's efforts to acquire their target language have been hidden in their behaviors shown through imitation and naming. Masur [33] found that children's early imitation of words (around 12 months) especially the words that are not in their vocabularies predicts and facilitates their later vocabulary development. The number of children who used imitation and naming "sometimes" and "often" increased through the months in a way that at 20 months of age, all participants had these two types of behaviors as "often" behaviors in their daily routines, showing another finding that might be applied in explaining why children's vocabularies expand during these months quite fast.

Boys and girls develop their vocabularies at the same rate. This finding substantiates previous findings in the literature that gender may not be the main factor that explains variability in children's vocabulary development [9, 12]. The most striking result to emerge from the data is that all participants had a word spurt in the development course of vocabulary production; however, there were differences among children when they show this spurt and with the number of words in their vocabulary

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production. Some children reached to word spurt earlier with a limited number of words and some children reached the explosion later with a larger vocabulary production. This finding confirms the previous finding that all children have word spurt but of different ages [13, 14, 16] and provides evidence for the universality of the vocabulary word spurt.

5. Conclusion

Persian-speaking children have numerous similarities in the course of vocabulary development with children from English or other languages background. The results indicated that children had significant changes in the size of their vocabularies during the second year of their lives, showed the word spurt phenomenon, and followed the noun-verb sequence in their vocabulary composition.

Study limitations

Future studies may apply clinician-administered tools in addition to parents-administered tools to get a more reliable and valid picture of children's language abilities. We recruited our participants from a small city with Persian-speaking citizens, thus any generalization to the other cities of Iran with different population sizes, cultures, and languages must be done with caution.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Human Ethics Committee of Semnan University of Medical Sciences (Code: IR.SEMUMS.REC.1396.67).

In all follow-ups, the research participants were not subjected to any harm. In the present study, the participation was based on mothers' willingness, and the mothers had the right to withdraw from the study at any stage if they wish. Only mothers who fully consented to be part of our study were included anonymously in the whole process of the study. We respected the dignity and privacy of our participants and ensured an adequate level of confidentiality of the research data in all stages. We tried to avoid any deception or exaggeration about the aims and objectives of the research. We communicated with participants and any involved person in the study with honesty and transparency and avoided providing any type of misleading information or data presentation.

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