The Effect of Caretakers' Frequency and Positional Saliency on Noun Bias in Persian Children: A Study on Child Language Development

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Abstract

Noun bias in children's early vocabulary development is a long-held belief. The present study intended to examine the correlation between the input features like frequency and positional saliency in infant-directed speech and the noun bias characteristic of infants in their early child lexical development. To this purpose, the utterances of ten Persian children aged 1;4 and their caretakers at a kindergarten in Isfahan, Iran, were transcribed for twelve sessions. Persian language with its SOV order that gives much importance to verbs compared to nouns can make noun bias hypothesis of infants unstable. The results demonstrated a positive correlation between the frequency of nouns and verbs in Persian caretakers' utterances and the lexical development of children on age of 1;4. The transcriptions also identified a significant noun bias in the utterances of Persian children. Therefore, the lexical items in adult utterances can predict the initial lexical repertoire of infants. It can be inferred that nurture and the utterances heard by children might play a significant role in child vocabulary development.

Key words: Frequency, positional saliency, noun bias, Persian, infant-directed speech

1. Introduction

Early and rapid linguistic growth of children can hardly be ignored. In addition, lexical development has recently become one of the most significant discussions in the field of first language acquisition (e.g., Brent & Siskind, 2001; Ludingtion, 2013). However, the two word categories of noun and verb have for long been believed to be the starting point of learning a language for children. Due to the rapid acquisition of nouns in infancy, noun bias position observed in natural contexts where children acquire their mother tongue cannot be ignored (Bornstein, et al., 2004). Likewise, Piccin and Waxman (2007) believe that both children and adults can perceive nouns better compared to the encountered verbs. It is worth mentioning that noun bias experiments have produced similar results in diverse languages such as English, French, Dutch, and so forth (Bornstein et al., 2004).

The fact remains, however, that first language literature is not devoid of contrary results in this field too. Verb bias (e.g., Tardif, Shatz & Naigles, 1997) and similar behavior of both nouns and verbs (e.g., Ogura, Dale, Yamashita, Murase, & Mahieu, 2006) were observed in Korean, Mandarin-Chinese, and Japanese children. However, these contradictory evidences can be explained resorting to the language and research contexts in which the investigations were conducted (Ogura, et al., 2006). A recent evidence by Hao, et al. (2015) who conducted a study about the lexical development of 928 Chinese-speaking children about 1;0 and 2;6 unravelled the interactive effects "between the conceptual (imageability) and linguistic properties (word frequency, word length, and grammatical category) that jointly shape the development of Mandarin-speaking

children's early vocabulary" (Hao, et al., 2015; p. 505). Gentner (1982) also believes in the preference of nouns over verbs for early lexical learning due to the linguistic and teaching variables such as frequency, order, and lexical components of the words. Snedeker, Geren, and Shafto (2012) who collected some evidence from pre-schoolers and infants for one year identified that the participants could only manifest one-word items (i.e., nouns and social vocabularies) for the earlier time period and developing the verbs, adjectives, and multiwords were postponed to later times. The impact of previous experiences on vocabulary learning was also highlighted in their study.

1.1. Frequency

Although there exists a similar trend in children's learning vocabulary items, some factors such as health (Hoff, 2003), inner environment of the house (Linver, Brooks-Gunn, & Kohen, 2002), and outer side experience of children (Hoff & Naigles, 2002) can affect it. Among the experiences perceived by children, input factors such as frequency and positional saliency can be mentioned. Multiple studies have drawn attention to the frequency factor among others (Ogura, et al., 2006; Ellis, 2002; Arnon, 2015). Frequency, considered as one of the features of emergentist paradigm, was mostly defended by Ellis (2002) who puts a step forward by stating that language learning can be regarded as data collection for the frequency of form-function mappings (2006). Furthermore, Tomasello (2003, p. 327) also believes that language learning "depends crucially on the type and token frequency with which certain structures appear in the input". Frequency as the number of words the child hears in adult utterances has been dedicated a major role in acquiring different languages (Ogura, et al., 2006) and can give us a comprehensive view of the psychological processes involved in learning (Arnon, 2015). Some researchers like Goodman, Dale, and Li (2008) hold that the frequency factor in infant-directed speech can speed up language learning for children. Similarly, Ellis (2002, p. 143) in his paper "concludes by considering the history of frequency as an explanatory concept in theoretical and applied linguistics, its 40 years of exile, and its necessary reinstatement as a bridging variable that binds the different schools of language acquisition research." Giving such significance to frequency has made many researchers concentrate on it more broadly. Most studies (e.g., Hoff & Naigles, 2002; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991; Vibbert & Bornstein, 1989) investigated the correlation between the amount of parental or care givers' speech addressing the children. Understandably the quantity or frequency of their speech had a positive relationship with the children's vocabulary capacity in general. Along the same lines, Naigles and Hoff-Ginsberg (1998) conducted a study on the children aged 1;4 to 2;1 in order to predict the order of learning 25 verbs. The results were interesting since prediction of the age of learning the verbs came true considering the amount of verbs used by their mothers and the differential grammatical contexts the verbs were used in. As prediction is concerned, Blackwell (2005) in his study demonstrated the same results for another lexical category, the adjective. For him, the grammatical context and the quantity of mothers' speech had a predictive effect on the age of children's adjective learning.

In another study, Matthews, Lieven, Theakston, and Tomasello (2005) compared the amounts of low, high, and average frequency in children's' acquisition of word order. The sample consisted of two groups aged 2;9 and 3;9 for whom the different amounts of frequencies were examined in SOV word order. The findings showed that "the ability to use English word order develops from lexically specific schemas formed around frequent, distributionally regular items (e.g. verbs, pronouns) into more abstract, productive schemas as experience of the language is accrued" (p.121). However, Goodman, Dale, and Li (2008) who searched for the relationship between the age of acquisition of multiple 562 words and the input exposed to the children in the normative database of the MacArthur Communicative Development Inventories found some contradictory results to the previous findings in the literature. Examining the total groups of the words, he discovered that the lexical categories of verbs and adjectives and closed class lexical items which had a high frequency in the database could not bring about sooner vocabulary growth. Nevertheless, when he considered the single vocabularies by themselves, the results were in

keeping with the general understanding of frequency. Understandably, frequency played a major role in learning verbs and adjectives. By the same token Ellis and Schmidt (1998) investigated the impact of frequency and regularity on learning regular and irregular morphemes in adult learning. Their study showed contradictory behaviors of frequency. As a matter of fact, at the beginning of the acquisition, frequency had a positive effect on the learning of regular and irregular syntactic forms and, as the time passed, frequency unraveled to have contradictory results only for the regular forms.

1.2. Positional Saliency

As it was pointed out, frequency is examined in different contexts for different lexical items; however, few studies have elaborated on the part of positional saliency for the children's early language development. Positional saliency refers to the order in which words can happen in a multiword infant-directed utterance. The pattern of saliency can be for the first, middle, and last part of the care givers' speech. By and large, it is held that the lexical items in the first and last parts of an utterance can be more easily acquired (Gentner (1982). Golinkoff and Alioto (1995) argue the better discernment and grouping of the beginning and the final part of utterances as the reason behind this positional saliency. The study of positional saliency was mostly investigated for the recognition tasks. Shady and Gerken (1999) who compared the recognition of final and middle lexical items in the children aged two years demonstrated the priority of final words over middle words. Similarly, resorting to Headturn Preference Procedure (Jusczyk & Aslin, 1995), Seidl and Johnson (2006) detected that compared to the middle words, children aged at 0;7 to 0;8 were mostly sensitive to the first and last parts of the words occurring in listening exercises. However, in contrast to the previous findings, Naigles and Hoff-Ginsberg (1998) showed that the frequency of a verb occurring in the last part of the mothers' speech could not help children to figure out their grammatical class and in effect they had behaved poorly in using the verbs in making their own statements.

Searching for interesting results attract us to a study conducted by Goldfield (1993) who combined the three factors of noun-bias, frequency, and sentence position. The paper investigating the nouns and verbs used in one-year-olds-directed speech drew a demarcation line between the time when mothers and children played with toys and the regular time and reported that in general nouns rather than verbs were more frequently used in the final position of the infant-directed utterances. It conclusively showed the importance of frequency in the acquisition of nouns in one-year-old children during the time when they played with the toys.

Along the same lines, MOSAIC (Model of Syntax Acquisition in Children) designed by Freudenthal, Pine, and Gobet (2009) attempted to discover the role of frequency and positional saliency in learning the main forms of the verbs in English, French, Dutch, and Spanish. However, having a tentative conclusion about the correlation between the early acquisition of nouns and the two variables of frequency and positional saliency cannot come into existence unless we investigate it for multiple languages. As far as we found out in the literature, no study has been conducted in order to find out if these two variables can be important for early lexical development of the Persian children. Therefore, the aim of this paper is to examine the part of frequency and positional saliency in the acquisition of nouns and verbs for the Persian monolingual children.

This research study could have some beneficial outcomes in the area of child language acquisition. Frequency and saliency in spite of their familiarity and intuitiveness in first language acquisition have confused many researchers and theorists. Furthermore, what distinguishes this study from others in the literature is investigating these issues in Persian language as an Indo-European language in transcription data collection format. Mahootian (1997) characterizes Persian as a language with simple and compound verbs. Compound verbs in this language refer to the fact that preliminary elements of noun, adjective, adverb, prepositional phrases are used prior to the main verbs. Therefore, the point of departure here is the issue whether we can observe the similar behavior of noun bias in a language which respects its verbs by giving them so flexibility. In

addition, comprehensiveness of studying both nouns and verbs and non cross-sectionality are the other features which distinguish this research paper from others.

1.3. Research Hypotheses

The controversy about scientific evidence for frequency and pattern saliency made us examine the following research hypotheses:

Null Hypothesis 1: The speech of Persian children aged 1;4 has similar frequency for verbs and nouns.

Null Hypothesis 2: The nouns and verbs used in the speech of Persian caretakers directing children aged 1;4 are not positionally sensitive.

Null Hypothesis 3: There is no relationship between the frequency of nouns and verbs in Persian caretakers speech and the noun and verb development of the children aged 1;4.

Null Hypothesis 4: There is no relationship between the positional saliency of the Persian caretakers speech in terms of noun and verb and the noun and verb development of the children aged 1;4.

2. Method

2.1. Participants

In order to examine the role of frequency and positional saliency in lexical growth of the children, a non-random sample of ten monolingual Persian children aged 1;4 were selected based on availability criterion. The sample containing six girls and four boys were from a kindergarten in Isfahan, Iran. The criteria for selecting the subjects were based on consultation with the manager and the caretakers of the kindergarten about children's health, psychological, and linguistic problems. Since the inner environment of the place in which children live can affect their linguistic behavior, the caretakers were consulted about this issue too.

2.2. Data Collection Procedure

Along with the purpose of the study, some caretakers were selected in order to talk to the children. The study was conducted for 12 sessions in one month (i.e., three times a week). Each session had two parts of playing with unfamiliar toys and a break time. In the playing context which lasted for 15 minutes, the caretakers were asked to introduce the unfamiliar toys to the children and play with them. Thanks to a video-recorder, the linguistic data of the dyads were coded during the interaction.

The first 150 utterances of the transcriptions were selected as the main corpus. Among the selected utterances, the proper nouns and auxiliaries were crossed out. In fact, only the usual and basic nouns and verbs produced by the caretakers and children were analyzed in order to answer the questions of the research. In addition, for the purpose of the research, we only collected two-word and more than two-word utterances in order to have the three different patterns of the word positions (i.e., first, middle, and final positional saliency). Here, we resorted to the usual definitions for saliency. As the name indicates, first and final saliency refers to words placed at the beginning and end of an utterance respectively. For middle saliency, on the other hand, we only considered the words which were trapped between two other words such as articles. For instance, in the utterance: *This rabbit has slept. (این خرگوش خوابیده.)* , we have the word خرگوش in the middle saliency and the words این and خوابید in the first and last saliencies, respectively.

3. Results

3.1. Testing the First Null Hypothesis

H0 1: The speech of Persian children aged 1;4 has similar frequency for nouns and verbs.

As it was stated, input factors like frequency and positional saliency are among the input factors which can help children in language acquisition. The significance of frequency is highlighted by many researchers (Ellis, 2002). Along the same lines, Ellis (2006) makes language learning similar to having a repertoire of frequent words. However, this hypothesis considers the frequency with

which Persian children aged 1;4 state their vocabularies. The observed frequencies of this hypothesis illustrated that 80 out of 1120 utterances of the children were nouns (Table 1).On the other hand, while 160 verbs were expected, 120 verbs were observed. The observed data again confirm noun bias hypothesis and decreases the importance of verbs in infant-directed speech. Table 2 illustrates the observed and expected values to be significant. Significant difference could be observed in the proportion of nouns and verbs used by the children aged 1;4, χ^2 (1, n = 240) = 30, p < .000.

Table 1. Observed and expected numbers for the nouns and verbs used by Persian children aged 1;4

	Observed N	Expected N	Residual
noun	120	80.0	40.0
verb	120	160.0	-40.0
Total	240		

Table 2. Chi-square test for the nouns and verbs used by Persian children aged 1;4

	group
Chi-square	30.00[a]
df	1
Asymp. Sig.	.000

3.2. Testing the Second Null Hypothesis

H0 2: The nouns and verbs used in the speech of Persian caretakers directing children aged 1;4 are not positionally sensitive.

A two-way ANOVA between groups was run to examine the impact of lexical categories of nouns and verbs on the three positional saliency levels in the child-directed speech of caretakers. In fact, we had three levels (the first, middle, and final saliency) for each of the two categories (nouns and verbs). Table 3 shows the descriptive statistics of the two independent variables of nouns (M = 36.01, SD = 25.72) and verbs (M = 32.66, SD = 30.22).

Table 3. Descriptive statistics of the nouns and verbs used in the speech of Persian caretakers directing children aged 1;4

Lexical	saliency	M	SD	N
Noun	first	65.77	17.50	120
	middle	8.99	3.12	120
	final	33.29	6.55	120
	Total	36.01	25.72	360
Verb	first	17.85	5.75	120
	middle	8.95	3.07	120
	final	71.18	20.72	120
	Total	32.66	30.22	360
Total	first	41.81	27.30	240
	middle	8.97	3.09	240
	final	52.23	24.40	240
	Total	34.34	28.09	720

The interaction effect between positional saliency and lexical types (Table 4) was statistically significant F (2, 714) = 800.69, p=.000. In addition, the main effect for nouns and verbs F (1, 714) = 14.60, p=.000 and saliency F (2, 714)= 883.04, p=.000 also came up to statistical significance.

Table 4. Two-way ANOVA of the nouns and verbs used in the speech of Persian caretakers directing children aged 1;4

Source	Type III Sum of Squares	Df	MS	F	Sig.	Cohen's d
Corrected Model	468612.20[a]	5	93722.44	676.41	.00	.82
Intercept	849200.73	1	849200.73	6128.86	.00	.89
lexical	2023.40	1	2023.40	14.60	.00	.02
saliency	244705.01	2	122352.51	883.04	.00	.71
lexical * saliency	221883.78	2	110941.89	800.69	.00	.69
Error	98930.05	714	138.55			
Total	1416743.00	720				
Corrected Total	567542.26	719				

In addition, as can be seen in Table 5 lexical categories and saliency had a large effect size (partial effect size= .69). *Tukey post-hoc test* indicated all the differences between the groups of saliency were statistically different.

Table 5. Tukey post hoc for the nouns and verbs used in the speech of Persian caretakers directing children aged 1;4

(I) saliency	(J) saliency	Mean Difference (I-J)	Std. Error	Sig.
first	middle	32.84*	1.07	.00
	final	-10.42*	1.07	.00
middle	first	-32.84*	1.07	.00
	final	-43.26*	1.07	.00
final	first	10.42*	1.07	.00
	middle	43.26*	1.07	.00

3.3. Testing the Third Null Hypothesis

H0 3: There is no relationship between the frequency of nouns and verbs in Persian caretakers speech and the noun and verb development of the children aged 1;4.

As Tomasello (2003) argues language learning is based to a great extent on the frequency with which infants hear the words. Similarly, some researchers like Goodman, Dale, and Li (2008) underscores frequency in child-directed speech in accelerating the learning process. As for the relationship between the positional saliency of the Persian caretakers speech and the noun and verb development of the children aged 1;4, the results of Pearson product-moment correlation coefficient (Table 6) revealed a positive correlation between the two variables; r =.193, n = 240, p < .0005.

Table 6. Pearson Product-Moment Correlation Coefficient between the frequency of nouns and verbs in Persian caretakers speech and the noun and verb development of the children aged 1;4

		Caretaker lexical	Child lexical
Care lexical	Pearson Correlation	1	.19**
	Sig. (2-tailed)		.00
	N	240	240
Child lexical	Pearson Correlation	.19**	1
	Sig. (2-tailed)	.00	
	N	240	240

** p < .01 level.

3.4 Testing the Fourth Null Hypothesis

H04: There is no relationship between the positional saliency of the Persian caretakers speech in terms of noun and verb and the noun and verb development of the children aged 1;4.

The results obtained from the Parson product-moment correlation coefficient in Table 7 investigating the relationship between the positional saliency of the Persian caretakers speech in terms of noun and verb and the noun and verb development of the children aged 1;4 indicate a positive correlation between the lexical categories used by children and caretakers; r = -.73, n = 720, p < .0005. However, no significant relationship was found between the saliency of the nouns and verbs used by the caretaker and the lexical items used by the children; r =.048, n = 720, p > .0005.

Table 7. Pearson Product-Moment Correlation Coefficient between the positional saliency of the Persian caretakers speech in terms of noun and verb and the noun and verb development of the children aged 1;4

		caretaker	Lexical of caretaker	Saliency of caretaker	Child lexical
caretaker	Pearson Correlation	1	-.06	.15**	.04
	Sig. (2-tailed)		.10	.00	.19
	N	720	720	720	720
Lexical of caretaker	Pearson Correlation	-.06	1	.00	-.73**
	Sig. (2-tailed)	.10		1.00	.00
	N	720	720	720	720
Saliency of caretaker	Pearson Correlation	.15**	.00	1	.00
	Sig. (2-tailed)	.00	1.00		1.00
	N	720	720	720	720
Child lexical	Pearson Correlation	.04	-.73**	.00	1
	Sig. (2-tailed)	.19	.00	1.00	
	N	720	720	720	720

** p < .01 level.

4. Discussion and Conclusions

Can we attribute any successful achievement in first language learning to frequency and saliency in child-directed speech? Generally, Ambridge, Kidd, Rowland, and Theakston (2015) hold that while frequency affects the acquisition of lexical items, it does so by the interaction of some factors like positional saliency and speech length. This research paper investigating the role of frequency and saliency in a rarely examined language brought some important views into consideration. Comprehensiveness as one of the features of this research probed the frequency of nouns and verbs in the utterances uttered by children. Inasmuch as one of the features of child-directed speech is not concerned with effect but relationship, the other hypotheses dealt with the correlation between nouns and verbs used by adults and children aged 1;4. Transcriptions of the speech of the caretakers and children in the kindergarten for 12 sessions made us somehow convinced that noun bias hypothesis can be survived in most contexts.

The first research hypothesis concerns with the issue that the children used nouns in a higher proportion than verbs. Although noun bias is not a surprising issue, the proportion is somehow amazing. The produced results corroborate the findings of a great deal of the previous studies in this domain (e.g., Gentner, 1982; Snedeker, Geren, & Shafto, 2012; Hao et al., 2015). However, in contrast to the findings by Tardif, Shatz, and Naigles, (1997) for verb bias and Ogura, et al., (2006) for nouns and verbs behaving similarly, no such evidence was detected in earlier acquisition of lexical items. The frequency and initial saliency position of nouns in Persian can be claimed as the reasons behind this finding. Furthermore, Hao et al. (2015) explained conceptual and linguistic properties like frequency as the reasons behind this early lexical acquisition. The second hypothesis or the sensitivity to saliency in first, middle, and final parts of Persian caretakers yielded significant differences between the three positions giving prominence to the first saliency for nouns and last

saliency for verbs. This also can be attributed to the importance Persian gives to the subject and verb in SOV order. To put it simply, caretakers did not change their basic order in the child-directed utterances. The third hypothesis which sought the relationship between the frequency of nouns and verbs in Persian caretakers speech and the noun and verb increase in children on age of 1;4 demonstrated a positive correlation between the lexical items used by caretakers and children. However the correlation statistics (r = .19) was very low for this relationship. Although the results differ from Goodman, Dale, and Li (2008) in his investigation of total groups of words and Ellis and Schmidt (1998), they are consistent with most of the earlier findings (e.g., Ogura, et al., 2006; Ellis, 2002; Arnon, 2015; Goodman, Dale, & Li (2008). The finding in the last hypothesis was unexpected and showed no significant correlation between the positional saliency of the Persian caretakers' speech and the nouns and verbs used by children at this age. Even though few studies have been conducted in this area, the findings of the current study did not support the previous researches (e.g., Golinkoff & Alioto, 1995; Shady & Gerken, 1999; Seidl & Johnson, 2006; Naigles & Hoff-Ginsberg, 1998).

This study attempted to examine the relationship between ten Persian children aged 1;4 and their caretakers in order to find out if some input features in infant-directed speech such as word frequency and positional saliency can be enumerated as the reasons behind noun significance in early child development of lexical items. Nouns were mostly in the first position and verbs in the last positions in infant-directed speech. The positive correlation between frequency of nouns and verbs in Persian caretakers speech and lexical development of infants on age of 1;4 shows that the amount of verbs and nouns used in infant-directed speech can predict the acquisition of lexical items in children. In general, the results of this study indicate that the outer side experience of children (Hoff & Naigles, 2002) can play an important role in child vocabulary development.

Although in the present study, frequency and positional saliency could so much contribute to the previous literature, there are some other factors which might explain the superiority of nouns over other categories. There are some neurological and natural factors behind this issue. Markman (1987) proposes whole object constraint in which children think that any unfamiliar word refers to an object generally and not its specific characteristics. Gentner (2006) in his natural partitions hypothesis hold that real objects referring to nouns can be distinguished much better compared to the objects referring to verbs. In another hypothesis by researchers, it is assumed that since verbs are somehow dependent on their noun arguments to be understood, they are more likely to be acquired later (Golinkoff & Hirsh-Pasek, 2008). The other factor attributes to neurocognitive field. The analysis done over brain damaged patients who show some problems in uttering nouns and verbs revealed that uttering a noun is relevant to the left middle fusiform gyrus and uttering a verb is relevant to some sections of the left middle frontal gyrus (Caramazza & Hillis, 1991; Damasio & Tranel, 1993; Laiacona & Caramazza, 2004). Among the linguistic factors in child-directed speech, prosody is another factor which refers to rhythm, stress, and intonation with which children can distinguish grammatical categories in the utterances directed to them (Kemler, Hirsh-Pasek, Jusczyk, & Cassidy, 1989).

Generally, 16-month-old infants can say several words but their comprehension and their dependence on nonverbal communication is much more than that (Sullivan). However, children's lexical enhancement like many of their developments is the result of innateness and environment. Although the impact of nature cannot be dismissed, nurture can also play an essential role in this domain.

4.1. Limitations of the study

In this study, a number of important limitations need to be considered. First, most of the participants of this study were girls who are generally believed to develop their verbal behaviors sooner than boys (Özçalskan & Goldin-Meadow, 2010). Another limitation is that it could become more longitudinal in order to have more reliable findings. The involvement, interest, motivation, previous knowledge, and experience of the caretakers are among the other factors which can affect their behavior toward the child. This differential behavior undoubtedly can threat the validity of any study.

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