Research Paper: The Early Prelinguistic Skills in Iranian Infants and Toddlers

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ABSTRACT

Objectives: The prelinguistic skills which pave the way for language development have always been an area of research in the Speech Therapy field. Although studying these skills is important, there is a study gap among Persian children. Therefore, this study explored prelinguistic skills among a sample of Persian-speaking children aged 6 to 24 months and made a comparison between different age groups. We also studied the effects of gender and family history of speech-language disorders on children's prelinguistic abilities.

Methods: In the present study, 277 mothers of Iranian Persian-speaking children aged 6 to 24 months were asked to fill a research-made checklist that evaluated the prelinguistic skills of their children. This study was cross-sectional and was conducted in Tehran City, Iran, in 2021. Children's abilities in different age groups were compared using the analysis of variance (ANOVA), Scheffe test, the Kruskal-Wallis test, and the post-hoc test. The differences between the total scores of the two genders were also determined using the Mann-Whitney U test.

Results: Comparing the prelinguistic skills in different age groups indicated a statistically significant increase in the scores as children grow up. Children with a positive family history of speech-language disorders scored lower on the checklist than the others (91.03±17.37). Furthermore, there were statistically significant differences between the two genders in developing gesture, vocalization, first words, social interaction, imitation, and play; girls had higher scores.

Conclusion: Based on the studies conducted in different countries, prelinguistic skills develop as children grow up; these skills facilitate language acquisition and other social skills. The present study also demonstrated the development of these skills alongside children's development. This similarity between Persian-speaking children and other children from different cultures and languages, as well as better performance in children with a negative family history of speech-language impairments, confirm the role of genetic factors in children's development. Moreover, the differences in the development of some prelinguistic skills between girls and boys reveal the impact of various factors, such as social factors, on prelinguistic skills development.

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Highlights

- Six to 24 months old children have different abilities in terms of prelinguistic skills.
- There are differences between girls and boys regarding prelinguistic skills, such as gesture, vocalization, first word, social interaction, imitation, and play.
- Children develop their communicational skills in the prelinguistic stage as they grow up.
- Positive family history of speech-language disorders affects children's performance in the prelinguistic stage.

Plain Language Summary

Children develop prelinguistic skills before learning to use language. Prelinguistic skills are the only ways that children can communicate with their parents before expressing their first words. For example, pointing at something is a prelinguistic skill, which provides a foundation for language learning. Studying these skills is very important because it gives us more information about the prerequisites of language learning and determining communication deficits at an early age. This study focused on the development of prelinguistic skills in Persian children aged 6 to 24 months. We found that these skills develop as children age and become more complex. Based on the results, a positive history of speech or language-related disorders in the family affects children's prelinguistic skills. Also, we found some differences between girls and boys in developing these skills. Our findings provided helpful information about prelinguistic skills that can spot children at risk of communication disorders.

1. Introduction

The prelinguistic stage is between 1 month and 18 or 24 months of age [1]. This period is before the language emergence phase. Communication skills developing in the prelinguistic stage are nonverbal skills that form the main communication ways of children at this period. This phase involves a subtle but systematic developmental transition as children move from the prelinguistic to the linguistic stage. These skills serve as a foundation and predictor for later language development. Therefore, they are important subjects to study in this stage [2, 3].

The prelinguistic skills that develop before language acquisition can be classified as means of communication (e.g., eye contact, gestures, vocalization, first words, and facial expressions) [4-9], and communicative functions (e.g., behavior regulation, joint attention, and social interaction [10]. Furthermore, some prelinguistic skills have cognitive bases, like imitation, object permanence, and playing [11-13].

Prelinguistic skills are essential in children's development because of their association with language acquisition [2, 3]. These skills are the basis of language development, as children with limited prelinguistic skills may face difficulties in language acquisition [14]. As indicated in the study conducted by Luke et al., lower pointing gestures at 12 and 14 months are associated with language development delays [15]. Besides, children's communication abilities in this stage predict their later language development [16]. That is why some researchers name prelinguistic skills as language predictors [17, 18]. For instance, the predictive value of babbling on subsequent language acquisition has been mentioned in Fasolo, Majorano, and Dodorico's study. Based on their findings, late talkers have limited phonetic complexity and a lower rate of babbling than typically-developing children [19].

There are some factors, such as family history and gender, that might affect the children's communication skills development [20, 21]. Family history of speech-language disorders is one of the risk factors for these impairments in children up to five years old [22]. Sunderajan and Kanhere [23], Molini-Avejonas et al. [22], Saeed et al. [24], and Conti-Ramsden and Durkin [25] highlighted the higher prevalence of speech-language impairments in children with positive family history. Twin studies [26] and family aggregation studies [27], as well as genetic linkage analyses [28], provided strong evidence of running speech-language impairments in families.

While girls and boys are similar at birth, there are differences in their verbal abilities under the age of 3 [21]. For

instance, girls have a larger vocabulary than boys at 18 to 24 months [29]. Some researchers discuss the influence of social factors on cognitive and language domains [30-33]; however, others debate on the greater male variability hypothesis (i.e., greater variability among males in intelligence compared to females), which might lead to different language abilities in boys [34, 35]. Also, after the discovery of the first gene connected with speech and language disorders, the FOXP2 gene [36], a considerable number of studies focused on gender differences as genetic factors involved in speech and language developments [37-39]. For instance, in a review article, Wermke et al. concluded that the difference between hormones in boys and girls leads to faster language development in girls [40].

Few studies have been published about Persian children's prelinguistic skills. Most of these studies only focus on the expressive language and first words [41-44]. For example, Mahmoudi Bakhtiyari et al. studied expressive lexicon size in Persian children aged 18 to 36 months [45]. Some studies have focused on only one prelinguistic skill [46, 47], and some had a limited number of participants [48, 49].

The relation between prelinguistic and linguistic stages increases the significance of studying the prelinguistic skills [17]. Despite the importance of these skills, there are limited studies focused on prelinguistic skills and comparing them in different age groups in Persian-speaking children. The present study aimed to investigate the prelinguistic skills in Persian-speaking children aged 6 to 24 months and compare these children within different age groups and genders. We also studied the effects of family history of speech-language impairments.

2. Materials and Methods

This cross-sectional study was conducted in Tehran City, Iran, in 2021. We included 277 Persian-speaking children (124 girls and 153 boys) aged between 6 and 24 months (Mean±SD: 15.81±5.9 months). The children were independently grouped according to their ages. In this study, 49 children aged 6-9 months, 53 children aged 10-12 months, 73 children aged 13-18 months, and 102 children aged 19-24 months. A convenient sampling method was used for the selection of the study participants from Tehran, Iran. The inclusion criteria were normal mental and physical development, having no history or symptoms of neurological problems, brain damage, seizures, or any other disorders, having literate mothers, and no divorced parents. The Persian version of the ages and stages questionnaire was used to check children's developmental status. It is a reliable and valid tool for assessing the physical and mental development of Persian children [50]. Mothers of the children who withdrew from the study were excluded. After explaining the aim and method of the research, mothers of the children interested in participating were checked regarding the inclusion criteria. Those mothers whose children were eligible to participate in this study provided written informed consent. The researcher-made checklist was sent to the mothers by Email or social media apps like WhatsApp. All participants who received the checklist completed it. The research protocol was approved by the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences, Tehran, Iran (Code: IR.USWR.REC.1400.025). The characteristics of the children are demonstrated in Table 1.

In the present study, the mothers were asked to fill the communication skills checklist, which is a researcher-made checklist, and answer some questions about family history of speech-language disorders. This checklist evaluates the means of communication (i.e., eye contact, gestures, vocalization, first words, and facial expressions), communicative functions (i.e., behavior regulation, joint attention, and social interaction), and prelinguistic skills with cognitive bases (i.e., imitation and object permanence). The checklist contains 36 items (33 scored on a 3-point Likert-type scale, and three scored on a 5-point Likert-type scale), according to the psychometric properties of the researcher-made checklist, which was determined before the present study. It is a reliable and valid instrument. All items had the Content Validity Ratio (CVR) higher than 0.79 and the Content Validity Index (CVI) of higher than 0.62. Based on the validity of the age groups, the results of the communication skills checklist demonstrated significant differences between the four age groups. Moreover, based on the previous study, the checklist demonstrated a high association with the "childhood nonverbal communication scale" [51, 52]. The internal consistency determined by the Cronbach α was 0.952 for all the 3-point Likert scored items and was 0.857 for the 5-point Likert scored items. This result indicated a good correlation between these items. The test-retest reliability coefficient was also calculated regarding 50 mothers who filled the checklist for the second time about two weeks later. According to the intraclass correlation coefficient (ICC), the checklist demonstrated excellent reliability (ICC=0.933, P<0.001) [52].

After the data gathering, the statistical analysis was performed using the SPSS v. 25. Analysis of variance (ANOVA), Scheffé test [53], the Kruskal–Wallis, and the post-hoc test [54] were used to compare the children's ability in the four above-mentioned age groups. The dif-

Table 1. Characteristics of the participants (family history of speech-language disorders) (N=277)

Variables		No.(%)		
		Negative	Positive	Total
Participants' gender	Girls	112(90.3)	12(9.7)	124(44.8)
	Boys	124(81)	29(19)	153(55.2)
Number of children in each age group	6-9 months	45(91.8)	4(8.2)	49(17.69)
	10-12 months	47(88.7)	6(11.3)	53(19.13)
	13-18 months	64(87.7)	9(12.3)	73(26.35)
	19-24 months	80(78.4)	22(21.6)	102(36.83)

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ference between the total scores of the two genders was also determined using the Mann-Whitney U test.

3. Results

In the present research, 277 children aged between 6 and 24 months were studied. The results of the statistical analysis are described in the following. According to Table 2, the 2-way ANOVA test demonstrated lower scores of the communication skills checklist in children with a positive family history of speech-language impairments. Furthermore, the results illustrated the increase in the scores as children grow up. This increase is also demonstrated in the scores of gestures (Table 3) and first words (Table 4). Based on the results of the Scheffé test in Table 5, there were significant differences between the age groups.

The Kruskal-Wallis test showed a statistically significant difference in the score of each skill between the different age groups (i.e., eye contact χ^2 (3)=15.941, P=0.001; gestures χ^2 (3)=160.141, P=0.001; vocalization χ^2 (3)=124.231, P=0.001; first words χ^2 (3)=179.094, P=0.001; facial expressions χ^2 (3)=33.528, P=0.001; behavior regulation χ^2 (3)=102.062, P=0.001; joint attention χ^2 (3)=77.307, P=0.001; social interaction χ^2 (3)=95.188, P=0.001; imitation χ^2 (3)=128.707, P=0.001; object permanence χ^2 (3)=132.283, P=0.001; play χ^2 (3)=136.551, P=0.001). According to the post-hoc test, gestures and first words are specifically different between the four age groups. In other words, the scores of these two skills are statistically different between 6 to 9 and 10 to 12, 6 to 9 and 13 to 18, 6 to 9 and 19 to 24, 10 to 12 and 13 to 18, 10 to 12 and 19 to 24, and 13 to 18 and 19 to 24 months. The Kruskal-Wallis and the post-hoc tests results are presented in Table 6.

Based on the results of the Mann-Whitney U test in Table 7, the standardized test statistics for eye contact, gestures, vocalization, first words, facial expressions,

Table 2. Results of 2-way ANOVA test showing the relation between family history, age, and total score of the communication skills checklist (family history of speech-language disorders)

Age Groups (Month)	Mean±SD		
	Negative	Positive	Total
6-9	65.66±12.81	59±10.86	65.12±12.69
10-12	82.46±10.87	82.50±21	82.47±12.12
13-18	96.79±8.32	88.11±9.71	95.72±8.90
19-24	105.57±6.27	100.90±8.91	104.56±7.14
Total	90.98±17.45	91.31±17.13	91.03±17.37

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Table 3. Results of 2-way ANOVA test showing the relation between family history, age, and gestures score (family history of speech-language disorders)

Age Groups (Month)	Mean±SD		
	Negative	Positive	Total
6-9	11.73±3.01	10.25±2.62	11.61±2.99
10-12	16.82±3.30	16.83±5.49	16.83±3.54
13-18	21.20±2.16	18.88±3.55	20.91±2.47
19-24	22.46±1.84	21.59±4.76	22.27±1.91
Total	18.95±4.76	19.19±4.58	18.98±4.73

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behavior regulation, joint attention, social interaction, imitation, object permanence, and play were respectively -0.704, -2.621, -2.206, -3.624, -0.300, -1.468, -0.951, -2.154, -2.846, -1.162, and -3.953. P value was only lower than 0.05 in gesture, vocalization, first words, social interaction, imitation, and play skills.

4. Discussion

The present study aimed to assess prelinguistic skills in Persian-speaking children aged 6 to 24 months and compare the skills between different age groups and the two genders. Also, we studied the effects of family history of speech-language disorders on children's prelinguistic development. The prelinguistic skills assessed in this study were means of communication (i.e., eye contact, gestures, vocalization, first words, and facial expressions), communicative functions (i.e., behavior regulation, joint attention, and social interaction), and prelinguistic skills with cognitive bases (i.e., imitation and object permanence).

The analysis revealed the statistically significant differences between the scores of 6 to 9 months, 10 to 12 months, 13 to 18 months, and 19 to 24 months groups, indicating that these prelinguistic skills develop as children grow up.

According to the results, there is a difference in the frequency of eye contact between different age groups. These results are consistent with those of Brooks and Meltzoff [4], Dawson et al. [55], and Berger and Cunningham [56]. Eye contact, an essential skill affecting information processing, should be developed in children to facilitate learning [57].

According to our findings, gestures develop as children grow up. This increase in ability in the perception and expression of gestures from 6 to 24 months can be attrib-

Table 4. Results of 2-Way ANOVA test showing the relation between family history, age, and first words score (family history of speech-language disorders)

Age Groups (Month)	Mean±SD		
	Negative	Positive	Total
6-9	9.42±9.42	8±0.81	9.30±2.05
10-12	11.63±2.64	13.16±5.03	11.81±2.98
13-18	14.43±2.27	12.55±2.60	14.20±2.38
19-24	18.51±1.92	16.31±2.80	18.03±2.31
Total	14.30±4.10	14.21±3.97	14.29±4.07

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Table 5. Results of the Scheffé Test

Age Groups (Month)		Mean Difference	Standard Error	P
6-9	10 to 12	-17.34	1.94	<0.001
	13 to 18	-30.60	1.81	<0.001
	19 to 24	-39.44	1.70	<0.001
10-12	6 to 9	17.34	1.94	<0.001
	13 to 18	-13.25	1.76	<0.001
	19 to 24	-22.09	1.66	<0.001
13-18	6 to 9	30.60	1.81	<0.001
	10 to 12	13.25	1.79	<0.001
	19 to 24	-8.84	1.50	<0.001
19-24	6 to 9	39.44	1.70	<0.001
	10 to 12	22.09	1.66	<0.001
	13 to 18	8.84	1.50	<0.001

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uted to mothers' performance. Mothers in the early years of their children's life usually use gesture-word combinations [58, 59]. Moreover, with the emergence of communicative functions in children, especially joint attention, the use of some direct gestures such as pointing increases since pointing is one of the most common forms of communication in joint attention [60, 61]. However, our findings of gestures are consistent with the studies conducted by Bates et al. [62], Crais et al. [63], Tomasello et al. [64], Masur et al. [58], and Iverson et al. [59]. Babaei et al. concluded that gestures remain stable in Iranian children from 12 to 18 months. This difference might be due to the small number of samples in that study [48].

There is a difference between the results of the age groups in vocalization. These findings are consistent with Davis and Macneilge's paper. According to their findings, children use labial and alveolar consonants more than the others in their primary babblings. As children develop, the consonants become more varied, and when they reach 14 to 20 months of age, they use different consonants like nasal consonants [65].

Based on the results, children express more words as they grow up, which is consistent with studies conducted by Brooks and Kempe [66], Mahmoudi Bakhtiyari et al. [45], and Tardif et al. [67]. Children's first words are important issues to be assessed in the prelinguistic stage. Surprisingly, children who were late to express first words were more at risk for future language problems than children who were not [68]. Vocabulary spurt, an acceleration in the rate of expressing new words, happens between 19 to 18 months of age [69, 70]. The age of this apparent growth is also consistent with our findings.

The ability to express and perceive facial expressions and emotions are different between age groups. This finding is consistent with the studies conducted by Herba and Phillips [71], Cole [72], McClure [73], and Thompson [74].

Based on the results, there is a difference between the communicative functions scores in the age groups. Children's ability in response to and initiation of joint attention, behavioral regulation, and social interaction was different between the age groups, which is consistent with the studies conducted by Mundy et al. [75], Carpenter et al. [76], and Papousek [77]. However, the results are not consistent with Babaei et al.'s study because they consider the development of joint attention stable from 12 to 15 months of age. The difference is assumed to be due to the various methodologies [49].

The ability to imitate, which is the base of the mind theory [78], is different among the age groups. This finding is consistent with the papers published by Jones [79], Wang et al. [80], and Oostenbroek et al. [81]. The difference between the age groups in object permanence abil-

Table 6. Results of the Kruskal-Wallis and Post Hoc Tests

Skill	Test Statistics	Degrees of Freedom	P	Age Groups	Post Hoc Test
Eye contact	15.941	3	<0.001	6 to 9-10 to 12	<0.689
				6 to 9-13 to 18	<0.229
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<1.000
				10 to 12-19 to 24	<0.194
				13 to 18-19 to 24	<0.343
Gestures	160.141	3	<0.001	6 to 9-10 to 12	<0.001
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.001
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<0.021
Vocalization	124.231	3	<0.001	6 to 9-10 to 12	<0.052
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.073
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<0.001
First words	179.094	3	<0.001	6 to 9-10 to 12	<0.008
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.005
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<0.001
Facial expressions	33.528	3	<0.001	6 to 9-10 to 12	<0.877
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.020
				10 to 12-19 to 24	<0.004
				13 to 18-19 to 24	<1.000
Behavior regulation	102.062	3	<0.001	6 to 9-10 to 12	<0.002
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.001
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<1.000

Skill	Test Statistics	Degrees of Freedom	P	Age Groups	Post Hoc Test
Joint attention	77.307	3	<0.001	6 to 9-10 to 12	<0.001
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.256
				10 to 12-19 to 24	<0.056
				13 to 18-19 to 24	<1.000
Social interaction	95.188	3	<0.001	6 to 9-10 to 12	<0.003
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.001
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<0.942
Imitation	128.707	3	<0.001	6 to 9-10 to 12	<0.006
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.001
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<0.356
Object permanence	132.283	3	<0.001	6 to 9-10 to 12	<0.051
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.008
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<0.001
Play	136.551	3	<0.001	6 to 9-10 to 12	<0.001
				6 to 9-13 to 18	<0.001
				6 to 9-19 to 24	<0.001
				10 to 12-13 to 18	<0.001
				10 to 12-19 to 24	<0.001
				13 to 18-19 to 24	<0.294

Table 7. The Results of the Mann-Whitney U Test

Skills	Standardized Test Statistics	P
Eye contact	-0.704	<0.482
Gestures	-2.621	<0.009
Vocalization	-2.206	<0.027
First words	-3.624	<0.001
Facial expressions	-0.300	<0.764
Behavior regulation	-1.468	<0.142
Joint attention	-0.951	<0.342
Social interaction	-2.154	<0.031
Imitation	-2.846	<0.004
Object permanence	-1.162	<0.245
Play	-3.953	<0.001

ity, which is another skill with cognitive bases, is remarkable and is consistent with Gopnik et al.'s study [82].

According to O'Grady and Dusing, play skill develops in children as they age and become more complicated. For example, exploratory kind of play decreases, but functional, representational, and symbolic plays increase in children as they grow up [83]. The results of studies conducted by Nwokah et al. [84], Casby [85], and Bruce et al. [86] are consistent with the present study.

In addition to the difference between the results of the age groups, children with a negative family history of speech-language disorders had higher communication skills checklist scores. This finding is consistent with other studies [25-28], such as the study conducted by Molini-Avejonas et al., which considered positive family history a risk factor for speech-language impairments in children [22].

Our findings revealed the statistically significant differences between the two genders in gesture, vocalization, first words, social interaction, imitation, and play. As Jacklin and Baker [30] and Eagly et al. [31] indicated in their papers, there are some differences in the acquisition of language and its basic skills between the girls and boys based on social factors. For instance, Bornstein et al. reported that Argentinian, French, and American mothers tend to have more exploratory plays with boys and more symbolic plays with girls. Also, they often vocalize while playing exploratory plays with boys and use words and sentences while playing with girls [32, 33]. Besides, girls tend to have fewer exploratory games in comparison to boys. These social factors, which have some effects on girls and boys, might be a reason for the different performance of the two genders.

5. Conclusion

In conclusion, children develop their communicational skills in the prelinguistic stage as they grow up. In this regard, the scores of eye contact, gestures, vocalization, first words, facial expressions, behavior regulation, joint attention, social interaction, imitation, object permanence, and play are different between 6 to 9 months, 10 to 12 months, 13 to 18 months, and 19 to 24 months age groups. A positive family history of speech-language impairments also might be a risk factor for children's prelinguistic developmental issues. Furthermore, some prelinguistic abilities have different developmental patterns between girls and boys. We also faced some limitations in this study. Due to the spread of COVID-19, we used the convenience sampling method. Furthermore, the socioeconomic status of the families was not considered. It is suggested to conduct studies on families with different socioeconomic classes.

Ethical Considerations

Compliance with ethical guidelines

The research protocol was approved by the Ethics Committee of the University of Social Welfare and Rehabilitation Sciences, Tehran (Code: IR.USWR.REC.1400.025).

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflicts of interest.

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