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Effects of Parent-Implemented Language Intervention on Communication Skills of Iranian Toddlers: A Pilot Randomized Control Trial

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ABSTRACT

Introduction: In recent years, some studies have indicated that some aspects of language performance of children from low socioeconomic status (SES) families are lower in language tests. Appropriate and timely interventions can partially prevent communication problems in these children. This study aimed to investigate the effect of a parental education program on word acquisition rates in Iranian toddlers from low SES families.

Materials and Methods: Sixty-six mothers (toddlers aged 12-14 months) participated in this randomized controlled trial study. These mothers were allocated to the experimental group and control group using the randomization method of the permuted block (each block=6). After baseline assessments, mothers in the experimental group received parental education program aimed at enriching the mother-child interactions and mothers' knowledge of communication development for 9 weeks. The control group did not receive any education. The outcome measures were children's scores on the Persian version of the McArthur-Bates communicative development inventories and mothers' scores in multiple-choice exams regarding workshops' contents. Data were analyzed using of Chi-square test, independent t test and paired samples t-test, Mann-Whitney U-test, and Wilcoxon signed-rank test.

Results: Both groups had a significant increase in vocabulary size, while changes in the experimental group were more than double that of the control group (P<0.001). Other aspects of communicative behaviors, such as imitation, naming, and intentionality were changed only in the experimental group according to the course of typical development (P<0.001). Mothers significantly got higher scores after the workshops in a multiple-choice exam regarding children's communication, language, and interaction (P<0.001).

Conclusion: The results demonstrate that mothers' knowledge of communication development is malleable and probably has positive effects on the communication behaviors of toddlers from low SES backgrounds.

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1. Introduction

Early childhood is the most critical time for positive intervention. Children's development during this stage is strongly affected by their environment, and this effect continues to affect them for the rest of their lives [1], so further considerations are necessary to reduce the effects of socioeconomic inequalities. Children from low socioeconomic status (SES) families lag behind their wealthier peers on different language measures from infancy to adolescence [1-3]. The SES-related language gaps and communication disparities appear in the children's early years and are closely linked with their later literacy skills and academic achievements. Recent studies confirmed significant negative effects of low SES on preschoolers' language competence in three different areas, such as vocabulary, [3, 4] syntax, and their language-learning process skills [5]. The SES negative effects on some language skills are small at the beginning of language development [6], however, these influences increase over time, especially when maternal education is considered [7].

Optimistically, providing high-quality interventions has begun in recent decades [8-14]. Heidlage et al. [15] in their meta-analysis of parent-implemented language intervention studies reported 25 studies that administered such programs and achieved positive linguistic outcomes in children aged 0-8 years. However, only seven studies investigated the effects of these programs on children from low SES families [8-14] and the others were implemented in middle-class families. While these kinds of interventions should be provided earlier in children's lives due to better and more durable results of early intervention [16, 17], only Guttentag et al. examined the effects of a multi-module parenting intervention from prenatal to two and a half years after the birth of children in low SES families. Their results indicated mothers and children in the high-intensity group (home visitation coaching condition) achieved better immediate and long-lasting language outcomes than the controls in the other condition (monthly phone calls, printed information sheets, and community resources) [12]. It seems we need further evidence on the effects of such intervention with a simpler design and easy-to-do structures for low SES families in developing countries.

The present study -contrary to the previous studies- followed American Speech-language & Hearing Association (ASHA) principles for family-centered practice [18] included running contextualized evaluations and interventions that appreciate the family system and preferences, considering family priorities and concerns in planning workshops and their contents, developing meaningful learning workshops that provide information about typical development of speech, language and communication, strategies to have better interaction, and offering proper feedback to mothers during workshops, teaching mothers interaction skills to support and manage their behaviors during interactions, designing the interventional plans according to family beliefs and values, family histories, and Iranian cultures, being sensitive about financial issues that these families were struggling with and the resources that these families had access to, using the dynamic feature of the family system and focusing on family interactions, and using familiar items in various aspects of the assessment and interventions. This study was designed to increase parent behaviors that support language learning, including contingent responsivity and linguistic modeling [19-21]. Some examples for each category are taking turns (either non-verbal or verbal), answering child attempts for joint attention and gestures, practicing different speech acts, using indirect language stimulation strategies (self-speech, parallel speech, expansion, and extension), and following the child's focus of attention, modeling language during daily routines and shared attention, answering child vocalizations with words [19]. Besides, we targeted mothers of 12-14 months of toddlers since their children were the starting point of language development and language use.

Objectives

The present study was designed to evaluate the effectiveness of early mothers-implemented language intervention on toddlers' communication outcomes in low SES families. Since mothers received the main intervention, their knowledge about the content of our program was examined before and after the workshops. In summary, the present study tried to answer the following questions:

1. Did the mothers' scores on pretest and posttest change after giving information about interaction and communication?

2. Did the children's communication indices (communication intentions, comprehension signs, phrase comprehension, behaviors of starting to talk [naming and imitating], comprehension vocabulary, and production vocabulary) change after the intervention?

2. Materials and Methods

The present study was a double-blind randomized controlled trial (RCT) in which neither the speech and language pathologists (SLPs) nor the mothers knew what they were receiving.

Study participants

The research participants were not subjected to harm in any way. Participation in the study was based on people's willingness; the participants have the right to withdraw from the study at any stage. The research team respected the dignity of the participants in all stages. Before the study, full consent was obtained from the participants. In all stages of the study, the privacy of research participants has been protected.

In all stages of the study, confidentiality of the research data was ensured. The research team kept the participants anonymous. The research team tried to avoid any deception or exaggeration about the aims and objectives of the research. We declared affiliations, sources of funding, and possible conflicts of interest. The research team communicated with participants and any involved person in the study with honesty and transparency. The research team avoided any type of misleading information, as well as represented primary data findings in a biased way.

From 6 health centers located in specific areas of Semnan City in Iran, all mothers who had toddlers aged 12-14 months were invited to the study. From 125 signed consent forms, 74 mothers who were at a low SES level according to the proxy of family income as recorded in the health centers database, fathers' job, and area of living, had no history of mood disorders based on their scores on the Persian version of Beck's questionnaire, and their toddlers with no history of developmental disorders remained in the study. Eight mothers were excluded since they reported more than 20 expressive words for their children. Ebtedaei et al. [22] showed that Persian-speaking children aged 12-14 months did not show gender differences in their vocabularies span; however, in the present study, this variable was considered in statistics and gender balance was maintained between the groups.

Tools

Based on children's age, this study used the first pack of children's language assessments (9-18 months) developed by Kazemi et al. [23]. The demographic information sheet, children's speech acts, and MacArthur-Bates Communicative Development Inventories (MCDI) [24] were administered. The first variable investigated in the present study was communication intention. Mothers were interviewed for four types of requests. The examiner asked them to think about the whole last week, and answer questions. The questions were related to request for action, request for objects, rejection, and comment. Based on toddlers' age, it was expected that children would show their speech acts via vocalization, real words, gestures, or a combination of these three modes. Eight codes were defined according to these options (1=gestures; 2=vocalization; 3=words; 4=combination of gestures and vocalization; 5=combination of gestures and words; 6=combination of vocalization and words; 7=combination of gestures, vocalization and words; 8=none was reported.).

The Persian MCDI have five parts explained as below (the fifth part regarding gestures & Activities was not included in the present study):

Comprehension signs: Three yes/no questions that families should answer in advance. A child's score will be any number between zero and three.

Starting to talk: Two questions consider two important competencies in children, such as naming and imitation. Both skills are needed before children can produce real words. Parents should think about the last week and choose three options, such as never, sometime, and usually.

Phrase comprehension: This part includes 28 common phrases with yes/no options. A child's score was a number between 0 and 28.

Comprehension and production vocabularies: This word checklist had 19 subdivisions and provided two scores for each child, including a comprehension score calculated from the number of those words that children understand but do not say and an expression score calculated from words that children not only understand but also use.

Study design

The curriculum

The research team developed a family-centered intervention aimed at enriching the mother-child interactions and mothers' knowledge of communication development. This program consisted of four educational work-

shops that provided simple and understandable knowledge about children's communication development in addition to strategies that were easy to understand and easy to remember to be implemented at home. The total study period was 9 weeks, which included baseline and follow-up assessments. Workshops were held for even weeks. Pre and post-evaluations were conducted in the first and last weeks. Each workshop included five to six mothers and lasted for an hour and a half. The content of the four workshops was taken from the typical course of communication development defined by Owens [25], Hoff [7], and Jalilehvand [26]. To be consistent for all mothers and workshops, all workshops' contents (what to say, how to say, when to say, and possible questions and answers) were put on a booklet and handed to the SLP who was in charge to deliver workshops. She received training from the first authors for the contents but she did not know why she was presenting the workshops (to keep the study blinded).

Each of the four workshops had six parts. In the first step, in each session, mothers answered five multiple choice questions regarding the typical course of the speech, language, and communication, and child-mother interaction (for example: Which of the following methods is appropriate to provoke a child's protest? 1) Pick up his/her favorite toy; 2) Repeat the child's words; 3) Imitating the child's words and activities; 4) Encourage the child). Then the SLP provided mothers with general information about typical development with more focus on speech, language, and communication; how to make home backgrounds ready for an enriched mother-child interaction, including reducing the use of television or cellphones to calm the children and making a communicative relationship during daily routines with their children, targeting meal times to narrate, engaging the child in conversation by initiating topics, giving times to children to respond and keeping eye contact and exaggerating their facial expression during feeding, cleaning up, and taking bath. The SLP emphasized the mothers' strengths that can change their children's conversational skills, as well as potential issues that may be obstacles in their ways to maintain these behaviors during daily routines.

In the third step, the SLP explained the content of the workshop according to the agenda and asked mothers to practice specific communicative behaviors with their children who were present in all workshops. The floor was covered with a Persian rug to make the place a suitable space for the participants. If the mother failed to imitate the expected behavior, the SLP modeled the desired behavior with the child and the mother repeated the behavior with her child. All mothers in each group had the chance to review and discuss the strategies during each session. Then, the SLP handed in those questions again and asked mothers to answer again. Their answers were collected by the SLP. The last 10 minutes of each session were devoted to answering any issue or question that mothers might have. If there was no question, the SLP and the mothers had a fast review of the content of the last session/s. As the final activity of each workshop, each mother received a colored pamphlet including all the content (goal, toys, and activities) of the session.

Book sharing, conversation, and free play with children's favorite toys were the main strategies to introduce new vocabulary, practice speech acts, take turns, and find out the child's interests. For each goal, the SLP presented examples of what to do, and what not to do, with a child in each session.

The control group completed all questionnaires twice (week one and week nine). The control group did not receive any education in any format (workshops, pamphlets, or social networks). Another SLP blinded to participant condition interviewed mothers and was responsible for data collection.

Statistics

For numerical variables, the normal distribution assumption was checked by the Shapiro-Wilk test at the 95% confidence level. In the present study, independent t-test, paired samples t test, Chi-square test, U-Mann Whitney, and Wilcoxon signed-rank test to compare the two groups was implemented to search for changes and differences. P less than 0.05 was considered significant. The SPSS v. 24 was implemented to analyze data.

3. Results

The tests of normality indicated that the data did not have a normal distribution ($P<0.05$) (Table 1).

Table 2 presents the demographic features of both groups. Both groups did not have significant differences in the matter of background factors ($P>0.05$).

Mothers' knowledge of interaction and communication

The focus of the study was on changing mothers' knowledge about interaction and communication with their children using the least resources and materials and evaluating the effect of changing knowledge on children's communication indices. To do so, moth-

Table 1. Normality results evaluated by Shapiro-Wilk

Variables	Statistic	df	Sig.
Production vocabulary (pre-intervention)	0.918	62	0.001
Production vocabulary (post-intervention)	0.845	62	0.0001
The difference in production vocabularies between post and pre-intervention scores	0.781	62	0.0001
Comprehension vocabulary (pre-intervention)	0.936	62	0.003
Comprehension vocabulary (post-intervention)	0.972	62	0.167
The difference in comprehension vocabularies between post and pre-intervention scores	0.956	62	0.027
Phrase comprehension (pre-intervention)	0.856	62	0.0001
Phrase comprehension (post-intervention)	0.724	62	0.0001
The difference in phrase comprehensions between post and pre-intervention scores	0.916	62	0.0001

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ers answered 20 multiple-choice questions (five for each workshop). The total scores for pre-intervention and post-intervention were calculated and compared with the Wilcoxon signed-ranks test. Result indicated a significant change in mothers' knowledge (pre-intervention, Mean±SD=10.06±2.84; post-intervention, Mean±SD=14.59±3.35; z= -4.72, P<0.001).

Toddlers' speech acts

Table 3 presents the most common mode reported for each communication intention in both groups before and after the intervention.

Toddlers' comprehension signs

All children in both groups scored three in both assessment times for Comprehension Signs.

Table 2. Demographic characteristics of both broups (n=66)

Background Variables	Sub-Categories	No. (%)/Mean±SD		P*
		Control (n=33)	Experimental (n=33)	
Children's gender	Male	22(66.7)	24(72.7)	0.592
	Female	11(33.3)	9(27.3)	
Children's age		12.48±0.76	12.58±0.75	0.626
Mothers' Beck score		5.7±4.7	6.8±4.4	0.276
Maternal education	Less than a high school diploma	8(24.2)	16(48.5)	0.112
	High school diploma	12(36.4)	7(21.2)	
	University degrees	13(39.4)	10(30.3)	
Number of family members	Three	10(30.3)	9(27.3)	0.699
	Four	16(48.5)	14(42.4)	
	Five and above	7(21.2)	10(30.3)	
Order of birth	First	10(30.3)	11(33.3)	0.563
	Second	16(48.5)	12(36.4)	
	Third and above	7(21.2)	10(30.3)	

*Pearson's Chi-Square test or Mann-Whitney test

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Table 3. The most common mode for assertiveness in both groups

Groups	Descriptive Statistics	Request for Action		Request for Object		Rejection		Comment	
		Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
Experimental	Median	4*	4	4	6***	4	7	1****	4
	Mode	4	4	4	7	4	7	1	4
Control	Median	4	7**	4	4	4	4	4	4
	Mode	4	7	4	4	4	4	4	4

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*4 indicates a combination of gestures and vocalization; **7 indicates a combination of gestures, vocalization, and words; ***6 indicates a combination of vocalization and words; ****1 indicates gestures

Starting to talk

Table 4 presents the descriptive findings of the frequency of the naming and imitating behaviors before and after the program.

Phrase comprehension

Table 5 presents the scores of the groups.. Both groups did not have a significant difference before the intervention; however, the experimental group had a higher score after the workshops and the difference between the scores of the groups was significant.

Comprehension and production vocabularies

The results showed no significant differences in production and comprehension vocabulary scores of both groups before the intervention (P>0.05). However, after 8 weeks and 4 workshops, both groups increased their scores regarding these variables. A comparison of the post-intervention scores showed that the scores of the experimental group in these two variables were significantly higher than the control group. The experimental group had statistically significant changes in their production and comprehension vocabulary scores before and after the intervention (Table 5).

4. Discussion

The present study confirmed that parental education aimed at enhancing and enriching mothers' knowledge about communication development and how to interact and communicate with their toddlers was successful. We know from previous studies that parents' knowledge of children's language development is a crucial prerequisite for changing parents' language behaviors [27] and mediates the relation between child-directed speech and SES [28]. Therefore, the changes seen in toddlers' communication behaviors were probably a positive reaction to the changes in mothers' knowledge, although we are not sure due to our limitation to observe mothers' behaviors at home or in lab conditions. We probably facilitated the development of communicative behaviors in children from low SES backgrounds by changing mothers' knowledge because nothing changed in the number of toys or resources in participants' home in the last interview. The results of the present study support previous claims that changing parents' knowledge about typical development has positive effects on parent-child interactions and even a small amount of education but focus can have positive effects on children's vocabulary.

Table 4. Descriptive data regarding "Starting to talk"

Groups	Descriptive Indices	Imitation-Pre	Imitation-Post	Naming-Pre	Naming-Post
Experimental	Median	0*	1**	0	1
	Mode	0	1	0	1
Control	Median	1	1	0	1
	Mode	1	1	0	1

*Never; **Sometimes

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Table 5. Phrase comprehension and vocabularies changes

Index	Group	Mean±SD		P*	Mean Difference±SD	P**
		Pre-test	Post-test			
Production vocabularies	Experimental	6.94±5.47	30.36±23.75	<0.001	23.42±22.55	0.004†
	Control	8.27±6.37	18.70±19.75	<0.001	10.42±15.93	
	P‡	0.476	0.014	-	<0.001	-
Comprehension vocabularies	Experimental	141.91±85.55	221.61±73.80	<0.001	79.70±79.13	0.043
	Control	132.61±78.31	172.64±94.30	<0.001	40.03±64.70	
	P‡	0.658	0.022#	-	0.012	-
Phrase comprehension	Experimental	23.67±4.38	26.64±2.26	<0.001	2.97±3.22	0.978†
	Control	21.00±6.59	23.33±5.07	0.026	2.33±6.31	
	P‡	0.104	0.002	-	0.405	-

*Wilcoxon signed-ranks test.

**Adjusted for sex, beck scores, maternal education, and the number of family members, according to the multiple regression models.

†Dependent variable; ‡Mann-Whitney test; #t-test

Toddlers go from just gestures to a combination of gestures, vocalizations, and real words during the first two years of life. According to the present study, the experimental group changed their mode of communication in three speech acts (comment, rejection, and request for objects) while the control group changed only for one speech act. If we assumed that the content of the workshops did not change the mother's interactive behaviors, then the content of the workshops certainly made them better observers and interpreters of their children's acts.

Another finding that highlighted the positive effects of enhancing mothers' knowledge on children's communication was starting to talk behaviors such as imitation and naming. Imitation is mainly facilitated via cognitive and naming abilities because a sign of children's competencies to use symbols instead of signals are specific behaviors that their frequencies in the first year of life can change later children's language profiles. Due to the study limitations, we cannot be sure about mothers' behaviors at home. However, the content of the workshops had a special emphasis on imitating and labeling and how to help children to imitate and name effectively, and these changes were not observed in the control group, we can probably assume that the mothers in the experimental group made changes in their interactions or in their use of resources to have better communication with their children following the workshops.

This study showed that both groups showed significant changes in the size of their comprehension and production vocabularies and the number of phrase comprehension. The mean of changes in comprehension vocabulary in the experimental group was twice that of the control group. The mean of changes in production vocabulary in the experimental group was two and a half times more than that of the control group. It was difficult to find studies that exactly checked the effects of such an intervention on children from low SES backgrounds. Most studies focused on children at risk or with language impairment or autism spectrum disorder. The other concerns for these studies were the age range they covered or the level of SES that they provided. However, considering all these differences, some aspects can be cited here and show a partial agreement between the results of the present study and other studies. Other studies found that parent-implemented language intervention did not have a significant influence on children's comprehension of vocabulary [15], which is in contrast with our findings. The reasons for such a difference may be the age of the participants (our participants were younger and in the golden time to increase their comprehension vocabulary), the possibility of language disorders (our participants were yet in the typical range while the participants in the articles cited by Heidlage, Cunningham [15] had language disorders or were at risk for language disorders) and the level of SES (some of these studies did not define the SES situation for the families). Our

finding related to the production vocabulary is in complete agreement with the findings provided by previous studies [15], showing that parent-implemented language intervention had moderate to strong effects on children's production vocabulary.

5. Conclusion

The present study supports the hypothesis that mothers' communication knowledge and behavior are malleable in low SES families. Changes in children's communication outcomes by measuring the use of speech acts, naming, imitation, phrase comprehension, and vocabulary sizes support the hypothesis that children's language outcomes can be positively influenced by changing mothers' knowledge of typical development in communication.

Limitation

This study was taken place without objective evaluation of children due to their age. Someone may raise the concern that the intervention trained mothers to be better language reporters, however, there are points in the study design and its result that relieve minds. The SLPs taught mothers how to play and read books not to look for speech and language features, when and how to interact and communicate, and never provided information about the features of actual words. Besides, we evaluated behaviors other than what we taught. Therefore, any concern is irrelevant in this case. Time, money, and cultural consideration were against us having a long-term follow-up. Future longitudinal studies with a larger sample size may help to observe the sustainability of short-term language outcomes.

Ethical Considerations

Compliance with ethical guidelines

The Ethics Committee of human participants at the Semnan University of Medical Sciences approved the project (Ethics reference number: IR.SEMUMS.REC.1397.005; National Ethics code: 13811). The project received an Iranian Registry of Clinical Trials (IRCT) code (IRCT Code: IRCT20180612040069N). Informed consent was obtained from all individual participants who participated in the study.

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Authors' contributions

Conceptualization and Supervision: Masoomeh Salmani; Methodology: Masoomeh Salmani, Raheb Ghoorbani, Fatemeh Paknazar; Investigation, Writing-original draft, and Writing-review & editing: All authors; Data collection: Masoomeh Salmani, Fatemeh Ranjbar, Majid Gholamzadeh; Data analysis: Raheb Ghoorbani, Fatemeh Paknazar; Funding acquisition and Resources: Masoomeh Salmani.

Conflict of interest

The authors declared no conflict of interest.

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