



# Program to reduce empowerment barriers hindering mothers to contribute to speech skills of hearing-impaired children with cochlear implant

Leila Ravanyar<sup>1\*</sup>, Firoozeh Mostafavi<sup>2</sup>, Shervin-Sadat Hashemian<sup>3</sup>, Rana Hosseini<sup>1</sup>, Seyed Mohammad Mahdi Hazavehei<sup>4</sup>, Mohammad Majid Oryadi-Zanjani<sup>5</sup>

<sup>1</sup>Social Determinant of Health Research Center, Clinical Research Institute, Urmia University of Medical Sciences, Urmia, Iran

<sup>2</sup>Department of Health Education and Health Promotion, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

<sup>3</sup>Department of Community Medicine and Health, School of Medicine, Golestan University of Medical Sciences, Golestan, Iran

<sup>4</sup>Department of Public Health, School of Health, Hamedan University of Medical Sciences, Hamedan, Iran

<sup>5</sup>Department of Speech Therapy, School of Rehabilitation Sciences, Shiraz University of Medical Sciences, Shiraz, Iran

## Abstract

**Background and aims:** Given the importance of reducing barriers hindering the empowerment of mothers from contributing to the rehabilitation of hearing-impaired children with cochlear implants, the present study points to the direction of designing, adopting, and assessing a program that would lessen such barriers.

**Methods:** In this randomized controlled trial (RCT), participants were consecutively selected from individuals referring to speech-therapy centers serving hearing-impaired children in the Town of Shiraz (Iran). Intervention and control groups were established using randomized block selection (35 individuals per group). The parent-based intervention was adopted in 6 training sessions, each session lasting 80 minutes. A researcher-made questionnaire was employed to investigate empowerment barriers, while children's speech skill was assessed using the Newsha scale.

**Results:** Data collected from 35 intervention and 33 control group members were examined. Evaluation of primary and interactional effects of "time" and "group" shows time to have a meaningful effect on "parental discord" and "empowerment barrier" variables ( $P < 0.001$ ). Time-group interaction also proved significant regarding effects on "difficulty working with hearing-impaired child" and "parents' false beliefs". Compared to the control group, the intervention group shows significant improvement across all variables at studied different time periods. Not to forget the immediate effects of time and group on the "speech skill" variable, which also proved significant ( $P = 0.001$ ).

**Conclusion:** The results denote the effectiveness of the parent-based intervention on mothers' empowerment and speech improvement in children with impaired hearing.

**Keywords:** Reducing discord, Mothers, Children, Cochlear implant, Hearing impairments

## \*Corresponding Author:

Leila Ravanyar,

Email: [ravanyar2007@yahoo.com](mailto:ravanyar2007@yahoo.com)

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## Introduction

A cochlear implant is a life-changing achievement for reducing hearing problems in individuals with hearing impairment. A cochlear implant has found a growing application in recent year (1). Late advances in the field of the cochlear implant have significantly refined speech perception in hearing-impaired individuals (2). Nevertheless, cochlear implant only partially restores hearing and is never enough to completely resolve disability in children with hearing impairment. After cochlear implantation, hearing-impaired children and their families continue to struggle with communication and education-related complications, as well as sensory device issue (3).

Multiple factors are involved in helping children to cope with post-cochlear implantation conditions and heighten their educational achievement, especially in terms of

acquiring speech and communication abilities. Research on the effects of cochlear implantation is mainly focused on speech perception and sound production. However, several studies have addressed the educational drawbacks and how these children interact in educational settings (4). Concerning their outstanding restoring contribution, the family's concern over the child's impairment can be considered a determining factor for the outcomes of community-based rehabilitation programs if appropriately addressed under parent-based intervention (5-7).

To better understand the features of family structure, therapists are desired to appraise parental needs and concerns when making a detailed proposal of services. Family exigencies have a remarkable impact on family functioning and family-child interaction and must necessarily be considered during initial assessments (8-11). Across all the studies conducted on parents of

hearing-impaired children, subjects have confessed to being swayed by factors that influence their pattern of interacting with the child and following rehabilitation activities at home (12-14).

In some aspects, the situation of mothers of hearing-impaired children is different from mothers of hearing children. It has been determined that more than 90% of hearing-impaired children are born to hearing parents. In most cases, the family has no hearing loss history. The family needs to become more familiar with such a situation. Make a decision quickly and choose the best solution for their child, provide the services they need, and be their supporter. All these issues can endanger the mental health of the family, especially the mother (15).

Some studies have reported that the mental health of mothers of hearing-impaired children is lower than that of mothers of normal children (16). Khakpour et al found that the mental health of mothers of hearing-impaired children is lower than that of mothers of normal children, and they are more prone to depression, anxiety, psychosis, aggression, and morbid fear compared to mothers of other children (17). Other studies have also reported more depression in mothers of hearing-impaired children than in mothers of hearing children (18).

Specialized support and intervention offered to families is an invaluable cooperative process that, if presented promptly, would enhance their inculcating efforts by tapering stress, depression, and a range of other mental conditions that emerge once families become wary of a child's hearing impairment (18-21).

Gohary and colleagues' research found that mothers of children using CI children have higher general health than mothers with children using hearing aids (HA), and the level was close to mothers with normal hearing (NH) children. Cochlear implantation and, as a result improving communication is effective in improving the general health of mothers of hearing-impaired children (22). Early interventions begin during preschool and involve large-scale collaboration with parents (23). In Iranian culture, mothers are responsible for early childhood education. Hence, the success of early intervention programs demands mothers that are sufficiently fit in terms of mental and physical condition (24-26). Mothers are more often in contact with specialists and educate their hearing-impaired children at home and are better than fathers able to establish a relationship with their children. Sometimes they are always responsible for their relationship. Hard-of-hearing children often understand their mother's words better, and lip-reading their father's words is (27).

Since families are active in setting goals, determining special needs, and performing timely interventions, they are considered valuable in providing services to children. Also, the ability of mothers to cope with their child's hearing loss can change the child's life in various ways. To carry out family-centered and parent-centered treatment and intervention programs for our families, each group has unique needs and beliefs that affect the treatment

outcomes according to the prevailing conditions. In Iranian culture, mothers have the leading role of raising children and can communicate better with them. They often teach the hearing-impaired child at home, so we need first to understand the needs of these families (especially mothers) regarding the care of their children and the obstacles and facilitating factors of mothers' ability concerning children's speech. Considering that in Iran, no study has been done on the experiences and needs of parents having a disabled child, the influential factors in their participation in the treatment process of their children. Therefore, the present study aims to formulate, implement and evaluate an educational intervention program to reduce barriers to empowering mothers on the speech progress of hearing-impaired children with a cochlear implant.

### Materials and Methods

The research is a randomized controlled trial (RCT) in the speech-therapy centers serving hearing-impaired children in the Town of Shiraz (Iran) in 2016. At first, the study's aims and how the intervention would be made were entirely and clearly explained to the participants, and written informed consent was obtained from them. The target population comprises mothers with hearing-impaired children referring to these centers for speech therapy. Subjects were consecutively selected from among the individuals attending two major centers offering services to hearing-impaired children. Subjects from each of the centers who met the criteria for entering the study were included in the sampling list for random allocation to two intervention and control groups.

Inclusion criteria included parents being "hearing parents", Having a hearing-impaired child of 1-7 years with a speech problem, Absence of impaired hearing in other children, absence of disability other than hearing and speech impairment, interest for voluntary participation in the study.

Individuals with more than two cases of absence from the intervention program or the intention to withdraw entirely from the research were automatically excluded. Intervention and control groups were established using randomized block selection. As provided by the rule of allocation concealment, the person in charge of grouping did not know the subjects. The sample size was determined concerning the outcomes of the study conducted by Samadi et al (106) and by making use of a sample formula for quantitative research with type I error set at 5%, power of 80%, minimum expected difference of 1.4 for the progress in the condition of hearing-impaired children. Thirty-five individuals were allocated to each group, and, in total, 70 individuals participated in the research.

### Intervention

The purpose of designing the educational program in this study was to eliminate the needs (including increasing informational and educational needs, the need for

support from people around, and building mental and psychological capacity), strengthen facilitating factors, and reduce obstacles by relying on the individual and interpersonal levels of mothers. For this purpose and to prepare relevant content, a panel of experts was formed with researchers, speech therapists, clinical psychologists, and experts in health education and health promotion. Based on this panel, the contents related to each variable created in the qualitative stage were presented. This content separately includes:

- A. To meet the informational and educational needs, the educational content was prepared, including increasing the awareness and knowledge of mothers regarding various aspects of deafness and hearing loss of children.
- B. To address the need for support from those around and to build mental and psychological capacity, educational content, including methods to improve the self-confidence and resilience of parents, especially mothers with problems, was prepared.
- C. In order to achieve the facilitating factor of normalizing the conditions, educational content, including improving the awareness of mothers about deafness and hearing loss as well as the skills of working with children to improve the conditions, were prepared.
- D. To achieve the facilitating factors of increasing mothers' ability and using environmental resources, educational content, including increasing mothers' ability to teach a hearing-impaired child and improve their self-confidence, was prepared.
- E. In order to reduce the obstacles of working with a hearing-impaired child, educational content, including the skills of working with a child and methods of raising children with disabilities was prepared. At the same time, conditions were planned to discuss the problems of parents.

- F. To reduce the obstacle of parents' false beliefs, conditions were planned to discuss and correct them.
- G. In order to reduce the obstacle of parents' incompatibility, in addition to preparing content regarding communication and interaction with the child, parents with each other, and therapists, conditions for practical training to face these conditions were planned.

After reviewing and overlapping the presented contents, finally, the contents of the meetings were presented. These topics include increasing the awareness and knowledge of mothers regarding deafness and hearing loss, planning and recognizing the problems of working with a hearing-impaired child in the process of treatment and rehabilitation, methods of raising children, increasing the ability of mothers to educate their children, and improving their self-confidence. In each session, it was necessary to select methods and strategies related to theories and practical applications to address the research goals for intervention. Based on the created content, experts of the sessions and required training methods were also examined and determined.

The training package in this study included the training protocol related to the causes obtained in 6 training sessions of 80 minutes (Table 1). These sessions were conducted with the participation of researchers, a speech therapist, and a psychologist. The chosen methods are based on existing theory and empirical evidence, target determinants, and influence participants' behavior or change agents' behavior (28). Based on this, appropriate educational strategies (related to health education theories) were used in each session for the best effect. A supplementary brochure titled "How Can I be Useful" was also handed out to each participating mother. Classes were held uniformly (regarding attendants and the nature of the organizing center) at both centers and regular intervals. Each session involved a diverse range of theoretical and

**Table 1.** Program of educational intervention sessions

| Meetings       | Behavioral goals  | Educational area                      | Teaching method                | Educational tools                                  | Time (min) |
|----------------|---|---------------------------------------|--------------------------------|--|------------|
| First session  | Increasing mothers' awareness and knowledge about different aspects of the disorder and reducing their false beliefs  | Psychomotor<br>cognitive<br>Emotional | Lecture-question<br>and answer | Whiteboard, educational<br>slides, video projector | 80         |
| Second session | Reducing the obstacles of working with a hearing-impaired child and parental incompatibilities  | Psychomotor<br>Cognitive<br>Emotional | Lecture-question<br>and answer | Whiteboard, educational<br>slides, video projector | 80         |
| Third session  | Improving the awareness of mothers concerning children's behavioral issues, skills of working with children, and achieving the facilitating factor of normalizing the situation | Psychomotor<br>Cognitive<br>Emotional | Lecture-question<br>and answer | Whiteboard, educational<br>slides, video projector | 80         |
| Fourth session | Gathering information to use strategies to increase the individual capabilities of mothers  | Psychomotor<br>Cognitive<br>Emotional | Lecture-question<br>and answer | Whiteboard, educational<br>slides, video projector | 80         |
| Fifth session  | Meeting support needs and building mental and psychological capacity  | Psychomotor<br>Cognitive<br>Emotional | Lecture-question<br>and answer | Whiteboard, educational<br>slides, video projector | 80         |
| Sixth session  | Improving the awareness of mothers and reducing the obstacles of working with a hearing-impaired child and parental incompatibilities   | Psychomotor<br>Cognitive<br>Emotional | Lecture-question<br>and answer | Whiteboard, educational<br>slides, video projector | 80         |

applied instructions. The training was conducted in both centers with the same people. The content of each session and the methods used are presented below. The control and intervention groups in this study received the usual services of the centers, including speech therapy and psychological counseling.

#### **Data collection tools**

Data were collected using two different tools, namely the researcher-made and the Newsha scale. The former questionnaire contained inquiries on demographic and family (mother) empowerment data and was used to evaluate the effect of a training program on mothers. Demographic data entailed the mother's age, number of children, parents' level of education and occupation, child's age at the time of exhibiting impairment, child's age at the time of applying cochlear implant, child's gender, and child's life condition. Alternately, family empowerment data for surveying empowerment barriers included difficulties of working with the hearing-impaired child (6 questions), parental discord (11 questions), and parents' false beliefs (7 questions). Items were designed as maintained by Likert scale 5-balanced response ("I Perfectly agree"; "I Agree"; "No Comment"; "I disagree"; "I Totally Disagree") and scored from 1 to 5. A panel of experts quantitatively evaluated face validity and content under study. Concerning this, a questionnaire was submitted to 7 relevant experts and their recommendation on relevancy and language perspicuity, ease of response, and items matching concepts was incorporated. Additional face validity was done by requesting a group of 6 non-participant mothers to report any instance of ambiguity for ultimate modification. Meantime, the reliability of the questionnaire was measured by internal consistency assessment using Cronbach's alpha and was determined to be 0.81%. A high correlation (0.85) was also achieved on the strength of the relationship between each domain and the overall empowerment score.

The intensity of speech impairment was measured using Newsha developmental scale. The tool evaluates seven developmental domains of a child, namely hearing, perceived language, spoken language, speech, sociability, cognition, and motor skills from birth to age 6. The present research evaluates the speech domain in 13 age groups. Every item of the test is assigned a score of 1, and development levels are domain criteria-based. A minimum score or higher signifies a development matching the milestone at the expected age. Scoring lower than the minimum in 2 separate runs within less than one-week interval means the child has yet to reach the developmental milestone and must be evaluated in a lower age group. In this way, a child's developmental delay relative to normal children of his/her age group can be determined.

Newsha is an integrated scale developed in Iran for assessing the development skills of the native Iranian population, and its validity and reliability have been

tested and approved. The speech therapist and therapist complete the Newsha questionnaire.

#### **Procedure**

The reception staff notified individuals interested in participation. Mothers were briefed about the objectives of the research prior to enrollment. Participants were requested to express their informed, voluntary participation in writing. Random allocation software was used to support randomization into 5 equal blocks. The intervention was implemented within a month. Pre-intervention and post-intervention speech-progress measurements were conducted three months before and six months after the intervention. Meanwhile, mothers were assessed for empowerment-progress 1 and 3 months after the intervention.

#### **Data analysis**

Study results were reported using descriptive statistical indexes to represent sample attributes. Additionally, inferential statistics and analysis to test the intervention hypothesis were classified into three "pre-test," "post-test," and "follow-up" stages. Data were analyzed using repeated measure ANOVA using SPSS® version 23 statistical software.

The first assumption compared in repeated measure ANOVA was sampling, or in other words, randomized assignment of test subjects to experimental groups. As previously elaborated, test subjects were grouped randomly. Thus, this assumption was fully observed.

Normal distribution of dependent variable scores was the second assumption to be considered. The nonparametric Kolmogorov-Smirnov test (KS test) was run to determine the normality of score distribution in groups subject to research. General health was determined to be the normal distribution score.

The following assumption to be assessed was the equality of variances using Levene's equality test. The assumption was tested and approved. Based on the results, the sphericity assumption was not met for "difficulty working with hearing-impaired child," "parents' false beliefs," and "empowerment barriers." Hence, index F could not be determined and required modified Epsilon decomposition and more sophisticated methods, such as Greenhouse-Geisser correction, to adjust the lack of sphericity. Modified Epsilon decomposition created low values in this study.

#### **Results**

Data from 35 intervention groups and 33 (2 being excluded due to reluctance to participate in the post-test stage) control group individuals were examined. The mean age of participating mothers in intervention and control groups was  $29.47 \pm 4.12$  and  $29.72 \pm 4.47$  ( $P=0.80$ ), respectively, mean age of fathers was  $33.66 \pm 4.53$  and  $34.5 \pm 39.31$  ( $P=0.54$ ) respectively, and mean age of children was  $3.1 \pm 83.29$  and  $4.30 \pm 1.46$  ( $P=0.16$ ) respectively. Also,



55.6% and 45.5% of children in the intervention and control groups were boys ( $P=0.27$ ).

The mean and deviation of the “empowerment barrier” criterion for mothers, together with its proximities for both groups (i.e., intervention and control) at the triple stages (i.e., pre-test, post-test, and follow-up), are presented in Table 2.

Using repeated measurement tests to measure the differences in descriptive indexes in order to evaluate the direct and interactional effects of “time” and “group,” a significant difference in the effect of time on “parental discord” and “empowerment barriers” variables was recorded ( $P<0.001$ ). The significance of the “time effect” indicates differences in the mean values of variables during the study. However, no intra-group difference was observed. Based on the findings, time-group interaction also proved significant regarding effects on the variables of “difficulty working with hearing-impaired child” and “parents’ false beliefs,” implying a meaningful mean difference between the two groups at different stages of the study process. Compared to the control group, the intervention group showed significant improvement across all variables at different stages of the study. Not to forget the primary effects of time and group on the “speech skill” variable, which also proved significant ( $P=0.001$ ; Table 3).

As to the “parental discord” and “speech skills” variables, results show every paired comparison to being significant. On the other hand, the paired comparison made for “parents’ false beliefs” at the pre-test vs. post-test and post-test vs. follow-up stages also shows a meaningful difference. Moreover, the same holds true for the paired comparison of the “empowerment barriers” variable at the pre-test vs. post-test and pre-test vs. follow-up stages (Table 4).

It is important to note that the obtained results do not determine the trend and pattern of changes. The variance analysis test was used to determine these trends and patterns. As illustrated in Table 4, the “difficult to work with hearing-impaired child” and “child’s speech

progress” follows a meaningful linear trend. As to all other variables, linear and curved flows at significant levels are observed (Table 5).

### Discussion

The repeated measurement test to measure the differences in descriptive indexes helps evaluate the primary and interactional effects of “time” and “group”. The results show a significant difference in the effect of time on “parental discord” and “empowerment barriers” variables ( $P<0.001$ ). The significance of the “time effect” indicates differences in the mean values of variables during the study. In other words, in both the intervention and control groups, the score for “parental discord” and “empowerment barriers” variables has experienced a significant decline. Therefore, specific interventions and training offered by these centers can reduce the empowerment barriers and parental discord, while these programs also vary

**Table 3.** Repeated measures test to evaluate the main and interactive effects of time and study groups on barriers to empowerment and speech development

| Variable                                       | Source of variation | df | F     | P      | Partial eta squared |
|--|---------------------|----|-------|--------|---------------------|
| Difficulty working with hearing-impaired child | Between-group       | 1  | 1.80  | 0.18   | 0.02                |
|  | Time effect         | 1  | 0.48  | 0.60   | 0.007               |
|  | Time & group effect | 1  | 4.33  | 0.03   | 0.06                |
| Parental discord                               | Between-group       | 1  | 1.30  | 0.25   | 0.01                |
|  | Time effect         | 2  | 11.20 | <0.001 | 0.15                |
|  | Time & group effect | 2  | 0.82  | 0.44   | 0.01                |
| Parents false beliefs                          | Between-group       | 1  | 4.02  | 0.04   | 0.05                |
|  | Time effect         | 1  | 6.00  | 0.004  | 0.08                |
|  | Time & group effect | 1  | 3.88  | 0.02   | 0.06                |
| Empowerment barriers                           | Between-group       | 1  | 0.14  | 0.71   | 0.002               |
|  | Time effect         | 1  | 11.52 | <0.001 | 0.15                |
|  | Time & group effect | 1  | 2.93  | 0.05   | 0.05                |
| Speech skills                                  | Between-group       | 1  | 11.24 | 0.001  | 0.15                |
|  | Time effect         | 1  | 12.10 | 0.001  | 0.15                |
|  | Time & group effect | 1  | 1.63  | 0.20   | 0.02                |

**Table 2.** Mean and standard deviation of empowerment barriers in mothers and its domains based on group membership

| Variable                                       | Group        | Pre-test      | Post-test     | Follow-up     |
|--|--------------|---------------|---------------|---------------|
|  |              | Mean ± SD     | Mean ± SD     | Mean ± SD     |
| Difficulty working with hearing-impaired child | Intervention | 17.33 ± 7.55  | 15.01 ± 4.11  | 14.38 ± 5.61  |
|  | Control      | 17.06 ± 6.18  | 16.03 ± 6.04  | 16.78 ± 8.60  |
| Parental discord                               | Intervention | 32.72 ± 6.30  | 30.36 ± 5.61  | 29.50 ± 5.65  |
|  | Control      | 30.66 ± 7.10  | 28.33 ± 6.44  | 28.78 ± 7.65  |
| Parents false beliefs                          | Intervention | 17.77 ± 4.39  | 14.16 ± 4.24  | 14.80 ± 4.82  |
|  | Control      | 17.45 ± 4.63  | 17.00 ± 5.35  | 17.24 ± 5.96  |
| Empowerment barriers                           | Intervention | 67.83 ± 13.35 | 59.52 ± 10.84 | 58.69 ± 11.14 |
|  | Control      | 65.18 ± 14.62 | 61.36 ± 14.47 | 62.81 ± 18.67 |
| Speech skills                                  | Intervention | 0.59 ± 0.20   | 0.74 ± 0.19   | 0.74 ± 0.21   |
|  | Control      | 0.52 ± 0.17   | 0.57 ± 0.19   | 0.62 ± 0.20   |

**Table 4.** Within-group pairwise comparisons using the Bonferroni test on barriers to empowerment and speech development

| Variables             | Pairwise comparison | Mean difference | Standard error | P      |
|-----------------------|---------------------|-----------------|----------------|--------|
| Parental discord      | Pre-test-post-test  | 2.34            | 0.56           | <0.001 |
|                       | Pre-test-follow-up  | 2.55            | 0.67           | 0.001  |
|                       | Post-test-follow-up | -2.34           | 0.56           | <0.001 |
| Parents false beliefs | Pre-test-post-test  | 2.04            | 0.58           | 0.003  |
|                       | Pre-test-follow-up  | 1.59            | 0.71           | 0.09   |
|                       | Post-test-follow-up | -2.03           | 0.58           | 0.003  |
| Empowerment barriers  | Pre-test-post-test  | 6.06            | 1.31           | <0.001 |
|                       | Pre-test-follow-up  | 5.75            | 1.69           | 0.004  |
|                       | Post-test-follow-up | -0.31           | 1.21           | 0.99   |
| Speech skills         | Pre-test-post-test  | -0.10           | 0.03           | 0.003  |
|                       | Pre-test-follow-up  | -0.13           | 0.03           | <0.001 |
|                       | Post-test-follow-up | -0.02           | 0.02           | 0.65   |

**Table 5.** Results of trend analysis of variables over time (repeated measures analysis of variance)

| Variable                                       | Trend        | Average squares | P       | Effect size |      |
|--|--------------|-----------------|---------|-------------|------|
| Difficulty working with hearing-impaired child | Time * Group | Linear          | 157.16  | 0.01        | 0.08 |
|  |              | Linear          | 224.00  | <0.001      | 0.18 |
| Parental discord                               | Time         | Curve           | 52.76   | 0.01        | 0.08 |
|  |              | Linear          | 87.29   | 0.03        | 0.07 |
| Parents false beliefs                          | Time         | Curve           | 70.22   | 0.006       | 0.11 |
|  |              | Linear          | 36.22   | 0.04        | 0.06 |
| Empowerment barriers                           | Time * Group | Curve           | 1139.00 | 0.001       | 0.15 |
|  |              | Curve           | 466.11  | 0.001       | 0.15 |
| Speech skills                                  | Time * Group | Linear          | 395.17  | 0.05        | 0.06 |
|  | Time         | Linear          | 0.59    | <0.001      | 0.21 |

significantly. At the same time, time-group interaction also proved significant in terms of effects on the variables of “difficulty working with hearing-impaired child” and “parents’ false beliefs,” implying a meaningful mean difference between the two groups at different stages of the study process. Hence, training intervention has lessened the difficulty of working with hearing-impaired children and the parents’ false beliefs in the intervention group instead of the control group.

The results obtained from the variance analysis test applied to determine the trend and pattern of variable changes against time demonstrate a turndown in the effects of intervention over time and the follow-up period. According to descriptive results and scores, the “empowerment barriers” variable score in both groups reduces in the course of the triple stages of the study with a linear and curved flow. Score reduction in the intervention group at post-test and follow-up stages is higher than the control group, meaning that organized intervention has more effectively led to improvement in the intervention group.

Study findings suggest that we can improve the rehabilitation indexes by alleviating empowerment barriers. Although, some studies report no change in mothers’ participation following the changes in the mediator variables. In their investigation into the effects of parent-based social skill training on individuals with a cochlear implant, Amrai et al observed the parent-based social skill training to have significant positive impacts on improving the decisiveness, self-restraint, and general social skills of individuals, despite of having no meaningful effect on cooperation and participation skills (29). Addressing specific factors such as mothers and providing them with interventions designed based on background and environmental records to target mediatory factors appropriately proves helpful in ameliorating the benefits gained from intervention programs.

Parallel to this study, the results obtained by Pakzad et al also show meaningful differences in the tapering of symptoms associated with behavioral disorders in intervention and control groups at the post-test stage. The researchers conclude that providing mothers with training based on the parenting model can significantly reduce behavioral disorders in hearing-impaired children, recommending its adoption as an effectual intervention measure (30).

Regarding the speech improvement domain, findings indicate parent-based interventions considering environmental aspects to help improve the measured variables. A result correlating with that obtained by Prizant et al stresses the outstanding role of family and the surrounding individuals in the treatment process and the effectiveness of coherent parent-based interventions with environmental and social considerations on improving speech in children with hearing impairment. Researchers have emphasized the importance of reckoning various family aspects in the intervention (31).

Results also suggest that removing empowering barriers would ease the burden of working with the child, provide the grounds for implementing and following up appropriate training at home, and enhance the speaking ability of the hearing-impaired child. In line with our study, in the review conducted by Hsieh et al, children aged 18 to 36 months with language development and their parents. The family participated in 6 sessions of 2-hour multidisciplinary workshops for six weeks. It was concluded that the family’s implementation of this intervention program could significantly improve the increasing and acceptable performance of children with language development (32). Samadi et al organized a 6-month coherent parent-child hearing development intervention program for 15 children under 3 with a hearing aid and severe sensorineural hearing loss. Children’s hearing level was assessed before and after (6 months) of intervention. The mean pre-intervention speech skill development rate and the efficiency index of intervention were measured at 0.31 and 0.87, respectively, a statistically significant figure. Simultaneously, the mean

relative change index determined that the pre-intervention speech skill development rate had grown by 2.38 folds throughout the intervention. The study was wrapped up by suggesting the effectiveness of a coherent parent-child hearing development intervention program on the development of speech skills in children with hearing impairment (33).

The effectiveness of parent-based interventions has been the topic of numerous other studies (34). In addition, the results of family-oriented studies in other studies show the cost-effectiveness of the intervention. Based on this, many studies have considered the need for long-term implementation and review to judge the family-centered empowerment program (35). These studies unanimously highlighted the cost-effective nature and outcome of interventions in different countries, calling for their wide-scale probing and implementation on a parent-empowering basis (36).

In additional research, Salamati et al investigated the effectiveness of a family training program (as a subsidiary of the state-wide community-based rehabilitation plan) on the disabled population covered by care and hygiene networks in 21 pilot provinces. Subjects were assessed after the intervention, and findings suggested that the program effectively boosts the functioning and performance of the disabled in specific categories (37).

## Conclusion

The present study showed that a family-based intervention program for mothers could effectively affect the speech development of children with hearing disorders while increasing their ability. Also, it showed that it is helpful to use mixed research methods to deeply understand a phenomenon based on the experiences of people who face it in their daily life and plan. As a result, these methods are helpful before using existing knowledge and theories. Our understanding of this natural phenomenon is profound and comprehensive. It also helps health providers know what knowledge and strategies to use and how to empower mothers with hearing disorders. The current study program, which is based on the understanding and experiences of the people involved in the process and the specific cultural, social, and economic context of Iranian society, and its investigation shows its effectiveness on the needs, obstacles, facilitating factors, indicators of speech progress and the mental health of mothers. The researchers suggest using the created intervention program to improve the condition of mothers and children with hearing disorders in public and private rehabilitation centers and to conduct similar studies with an increase in the follow-up period. Besides, based on the study process and its results, it can be helpful to design and implement intervention programs in the form of different theories and models of health education and health promotion.

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## Authors' Contribution

**Conceptualization:** Leila Ravanyar, Firoozeh Mostafavi, Seyed Mohammad Mahdi Hazavehei, Mohammad Majid Oryadi-Zanjani.

**Data curation:** Leila Ravanyar, Firoozeh Mostafavi, Seyed Mohammad Mahdi Hazavehei, Mohammad Majid Oryadi-Zanjani, Shervin-Sadat Hashemian, Rana Hosseini.

**Formal analysis:** Leila Ravanyar, Firoozeh Mostafavi, Seyed Mohammad Mahdi Hazavehei, Mohammad Majid Oryadi-Zanjani, Rana Hosseini.

**Funding acquisition:** Leila Ravanyar, Firoozeh Mostafavi.

**Investigation:** Leila Ravanyar, Shervin-Sadat Hashemian.

**Methodology:** Leila Ravanyar, Firoozeh Mostafavi, Seyed Mohammad Mahdi Hazavehei, Mohammad Majid Oryadi-Zanjani.

**Project administration:** Leila Ravanyar, Firoozeh Mostafavi.

**Resources:** Leila Ravanyar.

**Software:** Leila Ravanyar, Firoozeh Mostafavi, Seyed Mohammad Mahdi Hazavehei, Mohammad Majid Oryadi-Zanjani, Rana Hosseini.

**Supervision:** Leila Ravanyar, Firoozeh Mostafavi.

**Validation:** Leila Ravanyar, Firoozeh Mostafavi.

**Visualization:** Leila Ravanyar, Firoozeh Mostafavi.

**Writing—original draft:** Leila Ravanyar, Shervin-Sadat Hashemian, Seyed Mohammad Mahdi Hazavehei, Mohammad Majid Oryadi-Zanjani.

**Writing—review & editing:** Leila Ravanyar.

## Competing Interests

The authors declare that there is no conflict of interest.

## Ethical Approval

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The present study has been approved by the ethics committee of Isfahan University of Medical Sciences (ethics code IR.Imus.Rec.1393.393789) and registered in the Iranian Clinical Trial Registration Center (identifier: IRCT201611230857N1). The objectives of the study were explained to the participants and informed consent was obtained from them.

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