Research Paper: Developing a Minimal Pairs' Package for Persian-speaking Children: A Preliminary Study

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ABSTRACT

Objectives: Different treatment approaches have been introduced for children with Speech Sound Disorders (SSD). Minimal pair intervention, Metaphon therapy, and parents and children together approach as linguistically-based approaches are routinely utilized in this population and both of them shared minimal pairs as a common component. The purpose of the current study was to develop and investigate the validity of the material for this treatment approach for Persian-speaking children.

Methods: To develop the minimal pairs' package, 10 phonological processes were selected based on the literature. Several minimal pairs were generated for each phonological process and their content validity was determined by the content validity ratio. In the next step, the appropriate pictures were selected. In the final step, the package was administrated to 45 monolingual Persian-speaking children.

Results: Based on the experts' opinions, 293 minimal pairs out of 303 pairs, obtained appropriate content validity values (content validity ratio >0.62) and 10 minimal pairs were excluded at this step. Finally, 256 minimal pairs remained after the administration of the package on the subjects.

Discussion: Based on the results of the current project, it seems that the Persian photo minimal pairs' package is a valid material for use in related speech treatment in children with SSD.

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Highlights

- Persian minimal pairs' package was developed to use in some treatment procedures of phonological disorders.
- Item generation was carried out to generate the appropriate items for the Persian minimal pairs' package.
- The results of the content validity showed that the majority of the generated items are appropriate for this package.

Plain Language Summary

The development of the Persian minimal pairs' package was performed based on an extensive review of the related literature. The required steps to develop a valid package were followed in the current study. Persian speech and language pathologists can use this package as a material to implement therapeutic procedures like minimal pair therapy, Metaphon, and parents and children together procedure.

1. Introduction

Speech sound disorders (SSDs) are the most common communication disorders and this term covers articulation disorder, childhood apraxia of speech, and phonological disorders. The prevalence of SSDs is approximately 10% in preschoolers and school-age children [1, 2]. SSD affects children's ability to communicate and leads to frustration, anxiety, reduction of quality of life, and academic failure in adulthood [3]. Thus, selecting and implementing the most appropriate treatment approaches in terms of sub-type of SSD is strongly recommended for this population.

In terms of diagnosis, different therapeutic approaches and programs have been designed consisting of traditional articulation therapy, Parents and Child Together (PACT) [4], Metaphon [2], multiple opposition empty set, and minimal pair intervention. Children with phonological disorders are clients that their speech errors could be characterized by phonological patterns or processes. Phonological patterns or processes referred to the patterns that are systematically used by children to simplify speech sound production and they continue to use them until they can suppress them [5].

One of the approaches that aim to suppress or reduce delayed or unnatural phonological processes is minimal pair intervention. This approach is regarded as a linguistically-based one [6]. A minimal pair contains two words that differ just by one phoneme [7] and this difference is enough to change the meaning [3]. This approach was initially proposed by Wiener in 1981 [8], which greatly altered the clinical methods of treatment of SSD. Minimal pair intervention was proposed based on Stamp's theory of natural phonology and Greenfield and Smith's pragmatic principles of informativeness. Metaphon as another therapeutic approach that presented by Dean and Howell includes two main phases that minimal pairs are the core-activity in the second phase. The other treatment method in which minimal pairs are used as the main component of treatment is PACT [9], proposed by Bowen. As a whole, there are three practical therapeutic approaches that minimal pairs are needed to implement them in children with SSD.

Minimal pair contrast therapy uses word pairs that are only different for one phoneme. The contrasts between two words are created by the difference in phonological features (e.g. pat – bat, pat – fat) or syllable shape (bow – boat, key – ski). It is assumed that the child learns to understand that the two words that are different in only one phoneme also have a different meaning. In the first stage, the clinician trains the client to perceive the contrast well. Then, she or he focuses on the production of the intended contrast. Some studies have reported the positive effects of this approach on the phonologic system of children with phonological disorders [10].

Metaphon therapy as the other linguistically-based treatment procedure is applied for clients that minimal pair therapy is not efficient for them. Speech therapist teaches the speech sounds' features for facilitating the development of minimal pairs. Necessary skills and awareness to train the minimal pairs are taught to the clients. One critical component of this approach is related to teach phonological awareness. In this approach, the clinician teaches the phonemic difference in terms of duration, place of articulation, and manner of articulation. Improvement in the production of speech sounds is targeted by the taught phonological awareness [5]. The investigators have reported some evidence in favor of the treatment efficacy of this ap-

proach [2]. Parents and children together or PACT is considered as the remediation approach for phonological disorders. The developers of this approach hypothesized that we should guide the children to follow the normal way in speech development and parents have a critical role in the management of phonological disorders of their children. What these three treatments have in common is using the minimal pairs as a treatment step.

Several materials are utilized to conduct minimal paired therapy like workbooks, photo cards, line drawings, picture cards, and software programs.

A few instruments are targeting minimal pairs, including contrasts like the use of minimal pairs in articulation training clinician manual, Webber photo phonology minimal pair cards, Webber photo phonology minimal pair cards fun sheets, read aloud minimal pair contrast stories with activities, line drawing sets of the minimal pairs that freely available on the internet, the workbook of Scissors, Glue and phonological processes [6].

In Iran, clinicians use the minimal pair approach in different clinical settings. However, there is no Persian minimal pair package for applying the above-mentioned treatment approaches. Therefore, the main purpose of this study is to develop a package for minimal pair intervention, PACT, and Metaphon therapy approaches. It seems that generating this package help Persian-speaking Speech-Language Pathologists (SLPs) to conduct their treatment procedures more efficiently and effectively for children with phonological disorders.

2. Methods

This methodological and cross-sectional study was conducted to develop a package for the Persian minimal pairs.

Study Participants

After taking permission from the Education and Training Administration and the Welfare Organization of Rasht City, Guilan Province, Iran, the sampling was initiated. Forty-five Persian-speaking children aged 60-77 months were recruited to investigate the name agreement of the generated materials. The parents' children signed the consent form for the participation of their children in the present research. All participants were randomly selected from 5 nursery schools and 5 preschools in 2015 and were categorized into three age groups with 6 months interval. For the inclusion criteria, all of the children were monolingual and native Persian-speakers and exclusion criteria were the history of developmental delay, any speech and language disorders, hearing impairment, and cleft lip and palate. The examiner was the first author of the paper and the exclusion criteria were considered based on SLP examination, reports of the children's teachers and mothers, and medical records of the subjects.

Generation of the items for the Persian minimal pairs' package

Initially, frequent phonological processes of the Persian phonology were determined [11, 12]. Afterward, words with predicted criteria on contrast pairs were chosen by extensive literature review from several resources and references [13, 14] to represent each phonological process and the appropriate pictures were prepared for the items by the graphical artist. For this purpose, different tests and research studies in the English language were investigated and the phonological processes used in each of them were listed. As a case in point, the findings of English studies [15-19] were listed. Besides, a list of phonological processes reported in Persian-speaking children was prepared. Besides, the phonological processes and phoneme classes in Persian were investigated. Finally, the 10 most frequent processes were selected as follows: fronting, stopping, final consonant deletion, cluster reduction, voicing/devoicing, gliding, deaffrication, lambdacism, initial consonant deletion/glottal replacement, and vowel changes.

Content validity

The expert panel (consisting of 5 speech-language pathologists and 5 linguists) examined the target words selected for this package. They mentioned their opinions about the correctness and necessity of contrast pairs.

Checking the pictures of the minimal pairs by the experts

This step was carried out qualitatively. For this purpose, the pictures were prepared by the graphic artist for the target words. All pictures had high resolution, acceptable color contrast, and large size. Moreover, cultural, social, and religious factors were considered in preparing them. Then, 5 SLPs, who were experienced clinicians, were requested to comment on the pictures and comment on them. After making some modifications based on the SLPs' comments, the final pictures were designed for the minimal pairs' package.

Study procedure

Each child was assessed in a quiet room in the nursery schools and kindergartens. After communicating with the

child, the examiner who was an SLP asked the child to name the pictures. The name agreement of the pictures was determined. If the child could name the picture without any cue, a score of 2 would be given to him. If he could name the picture with some cue the score 1 would be given to him and if he could not name the picture, the score 0 would be given to him. The examiner prompted the children to name the pictures with statements like "excellent," "yes," and "you answered correctly". A recorder (model: SONY ICD- UX560F) and a laptop (model: ASUS-K46C) was utilized to record the speech of the participants. All responses of the participants were categorized into two groups: words that were elicited by more than 50% of the children and ones that were elicited by fewer than 50% of the children.

Statistical analysis

The data were analyzed in SPSS (SPSS, Inc., Chicago, IL, USA; IBM Corp., Armonk, NY, USA) version 23. Lawshe's method was used to determine the content validity of the items. Descriptive statistics were utilized to report the demographic statistics of the children, categorizing the participants' answers (words that were elicited by more than 50% and words that were elicited by fewer than 50% of the participants), and categorizing the answers in terms of the type of name eliciting (without a cue, with a cue, and no response).

3. Results

Study participants

Table 1 presents the demographic information of the participants.

Item generation

A total of 343 items considered for 303 minimal pairs were selected in this step.

Content validity

The findings of the CVR showed that 96.6% of the generated items of minimal pairs obtained values higher than 0.62. Considering the number of experts, these values are satisfactory for the CVR [20]. The results of the CVR values of the items are summarized in Table 2. After conducting this step, the number of minimal pairs decreased to 293.

Table 1. Demographic characteristics of the participants according to age and gender

Age Groups, mo	No. (%)		
	Girl	Boy	Total
60-65	7 (46.7)	8 (53.3)	15 (100)
66-71	8 (53.3)	7 (46.7)	15 (100)
72-77	6 (40)	9 (60)	15 (100)
Total	21 (46.67)	24 (53.33)	15 (100)

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Table 2. Results of the Content Validity Ratio (CVR) values of the minimal pairs' package

Number of Minimal Pairs	%	CVR value
244	80.5	1
49	16.1	0.8
5	1.7	0.6
2	0.7	0.4
1	0.3	0.2
2	0.7	Negative

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Findings of naming responses of the participants in terms of types of eliciting

The calculation of the frequency of distribution of the retrieval ways of the minimal pairs' package showed that 44.8% of the pictures were retrieved without any cue, 27.8% of the pictures were retrieved with a cue, and 27.4% of the pictures were not been answered. Also, 78.8% of the pictures were answered by higher than 50% of the children and 21.2% of the pictures were answered by fewer than 50% of the children. The number of the minimal pairs reached 256 items by administrating the minimal pairs on the children.

4. Discussion

In the present study, a minimal pairs' package was developed and its validity was determined. Despite the number of packages for minimal pairs, we did not find comprehensive information about the development of these packages. So, the description of essential steps to develop a valid package for minimal pairs could be an innovative aspect of this project. On the other hand, there is not any possibility to compare the results of the current research with another one.

In the first step, 10 frequent phonological processes were identified: fronting, stopping, final consonant deletion, cluster reduction, voicing/devoicing, gliding, deaffrication, lambdacism, Initial consonant deletion/glottal replacement, and vowel changes. They were the phonological processes that are frequently used by the Persian-speaking children according to the literature review [21]. The identification of these processes was necessary to select suitable minimal pairs.

For item generation, an extensive literature review was performed. In the current step, the authors tried to select the items that were appropriate for the children at the studied age group. Additionally, the picturable target words were selected. Considering these criteria is essential in item generation. Some studies that were related to the scale development for assessment of children and had item generation step, considered these factors [22].

In the present research, CVR was used to investigate the content validity of the generated items. This method is quantitative and used to study the content validity of some tests for the assessment of speech and language in Persian-speaking children [23].

The type of pictures for eliciting target words was different in existing works. Some studies used a line drawing for displaying the target words. Bowen used colorful drawings to display the minimal pairs in her package. It seems that the best method to elicit the target words is in the Drennan study [24] in which real photos were used. In the present work, real photos were used to elicit the target words, too.

About 20% of the items were named by fewer than 50% of the children. So, they were excluded from the package. It appears that they were not appropriate for that age range. Administrating the package on 45 children is considered as a pilot study and helped us to investigate whether target words are appropriate and are defined well for the intended age group or not [25]. Also, possible difficulties in performing studies with a larger sample size were determined by the pilot study.

It seems that validating this package provided the opportunity for Persian SLPs to implement the approaches of minimal pair intervention, Metaphon therapy, and PACT.

This study was a methodological study and was the first step to perform the valid linguistically-based treatment protocols like minimal pair therapy, Metaphon, and PACT for Persian-speaking children with SSD. So, the direction of further research could be designing the studies that target the effectiveness of the above-mentioned studies in this population. Also, developing a software package of minimal pairs is suggested in future works.

5. Conclusions

Based on the results of the current project, it seems that the minimal pairs' package is a valid package to be utilized in the clinical setting for children with SSD. Moreover, further studies are required to evaluate its efficacy in related treatment procedures.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by the University of Social Welfare and Rehabilitation's Ethics Committee. Before administering the package, written informed consent was obtained from parents' children.

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Authors' contributions

Conceptualization: Hananeh Ardalan and Talieh Zarifian; Methodology: Hananeh Ardalan; Writing – original draft: Akram Ahmadi and Mona Ebrahimipour.

Conflict of interest

The authors declared no conflict of interest.

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