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Efficacy of Multiple Oppositions Therapy in Children with Speech Sound Disorder

Abstract

Aim: Speech sound disorders (SSD) decrease intelligibility and increase the possibility of experiencing various communication problems. Considering the academic and psychological problems associated with speech sound disorders, the need for early intervention is undisputable. The aim of this study is to investigate the effectiveness of multiple oppositions therapy in Turkish-speaking children with SSD.
Material and Method: To determine the effectiveness of multiple oppositions therapy, a multiple probe design across behaviors with probe conditions was employed and nonwords were used as stimuli. The study was performed with three participants aged between 5;0 and 5;8. Two participants received therapy for three target sounds, and one participant received therapy for two target sounds.
Results: Participants achieved an accuracy (i.e., correct production) rate of 50%-85% during the intervention sessions. In the successive follow-up sessions, which took place two months after the therapy sessions ended, all participants met the accuracy criterion of 90% correct production with the exception of one target sound. In addition to the target sounds, there were many non-target sounds that were added to the phonetic repertoire of each participant by the time of the follow-up session.
Conclusion: The findings indicate that multiple oppositions therapy performed with nonwords is effective in promoting the production and generalization of speech sounds over a short period of time. This study calls for further replication with a larger population involving participants who have different speech sound problems.

Keywords: Speech sound disorder + nonwords + multiple oppositions + minimal pair.

Introduction

Speech sound disorder (SSD) is an umbrella term which refers to significant delay in the production and the perception of speech sounds independent of cognitive problems, age, or language background (McLeod and Baker, 2017). According to ASHA (n.d.) this broad term refers to organic problems such as childhood apraxia of speech, dysarthria, hearing impairment, cleft palate, and functional problems such as articulation (errors like distortion and substitutions during the production of speech sounds) and phonological disorders (rule-based errors like fronting, stopping etc.). The prevalence of SSD is hard to estimate since historically the disorders covered by this term have changed greatly. According to different sources, 2.3% to 24.6% of school-aged children were estimated to have speech delay or speech sound disorders (Law et al., 2000). SSDs are 2-3 times more common in boys than in girls (Justice, 2006).

Individuals diagnosed with an SSD who receive clinical intervention exhibit a better prognosis in terms of social, academic, and communication skills when compared to those who do not receive intervention (Gierut, 1998). It is crucial to receive intervention before school age because of the positive relationship between SDD

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and potential reading difficulties (McCormack et al., 2009).

Interventions performed on SSDs aim to bring the child's impaired speech sound system to the same level as the phonological rules in their native language and to increase the child's intelligibility (Barlow, 2001). Therapy approaches developed to achieve this goal differ from one another in terms of the following factors (Williams et al., 2010):

- Child's age
- Targeted group of disorders (such as articulation, phonological disorders, childhood apraxia)
- Applied therapy program
- Key components
- Long-term goals
- Target selection rules
- Focus level
- Type of application (group vs. individual)
- Materials and technology used
- Classification type of the disorder

The factors above should be considered in order to decide on a suitable therapy approach for a child. Speech and language pathologists should compare and contrast various therapy approaches based on the information they receive and choose the approach that will provide the maximum benefit. For example, for certain phonological disorders, therapy approaches targeting the phonological system may be preferred over practicing individual speech sounds. The minimal pair approach, which is a phonological therapy approach, focuses on relationships between target phonemes and their substitutes through pairs of words, and aims to expand the existing phonological system of children with SDD (Weiner, 1981).

Different types of contrasts are used in the minimal pair approach: (i) minimal contrast therapy (Weiner, 1981), (ii) maximal opposition (Gierut, 1990) or treatment of the empty set (Gierut, 1992)[1], and (iii) multiple oppositions (Williams, 2000a). In the selection of the appropriate contrast method, the child's level of intelligibility, phoneme inventory, and the incorrect phonemes used in place of the target phonemes are taken into consideration (Williams, 2000a).

According to Williams, homonymy, which occurs when a child produces one sound for many target sounds, causes intelligibility problems and communication breakdowns (Williams, 2000a). For instance, a child who produces ***t****ay* instead of ***ç****ay ('tea'), **k**ay ('to slide'), and **s**ay ('to count'),* uses the sound /t/ in place of the sounds /ʧ/, /k/, and /s/. As in this example, the consistent use of one sound in place of many sounds is called a phoneme collapse (Williams, 2006).

The selection of target sounds is made based on these phoneme collapses in the multiple oppositions approach. Thus, the aim is to modify the child's phonological system by focusing on errors and targeting multiple sounds (Williams, 2000a). Speech and language pathologists take maximal classification (targeting sounds with different manner, place, and voicing features from a phoneme collapse or set of rules) and maximal distinction (selecting a specific target sound which has maximal distance from the child's error) principles into consideration while determining the target sounds. It is assumed that with this target selection strategy the contrast of targeted sounds is more salient and, therefore, more learnable (Williams, 2005).

This approach consists of four phases: the familiarization + production phase, the contrasts + naturalistic play phase, the contrasts within communicative contexts phase, and the conversational recast phase (Williams, 2005; Williams, 2006; Williams et al., 2010):

Familiarization + Production Phase: In this phase, the clinician familiarizes the child with the rules, target sounds, picture stimuli and vocabulary.

Contrast + Naturalistic Play Phase: In the contrast part of this phase, the child is asked to imitate word pairs. If 70% accuracy is reached in two consecutive sessions, the child goes on to naturalistic play. Williams (2010) sees naturalistic play as a "bridging" activity. In naturalistic play, the child is expected to spontaneously name pictures or objects as part of a game that includes target sounds. If 90% success is reached, the child moves on to Phase 3.

Contrast within Communicative Contexts: This is the generalization phase. If ten untreated words with target sound can be produced with an accuracy of 90%, then a conversational speech sample can be obtained.

Conversational Recast Phase: In this phase, children work on communication-based activities that contain contrastive word pairs generated for target sounds.

Empirical studies, which have been increasing in number, test the effectiveness of all proposed approaches through experimental or quasi-experimental research. These studies compare therapy methods (Dodd, Crosbie et al., 2008; Topbaş & Ünal, 2010), and investigate the impact of important factors, such as speech stimuli (Powell et al., 1991), presentation of stimuli (Crowe et al., 2017; Dural & Ünal-Logacev, 2018),

[1]Maximal opposition or treatment of the empty set is also known as the complexity approach.

target selection (Morrisette & Gierut, 2003; Rvachew & Bernhardt, 2010), and therapy frequency (Allen, 2013), on the effectiveness of therapy.

The present study examines the efficacy of multiple oppositions therapy in which nonwords are used as speech stimuli. The following section explains the logic underlying the use of nonwords in treatment.

Nonwords and Speech Sound Disorders

Real words and nonwords differ in terms of their advantages in the treatment of SSD. As it is reported in the study conducted by Gierut et al. (2010), real words are *"relevant, functional, and salient stimuli"*. According to them, by using real words, clinicians give children the opportunity to hear these words during the day, practice on them, and engage in processing words in their native language. On the other hand, during SSD intervention in which nonwords are used, the child pays more attention to articulation routines as no semantic, syntactic or lexical experiential knowledge is involved. Although the authors support the use of real words for clinical purposes, they found enhanced nonword efficacy in their study.

According to Ferguson and Farwell (1975), the use of nonwords in SSD intervention facilitates acquisition of target sounds. When speakers encounter a real word, they first pay attention to the semantic features of the word and then the sounds that make up that word. For example, a child who encounters the word *ball* will first pay attention to the shape and color of the ball, and then they will notice that the word *ball* consists of the sounds [b], [ɔː], and [l]. Nonwords, on the other hand, lead to a decrease on this cognitive processing and an increase on automatic production of sounds and words (Cummings and Barlow, 2011).

Gathercole (2006) attracted attention to memory and stated that nonword repetition performance is mainly based on phonological representations in short-term memory rather than familiar lexical representations stored in long-term memory.

Although real words and nonwords differ in terms of memory, there is still a link between them according to some researchers (Edwards et al., 2004). For instance, Edwards et al. (2004) claim that nonword repetitions are related with vocabulary. They indicate that phonological knowledge becomes richer via expansion of vocabulary and that vocabulary size increases with phonological knowledge acting as a structured scaffolding.

The differences between processing nonwords and real words can offer different advantages during therapy. However, in order to facilitate production and generalization of nonwords, it is advised that these stimuli be formed in accordance with the phonotactic properties of the relevant language (Heisler & Goffman, 2016).

This study examines efficacy of the multiple oppositions therapy in Turkish-speaking children with speech sound disorders by using nonword speech stimuli. The reasons for choosing the multiple opposition approach are to introduce this relatively new therapy approach to speech-language pathologists (SLP) in Turkey and test its efficacy in Turkish-speaking children with SSD. Because of the limited number of minimal pairs which are picturable and real words, we chose the nonword speech stimuli.

Material and Methods

Research Design

This study implemented a multiple probe, single-subject design across behaviors with probe conditions. The dependent variable was the percentage of correct production of targeted sounds, while the independent variable was the therapy program, individually designed for each participant and created with nonwords in line with the multiple oppositions approach. The order by which the participants underwent intervention was randomly determined.

We followed the principles of the Declaration of Helsinki and obtained informed consent from the parents/guardians of the participants.

Participants and Data Collection

Three children (2 males, 1 female), whose ages ranged between 5;0 and 5;8, all native speakers of Turkish and attending pre-school, were included in the study. All participants applied to the Research & Training Center for Speech and Language Pathology (DİLKOM) at Anadolu University and passed audiological evaluation. They had normal oral-motor development and typical receptive and expressive language skills. None of them had received speech therapy prior to the study. All the participants had phoneme collapses and more than six phonemes were missing in their phonetic and phonemic inventories.

We used the *Turkish Early Language Development Test (TEDIL)* to assess the participants' language skills. TEDIL is a norm-referenced test (adapted from TELD-4 by Phyllis L. Newcomer & Donald D. Hammill) that measures the receptive and expressive language skills of children between the ages of 2;0 and 7;11. Validity and reliability studies were carried out for the test (Topbaş & Güven, 2011).

The *Turkish Articulation and Phonology Test (SST)* (Topbaş, 2005) was performed to assess

the phonetic inventory, phonological processes, and age equivalence of all participants. Moreover, we used the results of this test for the comparison of pre-treatment and post-treatment results. SST is a standardized test – the validity and reliability of which have been established – developed for the screening and differential diagnosis of Turkish-speaking children with articulation and phonological disorders. The SST consists of three subtests: i) the Articulation Subtest involving a single word elicitation task consisting of 93 words (containing 21 phonemes and 3 allophones of Turkish consonants), ii) the Auditory Discrimination Subtest, which assesses the ability to differentiate among phonemes via 24 word pairs, iii) the Phonological Analysis Subtest, based on continuous speech sampling involving description of 13 pictures.

The results of these standardized tests are shown in Table 1. While all participants showed typical development in terms of language and auditory discrimination skills, they had a rather narrow phonetic inventory and low age equivalency.

Table 1.

Standardized test results of the participants

		SST			
	Age	**Subtests**	**Age Equivalent**	**TEDİL**	**Phonetic Inventory**
P1	5:8	Articulation Phonology Auditory Discrimination	2;0 2;0 5;6	*Normal receptive language* *Normal expressive language*	/p, b, t, d, m, n, f, v, j, h/
P2	5:1	Articulation Phonology Auditory Discrimination	2;0 2;0 6;6	*Normal receptive language* *Normal expressive language*	/p, b, t, d, m, n, f, v, j, h/
P3	5:1	Articulation Phonology Auditory Discrimination	2;0 2;0 6;6	*Normal receptive language* *Normal expressive language*	/p, b, t, d, m, n, j, h/

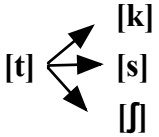
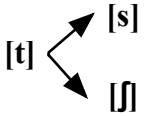
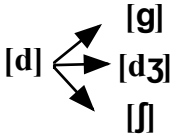
Target Selection and Speech Stimuli

We used different speech stimuli for intervention sessions and probe sessions. The following section describes these stimuli in detail.

Speech stimuli used in the intervention session: These lists were composed of words that contained the target sounds participants were unable to produce (Table 2). The sounds [t]~k, s, ʃ were selected for P1; the sounds [t]~s, ʃ were selected for P2; and the sounds [d]~g, ʤ, ʃ were selected for P3. During the selection of the target sounds, "maximal distinction" and "maximal classification" principles were not taken into consideration because the phoneme collapses did not cover more than four sounds and, therefore, all of them were selected as targets.

Table 2.

Target sounds and contrasts selected for participants

P1	P2	P3
		

We used nonword minimal pairs with a CVC (consonant-vowel-consonant) syllable structure and placed the target sounds word-initially (Table 3). In the multiple oppositions therapy, it is recommended to use a combination of real words and nonwords; however, we had very few word pairs which were picturable and also appropriate for children in Turkish.

The suitability of nonwords with respect to the phonotactic features of Turkish was ensured, and the following points were taken into consideration (Topbaş & Kopkallı-Yavuz, 2008):

1. Because /b, d, g, ʤ/ sounds cannot occur syllable-finally or word-finally in Turkish, we only placed targeted sounds word-initially in the minimal pairs.
2. The fact that the velar stops /k, g/ have two allophones was taken into consideration, and only the sound [k] was used with back vowels (/ʌ, ɯ, ʊ, o/). The allophones (/c, ɟ/), which are produced as palatals around front vowels (/oe, ɛ, ɪ, y/), were not used in this study in order to make the process easier for the children. After the termination of the therapies, these sounds were selected as treatment targets.
3. The use of consonant clusters is quite limited in Turkish. Consonant clusters, which do not phonetically appear word-initially (as they are pronounced with an

epenthetic vowel between two word-initial consonants), rarely appear in coda position. For this reason, consonant clusters were not used in the nonwords; they were only included in the generalization activities.

Speech stimuli used in the probe session: Real words in which the target sounds appeared in various positions and which were not practiced in the intervention sessions were selected, and they were used together with their corresponding pictures to create probe lists. The aim in creating these lists was to determine the extent to which participants generalized what they learned in the intervention sessions. Probe lists were used at the beginning of every session (baseline sessions, probe sessions, and follow-up sessions) to assess the generalization of targeted sounds (Figure 1 was drawn with the data gathered from these lists). In these lists, each target sound was tested by ten untreated words. Due to the aforimentioned phonotactic limitations of the Turkish language, the sounds /g/ and /ʤ/ only occurred word-initially or within-word syllable-initially.

Implementation

This study consists of the following three phases: (1) baseline sessions, (2) probe sessions, (3) intervention sessions, and (4) follow-up sessions. At least two baseline sessions and 18 intervention sessions were conducted for each participant. The follow-up sessions took place two weeks and two months after the intervention, respectively.

Table 3.

Nonword pairs determined for participants

Targets		Therapy Stimuli
P1	[t]~k, s, ʃ	tup ~ kup, sup, şup tuf ~ kuf, suf, şuf tuy ~ kuy, suy, şuy tıf ~ kıf, sıf, şıf tım ~ kım, sım, şım
P2	[t]~s, ʃ	tup ~sup, şup tuf ~ suf, şuf tuy ~ suy, şuy tıf ~sıf, şıf tım ~sım, şım
P3	[d]~g, ʤ, ʃ	dup ~ gup, cup, şum dun ~ gun, cun, şun day ~ gay, cay, şay dıy ~ gıy, cıy, şıy dım ~ gım, cım, şım

- ***Baseline Sessions***

3 sessions for P1, 5 sessions for P2, and 6 sessions for P3 were conducted with a three-day interval between the sessions. These sessions were carried out in order to determine whether the participant can produce the target sounds consistently. Probe lists were used in these sessions.

- ***Probe Sessions***

Probes were implemented at the beginning of every intervention session in order to assess development of the target sound. During the probe sessions, the participants were asked to name the pictures in the probe session lists, and no feedback (neither positive, nor negative) was given.

- ***Intervention Sessions***

The intervention sessions were planned as twice a week, 30-minute, one-on-one sessions, and consisted of 3 phases: the familiarization + production phase, the contrasts + naturalistic play phase, and the contrasts within communicative contexts phase (Williams, 2000a; 2000b; Williams, 2005; Williams, 2006).

In the *familiarization + production phase*, various games were played to familiarize the participants with the environment, and they were given information about the rules to be followed in the therapy room. Since nonwords were used, the word pairs were first introduced to the participants and they were told what the words matching the pictures referred to. The pictures used in the intervention were introduced as cute monsters and their bosses.

In the *contrasts + naturalistic play phase*, the intervention was initiated. The same session included all the target sounds and the word pairs, in which the target sound was in the word-initial position. For example, one of the contrasting sets presented to a participant who produced the sound /d/ in place of the sounds /g/, /ʃ/, and /ʤ/ was as follows: “dım”~“gım”; “dım”~“cım”; “dım”~“şım”. Five sets containing all the target sounds were created for each participant, and all sets were presented four times per session. In each contrast condition, the participant was given 20 production opportunities for all the target sounds. Five-minute breaks were given between the five sets. During these breaks, an activity that was previously determined according to the child's interest was performed. The order of the sets prepared separately for each participant was chosen randomly.

In this stage, the participants were asked to imitate the nonword pairs with gestural support and modeling with stress and intonation that the clinician provided with the corresponding picture. The correct and erroneous productions of the word pairs were recorded in the intervention session lists, both for the target sound and the

contrastive sound. The correct productions of the participants were reinforced, and in cases of erroneous productions, the next word pair was presented. When the participant produced the target sound and contrastive sound using the nonword pairs with an accuracy rate of 70% in two consecutive sessions, real words in which the target sounds were in all word positions (initial, middle, and final) were practiced. When the participant was able to imitate the target sound and contrastive sound in each word position by following the SLP's instructions with an accuracy rate of 70%, the phase with natural communication and real words was initiated.

The *contrasts within communicative contexts phase* included the generalization phase. The participant was expected to produce the target sounds spontaneously with an accuracy rate of 90% in untrained probe words.

The reinforcements used during the intervention sessions were determined through questions asked to the participants' parents. No tasks or instructions were given to the families during the intervention period since it would make it harder to maintain experimental control over the production of targeted speech sounds. The intervention period spanned eighteen sessions in total.

Hand puppets, boardgames, bingo, and memory games were also utilized during the intervention sessions.

- ***Follow-up Sessions***

At the end of the 18-session intervention, parents were advised to reinforce the target sounds determined for each participant within daily conversation, and all participants were called back two weeks and two months later for an assessment of the retainment of the sounds they learned. In the follow-up sessions, only probe lists were implemented.

Data Analysis

The percentage of the correct production of targeted sounds (the number of words in which the target sound was correctly produced/total number of words x 100) was calculated using the data obtained during the probing sessions (baseline sessions, intervention sessions, and follow-up sessions), and the percentages were plotted online graphs.

Reliability

In the present study, two types of reliability were measured: inter-observer reliability and procedural reliability. *Inter-observer reliability* was assessed by two SLPs from the Department of Speech and Language Therapy at Anadolu University. Inter-observer reliability percentage was 97.02% (consensus/consensus+disagreement x 100).

In order to obtain data regarding *procedural reliability*, an observer (SLP) watched the twenty percent of the video recordings which were randomly selected and checked whether the application of the therapy plan was implemented as it was indented. The percentage of procedural reliability was 97.78%.

Results

Figure 1 shows the change observed in the target speech sounds practiced with P1, P2, and P3 throughout the intervention process. Note that Figure 1 is based on data gathered from the real words in the probe list, which were not practiced in the intervention sessions. Thus, it does not reflect the results obtained through the items practiced in the intervention; practiced items yielded much higher accuracy rates.

The results show that P1 was unable to articulate the target sounds (/ʃ, s, k/) at the baseline level, but was able to gradually achieve a higher percentage of correct production of targeted sounds immediately after the start of the intervention sessions. For P1, the generalization phase for the sounds /s/ and /k/ began in the 15th session, while it began in the 16th session for the sound /ʃ/. At the end of the eighteen-session intervention program, we observed that the participant failed to meet the 90% accuracy criterion for the generalization of the target sounds (/ʃ/ - 70%; /s/ - 75%; /k/ - 80%). Two weeks later, in an assessment to identify the degree to which P1 was able to retain the target sounds, we observed that he did not meet the 90% criterion for the target sounds (/ʃ/ - 75%; /s/ - 80%; /k/ - 88%). However, the follow-up assessment two months later revealed that the 90% criterion was met (/ʃ/ - 95%; /s/ - 90%; /k/ - 90%).

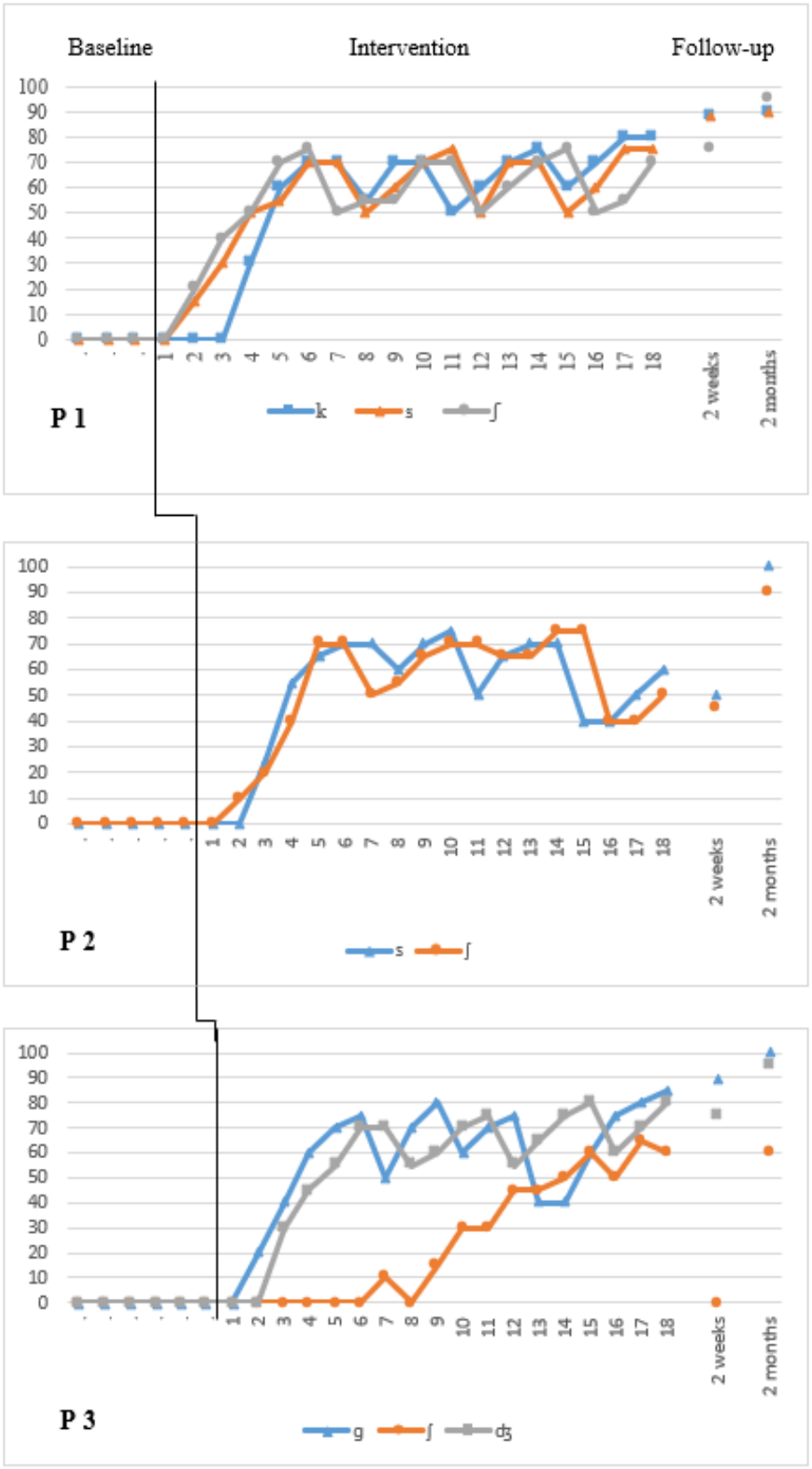


Figure 1.

Percentage of correct production of targeted sounds in baseline, intervention, and follow-up sessions gathered from the probe lists.

Figure 1 also demonstrates that P2 was unable to articulate the target sounds (/s, ʃ/) at the baseline level, but was able to gradually achieve a higher percentage of correct production of targeted sounds immediately after the start of the intervention sessions. For P2, the generalization phase for the sound /s/ began in the 15th session, while it began in the 16th session for the sound /ʃ/. When the eighteen-week program was terminated, we observed that he was unable to meet the 90% accuracy criterion set for the generalization of the target sounds (/ʃ/ - 50%; /s/ - 60%). The follow-up assessment two weeks later revealed that he was still unable to meet the 90% criterion for the target sounds (/ʃ/ - 45%; /s/ - 50%). The final follow-up session two months later, on the other hand, showed that the 90% criterion for the target sounds was satisfied (/ʃ/ - 95%; /s/ - 100%).

Finally, as illustrated in Figure 1, P3 was unable to articulate the target sounds (/g, ʤ, ʃ/) at the baseline level, but was able to gradually achieve a higher percentage of correct production of targeted sounds immediately after the start of the intervention sessions. For P3, the generalization phase for the sound /g/ began in the 13th session, while it began in the 16th session for the sound /ʤ/. When the 18-session intervention program was terminated, we observed that she was unable to meet the 90% accuracy criterion set for the generalization of the target sounds (/g/ - 85%; /ʤ/ - 80%). At the end of the 18-session treatment program, P3 was unable to produce the target sound /ʃ/ with an accuracy rate of 70% in the word-initial position of nonwords (/ʃ/-65%). The follow-up assessment two weeks later showed that she met the 90% accuracy criterion for /g/, yet remained at 75% for /ʤ/. Likewise, the same follow-up session revealed that the 90% accuracy criterion set for real words with the sound /ʃ/, which had a 70% accuracy criterion for nonwords, had still not been met (/ʃ/-0%). In the final follow-up assessment two months later, P3 did meet the 90% accuracy criterion for the target sounds, except for /ʃ/ (/g/ - 100%; /ʤ/- 95%; /ʃ/ - 60%).

In addition to assessment of the treated sounds, we investigated any expansion in the participants' phonetic inventory using the Turkish Articulation and Phonology Test (SST). The test results obtained before and after the treatment can be seen in Table 4.

Table 4.

Pre- and post-treatment phonetic inventory of participants measured with the Turkish Articulation and Phonology Test (SST)

Participants		**Phonetic Inventory**	**Number of Consonants in Phonetic Inventory**
P1	Pre Post	[p, b, t, d, m, n, f, v, j, h] [p, b, t, d, m, n, f, v, j, h, **ʃ, s, k]** **([c, ʧ, ɬ])***	10 16
P2	Pre Post	[p, b, t, d, m, n, f, v, j, h] [p, b, t, d, m, n, f, v, j, h, **s, ʃ]** **([/ʧ])***	10 13
P3	Pre Post	[p, b, t, d, m, n, j, h] [p, b, t, d, m, n, j, h, **g, ʤ, ʃ]** **([ʧ, k, c, s, z, f, v])***	8 18

Bold: Consonants treated through the therapy; *: Untreated phonemes acquired through the therapy.

We observed that the participants added certain sounds, which were not included in the intervention, to their phonetic inventory. These sounds are /c/, /ʧ/, and /ɬ/ for P1; /ʧ/ for P2; and /ʧ/, /k, c/, /s/, /z/, /f/, and /v/ for P3.

Discussion

Speech sound disorders are among the most frequently encountered speech and language disorders by SLPs (Law et al., 2000). In order to treat these frequently observed problems as quickly and effectively as possible, a detailed profile of the child's phonological system should be drawn out, an appropriate treatment method should be determined, and the speech stimuli and method to be used should be decided upon. However, many clinicians in the field have a tendency to implement the treatment method they are most familiar with for all speech sound disorders (Mcleod & Baker, 2014). In fact, the intervention strategies that will provide maximum benefit by reconstructing the child's sound system cannot be determined without drawing out the phonological profile of the client. For example, a multiple oppositions approach cannot be used

with children who produce only one or two speech sounds erroneously, and minimal pairs will not yield positive results with a child experiencing multiple phoneme collapses. Target selection is also directly related to the child's phonological system and the method to be used in intervention (Williams, 2006). For example, if the maximal oppositions approach is used, targets are selected based on the sounds that are acquired late; however, if the behavioral method is used, targets are selected based on the order of acquisition of sounds.

This study was conducted to reveal the role of the phonological system in the choice of the treatment method and to investigate effectiveness of the treatment, as well as to introduce a relatively new therapy approach to SLPs in Turkey.

The interventions in this study were conducted in line with the multiple oppositions approach, and the effectiveness of it was examined. In this approach, instead of focusing on individual speech sounds in an SSD resulting from a phoneme collapse, it is necessary to focus on these phoneme collapses and to make children aware of the changes in meaning that arise due to speech errors.

As a result of the treatment, we observed that all three participants were able to acquire the target sounds and that their articulation accuracy rates increased during the treatment process. At the end of the intervention sessions, we found that participants demonstrated accuracy rates between 50% and 85%, but were unable to reach an accuracy rate of 90%. During the follow-up sessions conducted two months later, we observed that all participants were able to produce all the target sounds, excluding one, with an accuracy rate of 90%. These findings support the previous studies which claim that Williams' multiple oppositions approach is effective (2000a, 2000b). One of the reasons why the results support the technique's effectiveness may be that Williams' proposal was implemented in the creation of participant selection criteria. For example, Williams recommends the multiple oppositions approach for children with severely unintelligible speech; however, she indicates that it is less effective for children that exhibit mild or low severity (2000a). The present study points to a severe problem of unintelligibility in children between the ages of 5;0 and 5;8 whose age equivalent with respect to articulation and phonology is under 2. In such severe phonological disorders, the aim is to reconstruct the phonological system and establish an expanded phonological system targeting adult speech by focusing on child-specific errors using the multiple oppositions approach. The participants of this study were able to replace their previously established phonological system with a partially adult-like system in a fairly short period of time.

In our view, one of the strongest features of the multiple oppositions approach is the target selection process. This approach emphasizes the importance of the *function* of a speech sound rather than its *nature* such as it being an early or late developing sound, or its phonetic and phonemic features (Williams, 2000b). Therefore, the child's phonological system has an important role in the target selection procedure although clinicians can choose targets considering maximal distance and maximal classification features. Our experience shows that focusing directly on homonymy helps children to understand their errors better, gives motivation to change their production and finally eliminates phoneme collapses which cause the severe intelligibility problem. However, it should be kept in mind that this therapy approach is suitable only for children with phoneme collapses. For children who do not have these types of errors, SLPs can use therapy approaches which are evidence-based such as the maximal approach (see Topbaş and Ünal, 2010).

Generalization in articulation refers to the transfer of learning to the untrained verbal context (e.g. from syllables to words, words to sentences or from trained sounds to untrained sounds) and situations (e.g. from clinic to daily life) (Gierut et al., 2010). In this study, which is conducted with the multiple oppositions approach, the participants acquired two to three sounds in a very short period of time, and they were able to generalize the sounds they acquired to words that were not practiced during the therapy. Most phonological approaches focus on sounds at the minimal pair level and do not offer any solutions regarding the generalization process. However, the multiple oppositions approach is one of the rare phonological approaches which targets not only the acquisition, but also the generalization of sounds. Through phases such as familiarization + production, contrasts + naturalistic play, contrasts within communicative contexts, and conversation recasts, it offers facilitative and guiding techniques that children can make use of when communicating with the sounds they acquire. In this study, participants achieved successful results even with probe lists consisting of words that were not practiced in the intervention sessions.

Another factor that may have played an important role in achieving effective outcomes is the speech stimuli that were used. Studies which compare the effectiveness of real words and nonwords claim that working with nonwords facilitates sound acquisition, and they posit that the fact that the child has never produced nor heard these words before enhances the success of the therapy (Gierut et al., 2010; Cummings &

Barlow, 2011). We believe that nonwords played an important role in the effectiveness of the intervention process since the absence of real words with semantic and lexical information facilitates phonological processing and articulation processes (Ferguson & Farwell, 1975; Gierut et al., 2010) in the initial phases of intervention sessions. As soon as children produce the targeted speech sounds more or less comfortably (in this study the criterion was 70%), there are no further advantages to using these types of speech stimuli. Therefore, in the later stages, introducing the real words can give an opportunity to participants to use the target sounds functionally for communication purposes. In our opinion, we can use the advantages of both real words and nonwords by practicing them across the phases.

The percentage of the participants' correct production of the targeted sounds increased during the period between the termination of the intervention sessions and the initiation of the follow-up sessions. This observation raises the question of whether the breaks after practicing speech sounds could be necessary and effective for children to generalize the sounds they have practiced. Bowen & Cupples (2004) gave 10-week breaks after performing block therapies and found that this had a positive impact on therapy outcomes. Presumably, what is being done in such therapies is working on a non-stimulable sound and making it stimulable. Miccio, Elbert & Forrest, (1999) suggested a therapy program in which clinicians can teach the stimulability to children with very small phonetic inventory without aiming direct treatment. The authors found enhanced efficiency of their therapy programs in terms of increased number of sounds in participants' phonetic inventory in a few months. Given that there is not even a single speech therapist in many cities of Turkey, the fact that a portion of the generalization process can be carried out by caregivers after stimulating the target sounds may be a very important finding. Including the caregivers in the therapies and guiding them can affect the outcomes of the therapies. In a very recent study by Sugden et al. (2020), the impact of including parents in the multiple oppositions interventions has been investigated. In the study, children with SSD received therapies three times in a week, including one session by an SLP and two sessions by the parents of the participants. It is found that delivery of multiple oppositions therapy combining parents and SLPs can be effective for some children with moderate to severe SDD.

One of the most important findings of this study is the spontaneous addition of many speech sounds to the child's inventory that were not targeted during therapy. Phonological therapy approaches are non-phonetic placement approaches. The child's realization that the word they are uttering is not understood and that they are articulating the same sound for different words coupled with the SLP's gestural support and verbal models with stress and intonation encourages the child to be more active during treatment. When trying to produce the target sound, the child coincidentally produces other sounds and, thus, adds new sounds to their inventory (Gierut 1989). At the end of this study, we observed that P1 had added three new sounds to his phonetic inventory, while P2 added one and P3 added seven. Although it is hard to decide which targeted sounds triggered which untrained sounds (since we had two or three targets), we observed certain *across-class generalizations* in the post-treatment phonetic inventory. Despite targeting only a plosive and two fricative sounds, P1 added one affricate and one approximant sound into his phonetic inventory. Similarly, P2 added an affricate while the targeted sounds were fricatives. We did not see any across-class generalizations in P3, but observed *within-class generalizations* which led to a great expansion in her phonetic inventory (seven sounds gained).

Williams states that the aim of the intervention is to create the greatest change in the child's phonological system in the shortest possible time (2005;2006). At the end of the 18-session intervention program, there was a significant change in the participants' phonological system. Although behavioral or traditional articulation therapies are unlikely to ensure acquisition of so many consonants in such a short time, the approaches need to be compared in further studies in order to establish a firmer evidence base for treatment of speech sound disorders.

Conclusion

The findings of the current study demonstrate that the multiple oppositions approach is effective in treating certain speech sound disorders. During the eighteen-session intervention process, the targeted accuracy level was achieved for all but one of the eight target sounds. In the follow-up sessions conducted two months after the target sounds were acquired, we observed that the participants retained most of the sounds and successfully generalized them to real words.

The findings obtained in the present study can potentially guide clinical decisions regarding interventions provided to Turkish-speaking children with SSD. However, since this is the first single-subject study utilizing multiple oppositions and nonwords in the treatment of Turkish-speaking children with SSD, further studies are needed to enhance generalizability of the findings.

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