

## **The Effectiveness of Phonological Awareness Training in Treating Deficiencies in Auditory Processing Among Children with Learning Disabilities Among Elementary Cycle Students in Saudi Arabia**

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### **Abstract**

This study identified the effectiveness of using a phonological awareness-based instructional program in developing the phonetic sequential-memorization skill among students with learning disabilities in the Aseer region. The study sample consisted of forty students from the third, fourth, fifth, sixth, and seventh grades, selected from schools in the Directorate of Education in the Aseer region. The special education teacher diagnosed the sample as students with learning disabilities. The study used the quasi-experimental methodology and divided the sample into two groups, an experimental group, and a control group. After applying for the instructional program, the results showed that the experimental group outperformed the control group in acquiring the phonetic sequential-memorization skill. The results showed no statistically significant differences in the phonetic sequential-memorization skill due to the difference in grade. It is concluded that the instructional program has a continuing effect in developing the phonetic sequential-memorization skill among students with learning disabilities in the Aseer region.

**Keywords:** phonological awareness, phonetic memorization, sequential memorization, students with LD

### **Introduction**

The sequential phonetic memory is closely related to the progress of the reading process because it is very important to have the ability to analyze, sequence, and remember auditory stimuli. Students with reading disabilities fail to distinguish the phonemic structure of spoken language (Al-Khasawneh, 2016) whether at the word level or the sentence level. To address these difficulties, special phonological training programs should be developed because such category perceives things differently. Therefore, the existence of programs to develop the phonetic sequential-memory for students with learning disabilities is a very essential component in developing the learning process. These programs call for the use of methods appropriate to the abilities of students with LDs. Developing these capabilities may positively affect the development

of aspects of personality, whether psychological or social, and it is expected to raise their ability in academic achievement due to its importance from various aspects, whether personal or academic.

Therefore, this study was designed to investigate the effectiveness of a phonological awareness skills-based training program in developing the skill of phonetic sequential-memory skills among students with LDs in the Aseer region. Students who suffer from deficiencies in decoding the written letter are making a lot of their mental effort to decode the letter. This leads to the loss of the element of comprehension and thus the absence of understanding and building the rest of the other higher capacities of analysis, concluding criticism, and other higher mental skills. Reading is one of the most important language skills for people with learning disabilities, as it is the basis for developing other language skills and expanding knowledge. The ability to auditory recall is the most important component of language knowledge. Students with learning disabilities face major problems with auditory recollection. This study is significant theoretically in opening the way for researchers to pay attention to phonological processes for people with learning disabilities because the skill of phonological awareness is one of the basics on which the skill of reading is built. This skill contributes to creating awareness about the sounds, syllables, and words of the language, which is reflected positively in the speed of reading and then comprehension.

The present study seeks to give answers to the following research questions:

1. Are there any statistically significant differences between the mean scores of the experimental group and the control group in the level of phonetic sequential memory due to the instructional program?
2. Are there any statistically significant differences between the mean scores of the experimental group and the control group in the level of phonetic sequential memory due to the school grade?
3. Are there any statistically significant differences between the mean scores of the experimental group and the control group in the level of phonetic sequential memory due to the follow-up test?

The theoretical significance of the study lies in revealing the importance of the skill of phonetic sequential memory in diagnosing and detecting those with learning disabilities. As for the practical importance of the study, it is highlighted through its ability to come up with an instrument to measure phonetic sequential memory. The instrument has acceptable validity and reliability indications that educational institutions, special education centers, teachers, and educational counselors can benefit from in diagnosing learning disabilities. The significance of this study is also in providing teachers of learning disabilities with a practical training program that helps them in training people with learning disabilities on phonological awareness skills because learning difficulties rooms lack such training programs.

**Phonological awareness:** Stanovich (1982) is considered the first to define phonological awareness skills. He argued that it is the conscious interaction with the phonemic level in speech, or it is the mental ability to change (manipulate) in the phonemic level of words. In other words, phonological awareness means having the ability to know the places of articulation of linguistic sounds, how to produce these sounds, and how these sounds are formed together to form words, sentences, and expressions. It also the ability to perceive the similarity and difference between these sounds, whether these sounds come in singular or different linguistic words and expressions. As for the current study, it defines phonological awareness as the set of practical activities that the instructional program contains.

**Phonetic sequential memorization:** It means the ability of the individual to organize his learned experiences, store them and then retrieve them, and identify them to benefit from these experiences in his different life situations (Lerner, Beverly, 2013). In this study, it is defined as the score that students with learning disabilities obtain on the test prepared by researchers.

**Students with LDs:** This category of students are defined as those who have disturbances in one or more of the basic psychological processes that include the understanding and use of written or spoken language, which appears in disorders of hearing, thinking, speech, reading, spelling, and math, and are due to a functional injury in the brain, and have no relation to any disability, whether it is mental, auditory, visual, or other (Al-Rousan, Al-Khatib, and Al-Natour, 2004). In this study, students with LDs are defined as the students who were detected using the tests approved by the Directorate of Education in the Aseer region and who are enrolled in its schools

### Review of literature

The category of students with learning disabilities attracts researchers to investigate and study, and perhaps the reason for this is the large number of students who suffer from different disabilities. Lerner (2012) points out that this category is one of the most common categories of special education. It constitutes (52%) of the community of people with special needs, and at the same time, its prevalence among school students ranges from 1% - 8% (Al-Waqfi, 2012).

Students with LDs are a heterogeneous category, which requires finding appropriate strategies and methods for the difficulties they face and following the theoretical background of each disability. Therefore, different points of view emerged in defining the concept of learning disabilities, such as the medical theory that considers learning disabilities to have a neurological basis or the educational theory that believes in modifying behavior, and the linguistic theory that defines it as based on a defect in the basic linguistic processes in acquiring the reading system (Smith, 2012). The phonological awareness skill is defined as the child's ability to identify, distinguish, and change the sounds in her mother tongue, regardless of the size and meaning of the word. Stanovich (1982) defined this skill first as the conscious interaction with the phonemic level in speech, or the mental ability to change (or manipulate) in the phonemic level of words.

One of the most common causes of reading difficulties is the difficulty in processing linguistic sounds in a language, or what is known as impaired phonological awareness (Lerner, 2012). Phonological awareness is the ability to process phonemes, and it has a strong relationship with reading ability. It means the ability to manipulate individual sounds in words, and it consists of basic vocal skills, such as the ability to judge whether two words have the same weight or not (Smith, 2012). Growth in mental abilities enables students with LDs to link between sound and meaning. This symbolic function of language builds for the student the basis for recognizing the phonological awareness of the language and facilitates knowledge of words. This in turn enables the student to divert his/her attention from the meaning of spoken speech to thinking and speaking about the language in use.

Different studies attempted to investigate and explore the impact of increasing phonological awareness in improving different learning disabilities. Salem (2020) investigated the impact of developing phonological awareness on the improvement of different learning disabilities. The study was applied to a sample of 36 third grade students with reading difficulties and was chosen using a Phonological Disturbance note. The Descriptive method and Experimental method were used in this study. The results showed that the training module was effective in developing loud reading skills (treatment of Phonological disorders) in primary school students

with reading disabilities (overall). The program was effective in developing loud reading skills (treatment of Phonological disorders) in primary school students with reading disabilities.

### **Previous studies**

Some studies have been conducted to investigate the effectiveness of a proposed program based on phonology awareness in the development of some verbal reading skills among students, and these studies have come up with different results. Salem (2020) explored the effectiveness of Training on Phonological awareness skills in the treatment of loud reading disabilities (Phonological Disorders) of primary school students with learning disabilities. The study included (36) students with learning disabilities in the third grade of the primary, who was selected by the Phonological Disturbance note card. The results revealed that the training module, which was developed by the researcher, was effective in developing loud reading skills

Qasim and Hassan (2019) investigated the effectiveness of a proposed program based on phonology awareness in the development of some verbal reading skills among students in the preparatory stage. The experimental method was followed using the pre and post measurement of the one group design. This study concluded that the effectiveness of the Suggested program based on phonology awareness in the development of some of the reading skills of the study (identification - pronunciation - comprehension) in the students of the preparatory stage.

Al-Brairi (2019) explored the development of some listening skills, phonics awareness for non-Arabic speaking students. The study aimed at determining the extent of effectiveness of the suggested program to the development of some listening skills, phonics awareness for non-Arabic speaking. The participants were foreigners at Al-Azhar University who were randomly selected. The study followed the experimental method. The results revealed positive results after applying for the instructional program in developing phonological awareness of non-Arabic speaking students.

Rababah (2017) investigated the effect of using written expression activities and reading stories on developing phonological awareness and knowledge of printed material among kindergarten children in Jordan. The study included (50) students from one of the governmental kindergartens in the city of Irbid, who were divided into two groups: control and experimental. Students received 24 classes, in which the stories were read in groups with a focus on the rules of printed materials, and they were involved in written expression activities once every weekend for 14 weeks. The results of the study indicated that the experimental group outperformed the control group in the level of phonological awareness.

Al-Shorbaji et al (2017) conducted a study aimed at identifying the impact of a program based on phonemic and artistic awareness of the reading performance of the Arabic language for first-grade primary students. The researchers designed a reading test on phonemic and phonological awareness in the Arabic language, in addition to a training program on phonemic and phonological awareness for Arabic language teachers. The study sample included (205) male and female students from four schools, divided into two groups: experimental and control. The results showed that there were statistically significant differences in the average results of the tests between the experimental and control groups in favor of the experimental group. The results also showed the presence of statistically significant differences in the average results of the experimental group in the third test that seeks to investigate the effect of the experiment on students. On the other hand, the results showed no statistically significant differences in the mean scores between males and females.

Al-Farsi and Imam (2017) also conducted a study aimed at identifying the effectiveness of a training program based on the introduction of phonological awareness in improving the

decoding skill of third-grade basic students with reading disabilities. The sample included (40) students enrolled in the third-grade in the Sultanate of Oman. The study tools included the phonemic awareness test, the decoding skill test, in addition to a training program based on the introduction to phonological awareness. The results of the study indicated that there were statistically significant differences between the experimental group and the control group in all dimensions of the phonological awareness test and the decoding skill test, except after reading the words of the text, and in favor of the experimental group.

Most of these studies emphasized the importance of developing auditory memory skills due to their close association with the ability to learn academic skills. Most studies have confirmed the deficiency in the skill of phonological awareness among students with learning disabilities (Rababah, 2017; Al-Shorbaji et al, 2017; Al-Farsi, 2017). The current study differs from previous studies like the instructional program that was prepared based on the cognitive theory to develop phonological awareness skills among students with LDs. This study also focuses on exploring the effectiveness of the program on developing the phonetic sequential-memorization

### **Research method**

This study followed the semi-experimental approach to determine the effect of the instructional program based on phonological awareness skills in developing phonetic sequential memory skills among students with LDs. The study divided the sample into two groups, an experimental and a control group, and applied a pre-test and post-test to measure the level of phonological awareness and then applied a follow-up test.

#### **Population and sample**

The study population included all 326 students with learning disabilities studying in schools of the Directorate of Education in the Aseer region, whose age is from (8-12) years, and in the third, fourth, fifth, and sixth elementary grades. These students are divided into thirty-three rooms from the learning difficulties classrooms in Aseer region schools. A sample of 40 students was selected randomly from four schools out of thirty-three schools. The sample was divided into two groups, an experimental and control group.

#### **Research instrument**

##### *The phonetic sequential-memory test*

This test consists of a series of numbers ordered by length, beginning with two numbers and ending with eight numbers, distributed on seven levels. The examiner reads the numerical series to the student orally at the rate of one second for each number, and the student is asked to repeat the series numbers immediately after hearing them. The purpose of the test was to measure the student's ability to remember a series of numbers of different lengths in the same order.

##### *Validity and reliability of the instrument*

The content validity was ensured by presenting the test to (15) specialized judges. The researchers relied on the consensus of 80% of the judges as a criterion for accepting the paragraph; the observations of more than 20% were a sufficient criterion for amending, deleting, or adding some paragraphs. Accordingly, the comments of all expert judges were collected, as no paragraph was deleted, and their observations were limited to modify the drafting of the application instructions.

The discrimination validity of the test was extracted by applying the test to an exploratory group of (30) male and female students (15 students with LDs and 15 regular students). They were

randomly selected from outside the study sample from students of the Aseer Region Education Directorate. To verify the validity, the mean scores and standard deviation of each group were calculated on the total scores of the test, and the (t) test was used to find out the significance of the differences. Table 1 presents the results.

Table 1. The mean means and standard deviations of the exploratory sample to verify the discriminatory validity of the phonetic sequential memory test

Test		Student category				T value	Sig.
		Students with LDs		Regular students			
		Mean score	Standard deviation	Mean score	Standard deviation		
phonetic memory	sequential	22.70	3.813	32.52	2.923	10.323	0.000

The researchers used the test-retest method in extracting the reliability by applying the test to a pilot sample of forty students, who were selected from two schools from the Directorate of Education in the Aseer region, who were chosen in a simple random way from outside the study sample, but from the same age group. The test was applied again after fifteen days. The Pearson correlation coefficient was extracted between the first and the second tests, and the value of the correlation coefficient was (0.84), which is a good indicator of stability. Isawi (1985) argued that if the correlation coefficient between the first and second applications is 0.7 or more, it is a good indicator of the stability of the scale. This means that the current scale has a high degree of stability over time and that this value is statistically significant at the level of significance ( $\alpha \geq 0.05$ ).

#### *The instructional program*

This program aims to develop the skill of phonetic sequential-memory among students with learning disabilities who are enrolled in the learning difficulties classrooms in the Aseer region. The program consists of a set of exercises and activities that the researchers have developed to allow students to acquire skills that fall within the dimensions of Phonological awareness.

The need to design this instructional program was to develop the skill of phonetic sequential memory among students with LDs at the basic stage. This problem was confirmed by previous studies in the field of reading that phonological awareness helps in preventing reading difficulties. This program came to meet the students' needs by training them in some methods that develop their sequential memory by providing audio content appropriate for the target age group. the program will help students to effectively receive the communication material and recall it, especially in the communication processes that take place during classroom education.

#### *Designing the instructional program*

The instructional program was designed according to the following principles:

1. Identifying the theoretical foundations that dealt with the importance of developing phonological awareness skills for students with learning disabilities, and the effect of applying for the phonological awareness program on developing the skill of phonetic sequential-memory.

2. Taking into account the nature of the age stage for primary school children, this stage is essential in their lives and is one of the main pillars in building their future personality.
3. Taking into account that all members of the sample have learning difficulties in reading.

#### *Content of the instructional program*

The current program is concerned with treating deficiencies in the skill of phonetic sequential-memory. Therefore, this program is not based on pre-defined academic content. The training materials are based on the skills of phonological awareness, noting that the program included sixteen training sessions, which were given collectively to the children of the experimental group in four sessions per week, and the duration of the session was one class. The assessment was conducted individually by using the phonetic sequential-memory test.

#### *Content validity of the program*

The program was evaluated by a group of judges, to identify the relevance of the objectives, the relevance of the content of the program, the appropriateness of educational methods, and the appropriateness of the language formulation for students with LDs. The linguistic wording of some paragraphs has been slightly modified in light of the judges' remarks. The percentage of agreement between the judges reached 96%, and this is considered acceptable for this study.

#### Data analysis

The returned test analyzed using the SPSS software to identify the correlated relationships of variables concerning phonological awareness skills in developing the phonetic sequential memory skill among students with learning disabilities. The statistical methods used to achieve the main objectives of the present investigation included descriptive statistics, independent sample T-Test, and analysis of variance (ANOVA).

#### **Findings and discussion**

**First:** the results of the first question, “Are there any statistically significant differences between the mean scores of the experimental group and the control group in the level of phonetic sequential memory due to the instructional program?”

To answer this question, the mean scores and standard deviations were calculated for each of the experimental and control groups for students with learning disabilities on the pre and post-tests as shown in Table (2).

Table 2. The mean scores and standard deviations of the students' grades on pre and post sequential memory test according to the group variable

Group	No.	Pre-test		Post-test	
		Mean score	St. dev	Mean score	St. dev
Experimental	20	22.70	3.813	57.20	5.238
Control	20	23.90	4.038	41.65	5.480

It is noted from Table 2 that the mean scores of the experimental group on the pretest was (22.70), while it was (57.20) in the post-test. The mean scores of the control group on the pretest

was (23.90), while it was (41.65) in the post-test. To find out the significance of these differences between the mean scores and determine their direction, ANCOVA analysis was used, and Table (3) presents the results.

Table 3. ANCOVA results for group effect on students with learning disabilities in the phonetic sequential-memory test

Source of variance	Sum of squares	Freedom value	Squares average	F-value	Sig.
Pre-test	19.355	1	19.355	0.668	0.419
Group	2294.296	1	2294.296	79.158	0.000
Error	1072.395	37	28.984		
Total	101223.000	40			

Table (3) indicates that the differences between the mean scores of the experimental and control groups are statistically significant, as the F value was (79.158), which is statistically significant at the level of (0.000). Therefore, the first null hypothesis is rejected, and the alternative hypothesis is accepted. There are statistically significant differences at the level of ( $\alpha \leq 0.05$ ) between the mean scores achieved on the phonetic sequential memory post-test among the members of the experimental group (who were subjected to training in the phonological awareness development program) and the mean scores of the control group (who were not subjected to training program). This result agrees with previous studies (Rababah, 2017; Al-Farsi, 2017). These results are also attributed to the many advantages that the program has. The program included a variety of training activities, such as those that focus on auditory recollection skills. This was done using various teaching methods. The phonological awareness program was incorporated so that it begins with ease and then moves gradually to challenging the capabilities of students with LDs. This enabled students to go through successful experiences in the learning difficulties classroom. It enhanced his self-confidence, which was missing in the classroom. The appropriate reinforcement techniques contributed to the effectiveness of the program. Students with LDs would receive a piece of candy if they could participate and perform their work without errors, then the best child in the group would get a poster that would be attached to his dress and seen by his classmates and his teacher, then he showed it to his parents at home. Moreover, the educational environment provided by the researchers during the training sessions, which focused on reinforcement and led to increasing students' interest in the program and their effective participation in it.

**Second:** results related to the second question, “Are there any statistically significant differences between the mean scores of the experimental group and the control group in the level of phonetic sequential memory due to the school grade?”

To answer this question, means and standard deviations were calculated for each of the two groups on the pre and post-tests. Table 4 presents the results.

Table 4. The mean scores and standard deviations for the pre and post-tests

Group	Test	Grade					
		Third	Fourth	Fifth	Sixth	Seventh	
Experimental	Pre-test	Mean score	21.25	24.00	25.50	19.75	23.00
		Standard deviation	3.304	4.397	2.380	4.349	3.162



Control	Post-test	Mean score	60.00	56.25	61.25	54.25	54.25
		Standard deviation	2.160	8.016	4.646	3.403	3.862
	Pre-test	Mean score	26.75	20.00	22.50	25.75	24.50
		Standard deviation	4.031	2.944	4.435	3.775	2.380
	Post-test	Mean score	40.25	45.00	42.75	39.75	40.50
		Standard deviation	4.992	6.377	8.098	5.500	1.732

Table 4 shows the mean scores and deviations of the pre and post-test scores for the two experimental and control groups according to the academic grade. To identify the existence of any statistical differences, ANCOVA analysis was conducted to reveal the effect of the grade of the student. Table 5 shows the results.

Table 5. ANCOVA analysis of the effect of the grade on the students with LDs in the phonetic sequential-memory test

Source of variance	Sum of squares	Freedom value	Squares average	F-value	Sig.
Pre-test	12.901	1	12.901	0.450	0.508
Grade	152.872	4	38.218	1.333	0.281
Group	2266.341	1	2266.341	79.057	0.000
group× grade	87.393	4	21.848	0.762	0.558
Error	831.349	29	28.667		
Total	101223.000	40			

Table 5 shows that the value of the significance level of the grade variable was (0.281), and the value of the significance level of the grades' interaction with the group variable was (0.558), both of which are greater than (0.05). This means that there are no significant differences in the skill of phonetic sequential-memory among students with LDs in the experimental and control groups due to the grade variable. The skill of phonetic sequential-memory did not differ between students according to their school grades. This could be attributed to the close levels between the students in these grades. This study did not agree or disagree with previous studies because previous studies did not take this variable into their study, and this is what distinguished this study from previous studies.

**Third:** results related to the third question, “Are there any statistically significant differences between the mean scores of the experimental group and the control group in the level of phonetic sequential memory due to the follow-up test?”

To answer this question, the mean scores and standard deviations were calculated for each of the experimental and control groups of students with LDs for the pre-tests and follow-up tests as shown in Table 6.

Table 6. The mean scores and standard deviations of students with LDs on the phonetic sequential-memory pre and post-tests according to the group variable

Group	No.	Pre-test		Post-test	
		Mean score	St. dev	Mean score	St. dev
Experimental	20	22.70	3.813	56.55	5.176
Control	20	23.90	4.038	42.15	4.545

It is noted from Table 6 that the mean scores of the experimental group on the pretest was (22.70) while on the follow-up test was (56.55). The mean scores of the control group on the pretest was (23.90) while on the follow-up test was (42.15). To find out the significance of these differences between the mean scores and determine their direction, the ANCOVA analysis was used, and Table 7 illustrates the results.

Table 7. ANCOVA analysis of group effect on students with LDs in the phonetic sequential-memory test

Source of variance	Sum of squares	Freedom value	Squares average	F-value	Sig.
Pre-test	15.596	1	15.596	0.651	0.425
Group	2079.270	1	2079.270	86.841	0.000
Error	885.904	37	23.943		
Total	100392.000	40			

Table 7 shows that the differences between the mean scores of the experimental and control groups are statistically significant, as the value of F was (86.841), which is statistically significant at the level of significance (0.000). Therefore, the first null hypothesis is rejected, and the alternative hypothesis is accepted; there are statistically significant differences at the level of significance ( $\alpha$  0.05) between the mean scores of the experimental group (who were subjected to training on the phonological awareness program) and the mean scores of the control group (who were not subjected to training program). This result can be explained by the strength of the training program, which left a clear impact on students with LDs. This indicates the continuing impact of the phonological awareness development program on developing the skill of sequential memory.

### Conclusion and recommendations

This study aimed at identifying the impact of using a phonological awareness-based instructional program in developing the phonetic sequential memory skills of students with LDs in the Aseer region. The instructional program proved to be useful and effective in increasing the level of this skill. Students improved, not just because of the strength of the instructional program, but also because of the methods and techniques used by the researcher and teachers, which were based on reinforcement. This category of students needs continuous care by developing such specialized programs to address their needs.

Based on these results, the study recommends the following:

1. Developing more instructional programs to develop the developmental skills of students with learning disabilities, with a focus on the academic difficulties of the same group.
2. Conducting research studies that investigate the relationship between phonetic sequential memory skills and academic achievement, and the effect of improvement in this skill in reading, writing, and spelling among students with learning disabilities.

Conducting studies examining the relationship between deficiencies in auditory follow-up skills, social isolation, and lack of self-esteem among students with learning disabilities.

### Declaration of conflicting interest

The authors state that there is no conflict of interest concerning the publication of this paper.

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