

**The Effect of a Multisensory Structured  
EFL Program on Developing Dyslexic  
Primary Pupils' Phonological Awareness  
and Spelling**

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### **Abstract:**

Pupils with dyslexia have trouble with language skills involving speech sound (phonological), print (orthographic) processing and in building pathways that connect speech with print. Thus, the current research aimed at investigating the effect of using a proposed multisensory structured EFL program on developing dyslexic primary pupils' skills of phonological awareness and spelling. The proposed program employed various multisensory strategies including visual, auditory, kinesthetic and tactile strategies which support the connection of oral language with visual language symbols. Participants of the research were (15) third year primary dyslexic pupils. They were diagnosed and selected based on adopting and using Stanford-Binet Intelligence Scale, 4th Edition (SB-IV) and the dyslexia Screening Test — DST, adopted from Fawcett, & Nicolson (1996). Other instruments designed and used for assessing pupils' phonological awareness skills and spelling included a phonological awareness test and a spelling test with a rubric for scoring pupils' spelling. The quasi-experimental design was adopted in which the participants were assigned into two groups: a control group (studied through the regular English class) and an experimental group (studied through the multisensory structured EFL program). Results revealed that the experimental group students outperformed their counterparts of the control group in the target EFL

phonological awareness skills and spelling due to the use of the proposed program.

**Key words:** dyslexia, multisensory teaching, phonological awareness and spelling.

### **Introduction:**

Foreign language education of students with special educational needs is a field of language pedagogy which urgently require special attention from teachers, researchers, trainers, curriculum planners and decision-makers. There are different types of learning disabilities that learners might have and which might affect their learning success in general and language development in particular. Examples to these disabilities include dyslexia, dysgraphia, dyscalculia, dyspraxia and attention deficit and hyperactivity disorder ADHD.

Dyslexia is a special learning disability which has a direct effect on learners' spoken and written language. It is mainly characterized by reading problems, difficulties in spelling, writing, pronouncing when reading aloud and comprehending what one reads. Different learners are influenced by dyslexia to different degrees. The difficulties are involuntary since they are caused by both genetic and environmental factors. Learners with this disability have a normal motivation to learn since the problem is not their intelligence as they have normal or above normal intelligence level. Therefore, using the proper teaching programs and strategies with those learners will be useful in helping them reach their potential.

Supplemental, intensive reading interventions for learners with dyslexia should be individualized and focused on the student's primary areas of difficulty. Instruction for dyslexic learners should follow a multisensory approach that combines reading, listening, spelling and writing as appropriate (Birsh & Carreker, 2011). Such an approach

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provides educators with multiple ways for supporting and enriching their teaching methods by incorporating learners' senses (seeing, hearing, feeling and touching, and even smelling and tasting). The current research focused on employing multisensory instruction for enhancing dyslexic pupils' language learning through developing their EFL phonological awareness skills and spelling.

### **Review of related literature**

Nordqvist (2017) stated that according to the University of Michigan, dyslexia is considered the most common learning disorder. About eighty percent of learners with learning disabilities are dyslexics. The International Dyslexia Association (2019) also reported that dyslexia has influenced 10%-15% of the individuals in the world. Dyslexia was described by Reid (2009) as "a processing difference, often characterized by difficulties in literacy acquisition affecting reading, writing and spelling. It can also have an impact on cognitive processes such as memory, speed of processing, time management, coordination and automaticity. There may be visual and/or phonological difficulties and there are usually some discrepancies in educational performances" (p. 4).

Besides, Jones (2015) and Pokrivčáková (2015) stated that the brain of the dyslexic learner processes words in a different manner leading to problems with receiving and processing verbal signs (letters, words, sentences); therefore, the learner cannot comprehend the message easily or correctly. Further, a more complex and commonly used explanation is adopted by the board of the International Dyslexia Association (IDA) (2019) in 2002 is as follows:

Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word

recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede the growth of vocabulary and background knowledge.

The previous explanations highlight the major characteristics of dyslexia including problems with poor decoding, poor reading fluency and poor spelling. Phonological weaknesses and some other certain linguistic difficulties are usually the major cause of the problems associated with dyslexic students. Phonological difficulties among students with dyslexia include the inability to: segment spoken language, identify individual words and divide them into syllables, and then into phonemes which are the smallest units of speech. Because speech is produced quickly, and sounds within spoken words are uttered rapidly, phonemes might overlap. Some students may also suffer a difficulty with rapid naming which can maximize the struggle of reading.

Early diagnosis of students at risk of dyslexia has been a challenging educational task in the past years. Mayo Clinic (2017) reported that there is no single test for dyslexia identification. Some factors should be considered in the diagnosis process. For example, the child's development, educational issues, home life and medical history are among these factors. In addition, instruments like questionnaires, vision, hearing and brain (neurological) tests, psychological tests, tests for reading and other academic skills might be helpful tools to diagnose dyslexia.

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In this context, Germano, César, & Capellini, (2017) developed a screening protocol for early identification of Brazilian dyslexic children. Their final version of the screening protocol consisted of seven cognitive-linguistic skills: letter naming, phonological awareness, phonological working memory, rapid naming, silent reading, non-sense words reading, and auditory comprehension of sentences from pictures.

Dyslexia has many types, Cicerchia (2016) stated that more than 70% of dyslexic individuals have phonological dyslexia which affects the ability to break words down into their component sounds. Leonard (2001), Ali (2012) and Asome & Capp (2016) indicated that phonological awareness, which is the ability to identify and distinguish between the individual sounds or phonemes in words, is regarded as the most significant predictor of learners' future reading success. Teaching phonological awareness to adults significantly enhances their reading fluency and spelling.

Phonological dyslexia is an extreme reading difficulty resulting from a phonological impairment that makes the individual phonemes of a language become 'sticky', difficult to be segmented and manipulated easily. The main reason results from a difference in brain areas associated with the processing of language sounds. Learners with phonological dyslexia are tapping brain parts which are less effective at processing phonemes and recognizing words by sight in comparison to efficient readers (Higuera, 2018).

In addition to phonological problems, spelling is considered as a hard skill for students with dyslexia. Some learners may be fast thinkers but slow spellers. Spelling troubles can decrease their progress because it takes a lot of time and energy just to write down a few

words or sentences. Dyslexia makes it difficult to segment the words into sounds, associate those sounds to letters and blend sounds into words. For some dyslexics, learning to spell may be more challenging than learning to read. Students with dyslexia frequently confuse similar letters. Vowels can be very tricky and may even get deleted (e.g. dnsr for dinosaur). dyslexics may also mix up the letters order (felt for left) and misspell common words, even after practice. They may recall words for spelling tests and quickly forget them once the test is done (Rosen, 2019).

Some studies were conducted to investigate the features of dyslexia and their impact on students' learning. For example, El-Masry, et al (2016) assessed the impact dyslexia had on different I.Q parameters as memory, attention, language, visual and auditory recognition, and so on. The study included the participation of ninety Egyptian children, all participants were subjected to: history review, physical examination, and reading disability assessment. Analysis of the results concluded that there is a strong interrelationship between dyslexia, cognition and school performance and presence of low average IQ levels despite good school achievement.

Nashaat, et al (2017) conducted a research for assessing the problems of twenty-five Egyptian children with dyslexia (age range: 6.5–10.7 years) to find out the correlation between their reading and spelling skills and their different cognitive and linguistic abilities. Instruments used included the dyslexia assessment test, Illinois test of psycholinguistic abilities, phonological awareness test and the test of semantics. Findings revealed that the participants' common disorders are rapid naming, semantics, phonological awareness and



writing; in addition, there was a correlation between reading (decoding) and spelling subtests with the phonological awareness scores.

Yuzaidey, et al. (2018) reviewed the different treatments used to improve the literacy and cognitive abilities for Malaysian children with dyslexia. Results indicated that there are very few kinds of interventions such as the multisensory approach, the phonological intervention, and the cognitive training approach which can be helpful to manage literacy and cognitive deficits among dyslexic children.

Previous literature illustrated that dyslexic students experience learning difficulties associated with reading, writing and spelling. Additionally, those dyslexics have their own individual differences, skills and experiences. Thus, effective diagnosis and support should integrate an understanding of their strengths as well as their differences. Understanding the major symptoms of dyslexia, along with indicative behaviors, can enable teachers to enhance recognition and to support those students' classroom learning through using effective teaching strategies. Teachers have to shoulder the responsibility of facing the challenge of making the understanding of dyslexic learners' individual differences a part of their everyday practice.

Reid (2019) explained that the teaching approaches to dyslexic children can be divided into four broad areas: individualized approaches; support approaches; assisted learning and whole-school approaches. For selecting the most appropriate programs and strategies for children with dyslexia, the following factors should be considered:

- The context: the nature of the learning and teaching provision, the age and school level of the learner.

- The assessment: how the assessment informs teaching, and if the individual's strengths and difficulties are readily determined from the assessment results.
- The curriculum: how the teaching program can be related to the curriculum and if the program outcomes can be transferable to other areas of the curriculum.
- The learner: determining the individual factors which affect learner's progress and if the program is appropriate for the learner's learning style.

Considering such factors requires pushing educators away from the traditional presentations with pencil and paper lessons, toward the innovative multisensory structured lessons in order to reach the needs of the diverse learners. Although the traditional method might be effective and essential, enriching lessons with multisensory elements employed by skillful teachers can help dyslexics reach their potential via sense stimulus.

Consistently, Reid (2009) and IDA (2014) listed the principles of a specialized teaching program for learners with dyslexia as follows:

- Structure: the progress should be logical and in small explicitly linked steps.
- A multisensory element: this includes the incorporation of elements of all the styles (visual, auditory, kinesthetic and tactile).
- Reinforcement: skills which are learned should be reinforced through practice, learning and preserving in long term memory.
- Skillful teaching: teaching is not only about transmitting information, but about accessing useful and transferable skills; for instance, phonological awareness skills can be later transferred and utilized in spelling and writing skills.

- Metacognitive aspects: this involves thinking about thinking and learners self-questioning of how a particular response was reached.

Accordingly, students with dyslexia would benefit from a supportive environment integrated with an individualized, multisensory structured program of learning. IDA (2009) illustrated that such a program would activate the brain pathways used for reading and spelling and would help transmit information with sufficient speed and accuracy. Using the multisensory approach would allow students to have the merit of learning alphabetic patterns and words with engagement of all learning modalities. For example, teaching the basics of phonic association with letter forms, both visually introduced and reproduced in writing would also benefit students of all ages.

Pokrivčáková (2015), Hoisington (2015), Kelly & Phillips (2016) and Carr, et al (2017) regarded multisensory instruction, which is based on the Orton-Gillingham approach, as a teaching approach that employs more than one sense at a time. All learners benefit from this type of instruction, but it is particularly effective with students who struggle. The Multisensory approach integrates information processing through seeing, hearing, moving or touching, and even sometimes smelling and tasting can be employed in learning. This approach focuses mainly on using visual, auditory, and kinesthetic-tactile (VAKT) elements which open multiple paths for the information to reach the learner's brain through activating different brain parts simultaneously and enhancing memory and language learning. It also helps learners/teachers identify what learning/teaching style suits them best and introduces more ways for understanding new

information, for remembering it and more ways for recalling it later.

Mostafa & Ghani (2016) examined the effect of multisensory approach on improving recognition of English letter sound association among Kuwaiti mild disabled students. Quantitative analysis of the data showed the positive impact of the multisensory approach on teaching how to identify the English letters and their sounds. It was also concluded that the multisensory instruction could be applied in teaching reading skills as well as phonemic awareness skills which could enable the students to possess the early reading skills.

Ashbaugh (2016) also concluded that multisensory teaching techniques and strategies motivate learners by engaging and encouraging them to use most of their senses. The effectiveness of multisensory spelling teaching techniques was investigated. Pre- and post-assessments of two spelling inventories, collected weekly dictated sentences, and students' writing samples were analyzed for collecting the research data. Findings led to supporting the use of multisensory instruction for the development of spelling skills and improvement in subsequent writing tasks.

Alwaqassi (2017) assessed the actual use of the multisensory method as well as teachers' perceptions concerning this method. This qualitative research made use of data collected via observation and interviews. Teachers agreed that students with disabilities benefit from the multisensory approach of teaching as they get more engage and progress with the lessons. It was also suggested that additional research regarding the multisensory method is necessary.

To conclude, employing the multisensory approach in the learning and teaching of dyslexics would enable them

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develop their reading and writing skills. It integrates visual, auditory, tactile (touch) and kinesthetic (movement) learning experiences which activate different areas of the brain in an individualized manner. It is also worth mentioning that in spite of the problems that dyslexic students might suffer, they cannot be stopped from being creative since they might have bright and strength points that enlighten their way. There are a lot of inventors and scientists who have unique ideas and skills. Jones (2015) and Pokrivčáková (2015) illustrated that people with dyslexia have the ability to imagine how everything works together and picture how things will end up. They are also able to consider from a different angle and produce unusual ideas. For example, Steve Jobs (the creator of Apple) and Christopher Tonkin (a talented scientist) are famous and gifted persons who suffered dyslexia. Accordingly, if appropriate teaching approaches are employed for motivating and engaging dyslexic individuals, they might achieve very ambitious results. Thus, the current research focused on dyslexia and particularly the phonological and spelling problems among dyslexic pupils and how to overcome these problems through using a proposed multisensory EFL program.

### **Statement of the problem**

Based on the previous literature and related studies, dyslexics suffer a lot of problems associated with speech sound (phonological), print (orthographic) processing and in connecting speech with print. Thus, the problem of the current research focused on EFL phonological awareness skills and spelling as being crucial troubles for dyslexic pupils which negatively affect their reading and writing success. Accordingly, a multisensory structured EFL program was proposed to develop dyslexic primary pupils' phonological awareness and spelling.

## **Questions of the Study**

The present study answered the following questions:

1. What are the features: of a proposed multisensory structured EFL program for developing 3<sup>rd</sup> year primary dyslexic pupils' phonological awareness and spelling?
2. What is the effect of the proposed multisensory structured EFL program on developing 3<sup>rd</sup> year primary dyslexic pupils' phonological awareness?
3. What is the effect of the proposed multisensory structured EFL program on developing 3<sup>rd</sup> year primary dyslexic pupils' spelling?

## **Purpose**

The present study aimed at assessing the effect of using a proposed multisensory structured EFL program for developing 3<sup>rd</sup> year primary dyslexic pupils' phonological awareness and spelling.

## **Delimitations**

The study was delimited to the following:

1. A sample of 3<sup>rd</sup> year primary stage dyslexic pupils from two primary schools in Aga city, Dakahlia governorate.
2. EFL phonological awareness and spelling as being two strong predictors of pupils' reading success.
3. Units 7 to 10 from Time for English for 3<sup>rd</sup> year primary stage.

## **Operational definition of terms**

**Dyslexia:** the definition of the international dyslexia association was adopted in this research, "Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often

unexpected in relation to other cognitive abilities and the provision of effective classroom instruction”.

**EFL phonological awareness:** the skill that enables pupils to recognize and work with the sounds of spoken language. Examples to phonological awareness subskills include rhyming, sound/syllable segmenting, deleting and blending, phoneme substitution, and so on. An important element of phonological awareness is phonemic awareness or the skill of segmenting words into their constituting sounds or phonemes.

**Spelling:** the skill of writing words and sentences with correct letters in a proper order.

**Multisensory instruction:** is a method of teaching that engages more than one sense at a time. For pupils with dyslexia, the use of sight, hearing, movement and touch can be helpful for them to easily connect oral language with visual language symbols.

### **Hypotheses**

The present study tested the following hypotheses:

1. There is a statistically significant difference at 0.05 level between the mean ranks of the control group and the experimental group on the post administration of the EFL phonological awareness test in favor of the experimental group.
2. There is a statistically significant difference at 0.05 level between the mean ranks of the experimental group pre-post administration of the EFL phonological awareness test in favor of the post administration.
3. There is a statistically significant difference at 0.05 level between the mean ranks of the control group and the experimental group on the post administration of the EFL spelling test in favor of the experimental group.

4. There is a statistically significant difference at 0.05 level between the mean ranks of the experimental group pre-post administration of the EFL spelling test in favor of the post administration.

## **Method of the research**

### **Participants**

Identification of the target dyslexic participants included the diagnosis of two classes (N= 55 pupils for each class) of the third grade primary stage from two different primary schools: Ahmed Oraby primary school and Talaat Harb primary school, at Shobrawish, Aga city, Dakahlia governorate. Pupils with some sensory deficits (e.g. visual or hearing impairment), attention deficit hyperactivity disorder, or below average intelligence quotient (with IQ less than 90) were excluded.

The remaining pupils were enrolled in the research and were assessed using the dyslexia screening test. Based on the administration of this test, the number of pupils who have apparent dyslexia was fifteen; and they were divided into two groups: a control group (n= 8) and an experimental group (n= 7). Both groups receive the pre and post administration of the phonological awareness test and the spelling test.

### **Design**

The study adopted the quasi-experimental design using two groups: an experimental group and a control group. The experimental group studied through the proposed multisensory structured language program, while the control group received the regular teaching. Both groups received the pre- and post-administration of the EFL phonological awareness test and the spelling test.



## **Procedures**

### **Designing the instruments of the research**

**Stanford-Binet Intelligence Scale, 4th Edition (SB4)** was adopted and administered for excluding the pupils with below average IQ (less than 90).

**The dyslexia Screening Test — DST**, by Fawcett, & Nicolson (1996) was adopted for the diagnosis of the participants. It involves eleven subtests and gives a profile of abilities on the key skills of balance, speed and audition as well as literacy, phonology and memory. These subtests are: a one-minute reading, nonsense passage reading, and two-minute spelling subtests for assessing pupils' decoding and spelling skills. The rapid naming, verbal fluency and semantic fluency examined pupils' semantics ability. The one-minute writing was used for assessment of the speed and quality of writing. The phonological segmentation is concerned with the elision of syllables or phonemes. Other subtests that reflect some cognitive abilities and some related motor functions are: backward digit span (verbal working memory), bead threading (fine motor coordination) and postural stability (gross motor control).

### **The phonological awareness skills test**

The aim of designing the EFL phonological awareness test was to: establish the homogeneity level of the control and experimental groups, and to assess the participants' pre-and post-levels in the target skills. The phonological awareness skills were pre-determined based on reviewing literature related to dyslexia and analyzing the target primary pupils English textbook (Time for English) and teacher's guide. Those skills are:

- Rhyming
- syllable/sound blending and deletion
- Phoneme elision of first sound in a constant blend

- Phoneme substitution
- Identifying sounds of letters and distinguishing between them
- Associating sounds of letters with written form
- Nonsense words repetition and decoding

The phonological awareness skills test (see appendix 1) consisted of thirteen questions. The first two questions were designed to measure the rhyming skill as the pupils were asked to either identify or produce rhyming words. The third, fourth, fifth and sixth questions measured pupils' skill of syllable/sound blending and deletion since they ask the pupils to either delete or blend a syllable and to delete or blend a sound. The seventh question addressed the skill of Phoneme elision of first sound in a constant blend as the pupils were required to make new words by taking off the first sound of a constant blend. The skill of phoneme substitution was addressed in the eighth question as the pupils were asked to take off the first sound of a word and replace it with another sound producing a new word. Besides, the ninth and tenth questions assessed pupils' skill of identifying sounds of letters and distinguishing between them. The eleventh question measured the skills of associating sounds of letters with their written form. Finally, the last two questions addressed pupils' skills of nonsense words repetition and decoding since they were required to repeat and read some nonsense words.

Reliability of the phonological awareness skills test was estimated through getting the coefficient of internal consistency ( $\alpha$  Cronbach). Five pupils other than the main participants of the experimental and control groups were selected to be the sample of the pilot study. The value of ( $\alpha$  Cronbach) was 0.65 which indicated the reliability of the test.

### **The EFL spelling test**

The spelling test was prepared for measuring third year primary dyslexic pupils' spelling before and after conducting the experimental treatment. The test included three questions; the first question is a mini-dialogue in which the pupils were required to listen to the dialogue and fill in the gaps. The second question included some pictures with unscrambled words and the pupils were asked to re-spell the words correctly. The last question is a dictation task in which the pupils are required to write the sentences they listen. Besides, a holistic rubric was designed for scoring pupils' spelling performance.

Reliability of the EFL spelling test was measured through administering it to a pilot sample of five pupils. The value of Cronbach's Alpha coefficient calculated for the test is 0.69 which reflects that the reliability value is fairly accepted. The final version of the spelling test is presented in (appendix 2).

### **Designing the multisensory structured EFL program**

Based on reviewing literature related to dyslexia, phonological awareness, spelling and multisensory structured language instruction, the design of the proposed multisensory structured EFL program was constructed. The major **goals** of this program were to:

- develop 3<sup>rd</sup> year primary dyslexic pupils' skills of phonological awareness.
- develop 3<sup>rd</sup> year primary dyslexic pupils' EFL spelling.

### **Content**

The content of the proposed program is mainly activity-based aiming at improving the dyslexic primary pupils' phonological awareness and spelling. The proposed multisensory structured EFL program was designed based on four units from the pupils' textbook (Time for English); it consisted of eight sessions. **A training guide** was also

prepared for helping the teacher understand and follow the phases in each session effectively.

Throughout the sessions, multiple multisensory strategies addressing a combination of human senses were employed, i.e. auditory, visual, and kinesthetic, and tactile. Each session was conveyed using most of these modalities; and each of the program sessions has its own objectives, and multisensory structured teaching and assessment activities through which pupils demonstrate to what extent they acquire the target skills. The multisensory instructional activities were prepared to activate pupils' sensory motor pathways through involvement of fingertips, hand, arm, whole body, and vocal speech during reading. One model instructional activity aiming at helping pupils discover a new letter-sound association (/k/ = ck) included having the students listen to words with the same sound in the final position while looking at the mouth in a mirror feeling how it is produced, seeing a list of words and writing the new digraph. The teacher encouraged the pupils to be fully engaged through employing their senses in learning providing them with appropriate informative feedback.

Procedures of each session were as follows:

1. **Review and warm up:** this includes engaging the pupils in an activity or a game from a previous lesson and checking if they did their homework.
2. **Presentation:** this is for introducing the new words and phonics in a methodical step-by-step multisensory manner so that pupils hear, see, act, feel and write the target words/sounds or letters.
3. **Practice:** this phase is for using different multisensory activities and games in order to help the target dyslexic pupils internalize the new words and sounds. The activities are not confined to practicing the target sounds of the lesson, but they generally include the

previously learned sounds and words as well.

4. **Assessment:** pupils are engaged in additional activities or games for further practice and for demonstrating that learning has taken place.

(for more details about the proposed multisensory structured EFL program, see appendix 3).

The following figure illustrates the multisensory activities and materials used with each style as proposed in the current research.

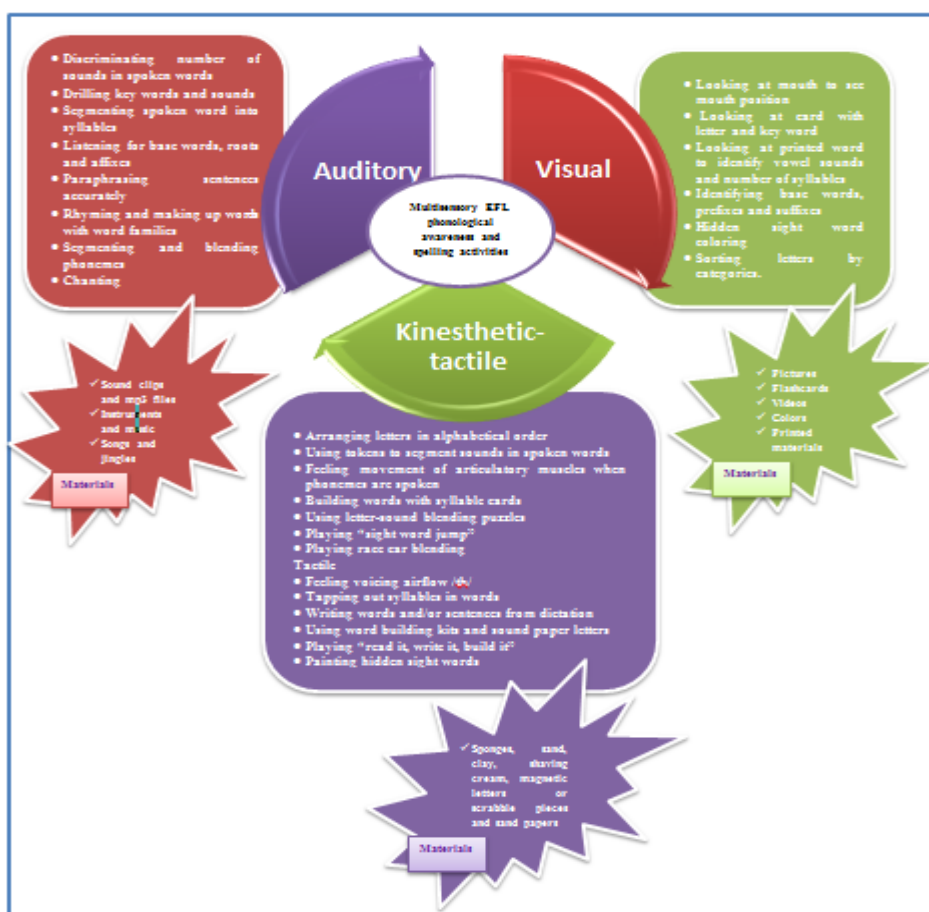


Figure 1. The multisensory activities and materials

### **The experimental intervention**

A quasi-experimental design with one experimental group and one control group was used in this research. The following steps were followed.

#### • **Pre- intervention**

Stanford-Binet Intelligence Scale, 4th Edition (SB-IV) was administered with the help of a specialized psychologist to get the intelligent quotient (IQ) of the pupils and exclude those whose IQ is below 90. After that, the dyslexia Screening Test — DST was adopted and used to diagnose the remaining pupils and to determine the dyslexic pupils who were the target participants in the current research. Administration of these two adopted instruments were conducted throughout the first semester of the academic year 2018/2019.

The next step included assessing 3<sup>rd</sup> year primary dyslexic pupils' EFL phonological awareness skills and spelling before conducting the experimental treatment at the beginning of the second semester of the academic year 2018/2019 for establishing the homogeneity between participants of the control and the experimental groups. Table (1) illustrates the results of the pre-administration of the EFL phonological awareness test.

Table 1.

Establishing homogeneity of the control and experimental groups on the EFL phonological awareness test

skills	group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Sig. (2-tailed)
Rhyming	1	7	8.21	57.50	26.5	Not Sig.
	2	8	7.81	62.50		
	Total	15				
syllable/sound blending and deletion	1	7	9.00	63.00	21	Not Sig.
	2	8	7.12	57.00		
	Total	15				

Phoneme elision of first sound in a constant blend	1	7	7.50	52.50	24.5	Not Sig.
	2	8	8.44	67.50		
	Total	15				
Phoneme substitution	1	7	7.64	53.50	25.5	Not Sig.
	2	8	8.31	66.50		
	Total	15				
Identifying sound of letters and distinguishing between them	1	7	7.64	53.50	25.5	Not Sig.
	2	8	8.31	66.50		
	Total	15				
Associating sound of letters with written form	1	7	8.00	56.00	28	Not Sig.
	2	8	8.00	64.00		
	Total	15				
Nonsense words repetition and decoding	1	7	7.86	55.00	27	Not Sig.
	2	8	8.12	65.00		
	Total	15				
Total	1	7	7.36	51.50	23	Not Sig.
	2	8	8.56	68.50		
	Total	15				

N.B./ group (1) is the experimental group, group (2) is the control group.

Non-parametric Mann–Whitney U-test was used for calculating the difference between the control and experimental groups on the pre-administration of the phonological awareness skills test. Data shown in the above table indicates that U-values were not significant in the seven skills and in the total value of the EFL phonological awareness test; this proves that there was no significant difference between the mean ranks of the control and experimental groups on the pre-test. In other words, the homogeneity was established since the two groups were equivalent in their phonological awareness level before conducting the treatment.

In addition, the spelling test was administered to both

groups before conducting the treatment. Table (2) presents the results of the pre-administration of the test.

Table 2.

Establishing homogeneity of the control and experimental groups on the EFL spelling test

The spelling test	Group	N	Mean rank	Sum of ranks	Mann-Whitney (U)	Sig. (2-tailed)
Total	Exp.	7	8.14	57.00	27	Not Sig.
	Control	8	7.88	63.00		
	Total	15				

As illustrated in table (2), U-value is not significant which reflects that there was no significant difference between the mean ranks of the two groups in their EFL spelling level. In other words, the two groups were equivalent in their spelling performance before conducting the experimental intervention.

- **The intervention**

The proposed multisensory structured EFL program was applied to pupils of the experimental group while the control group studied through the regular English lessons. The experimental treatment was conducted in the second semester of the academic year 2018/2019. The application of the proposed program was carried out within eight sessions, 45 minutes for each session.

- **Post-intervention**

The post-administration of the instruments (the EFL phonological awareness skills test and the spelling test) was conducted after the experimental intervention to examine the progress in pupils' EFL phonological awareness and spelling levels for both the control and experimental groups.



## Results

### Testing the first hypothesis

Non-parametric U-test for independent samples was used to test the first hypothesis which is " There is a statistically significant difference at 0.05 level between the mean ranks of the control group and the experimental group on the post administration of the EFL phonological awareness test in favor of the experimental group". Table (3) illustrates results of testing this hypothesis.

Table 3.

Comparing performance of the control and experimental groups on the post-administration of the phonological awareness skills test

Skills	Group	N	Mean Rank	Sum of Ranks	Mann-Whitney U	Sig. (2-tailed)
Rhyming	1	7	10.93	76.50	7.5	Significant at 0.05
	2	8	5.44	43.50		
	Total	15				
syllable/sound blending and deletion	1	7	11.00	77.00	7	Significant at 0.05
	2	8	5.38	43.00		
	Total	15				
Phoneme elision of first sound in a constant blend	1	7	11.21	78.50	5.5	Significant at 0.05
	2	8	5.19	41.50		
	Total	15				
Phoneme substitution	1	7	11.14	78.00	6	Significant at 0.05
	2	8	5.25	42.00		
	Total	15				
Identifying sound of letters and distinguishing between them	1	7	11.57	81.00	3	Significant at 0.05
	2	8	4.88	39.00		
	Total	15				
Associating sound of letters with written form	1	7	11.57	81.00	3	Significant at 0.05
	2	8	4.88	39.00		
	Total	15				

Nonsense words repetition and decoding	1	7	11.79	82.50	1.5	Significant at 0.05
	2	8	4.69	37.50		
	Total	15				
Total	1	7	12.00	84.00	0	Significant at 0.05
	2	8	4.50	36.00		
	Total	15				

Table (3) shows that the mean ranks of the experimental group in each individual skill are higher than those of the control group. Regarding the total difference between the two groups in all the phonological skills, data concludes that the total mean rank of the experimental group (12.00) is higher than the control group (4.50). The total U-value (=0) in addition to U-values of the individual skills are significant at .05 level which support the statistically significant difference between the experimental and control groups' pupils in their phonological awareness skills. Moreover, the following graph reflects the previously discussed differences between the control and experimental groups which led to accepting and verifying the first hypothesis.

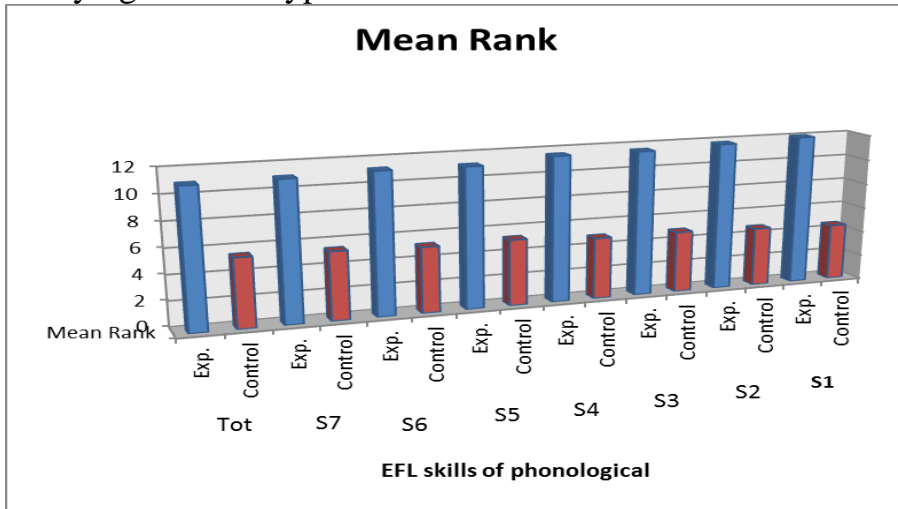


Figure 2. comparison between the experimental and control groups' phonological awareness skills

### Testing the second hypothesis

Wilcoxon signed-rank test for dependent samples was used to test the second hypothesis which addressed the significant difference between the mean ranks of the experimental group's pre and post administration of the phonological awareness skills test. Results are shown in table (4).

Table (4).

Comparing the pre-post performance of the experimental group on the phonological awareness skills test

Skills	Ranks	N	Mean Rank	Sum of Ranks	Z	Value of effect size	Level of effect size	Sig. (2-tailed)
Rhyming	Negative Ranks	0	.00	.00	2.38	0.90	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				
	Ties	0						
	Total	7						
syllable/sound blending and deletion	Negative Ranks	0	.00	.00	2.414	0.91	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				
	Ties	0						
	Total	7						
Phoneme elision of first sound in a constant blend	Negative Ranks	0	.00	.00	2.414	0.91	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				
	Ties	0						
	Total	7						
Phoneme substitution	Negative Ranks	0	.00	.00	2.41	0.91	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				
	Ties	0						
	Total	7						
Identifying sound of letters and distinguishing between them	Negative Ranks	0	.00	.00	2.46	0.93	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				
	Ties	0						
	Total	7						
Associating sound	Negative Ranks	0	.00	.00	2.414	0.91	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				

of letters with written form	Ties	0						
	Total	7						
Nonsense words repetition and decoding	Negative Ranks	0	.00	.00	2.388	0.90	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				
	Ties	0						
	Total	7						
Total	Negative Ranks	0	.00	.00	2.371	0.896	high	Significant at 0.05
	Positive Ranks	7	4.00	28.00				
	Ties	0						
	Total	7						

Table (4) illustrates that the estimated Z-values are significant at 0.05 level for each particular skill and the total phonological awareness level. This reflects the statistically significant difference between the mean ranks of the experimental group's pre-post-administration of the phonological awareness skills test in favor of the post-administration due to using the proposed multisensory EFL program.

In addition, results indicate that the effect size of the program is high in the seven skills and in the total level which supports the positive impact of the proposed multisensory structured EFL program on pupils' target phonological awareness skills. Accordingly, the second hypothesis of the study is considered acceptable.

### **Testing the third hypothesis**

Results of testing the third hypothesis which is " There is a statistically significant difference at 0.05 level between the mean ranks of the control group and the experimental group on the post administration of the EFL spelling test in favor of the experimental group" are shown in table (5).

Table 5.

Comparing performance of the control and experimental groups on the post-administration of the EFL spelling test

The spelling test	Group	N	Mean rank	Sum of ranks	Mann-Whitney (U)	Sig. (2-tailed)
Total	Exp.	7	11.93	83.50	0.5	Significant at 0.05
	Control	8	4.56	36.50		
Total		15				

Table (٥) shows that the mean rank of the experimental group (11.93) in the spelling test is higher than that of the control group (4.56). Moreover, U-value (U= 0.5) is significant at .05 level which supports the statistically significant difference between the experimental and control groups in the EFL spelling test which is in favor of the experimental group. The following figure also illustrates this difference between the two groups.

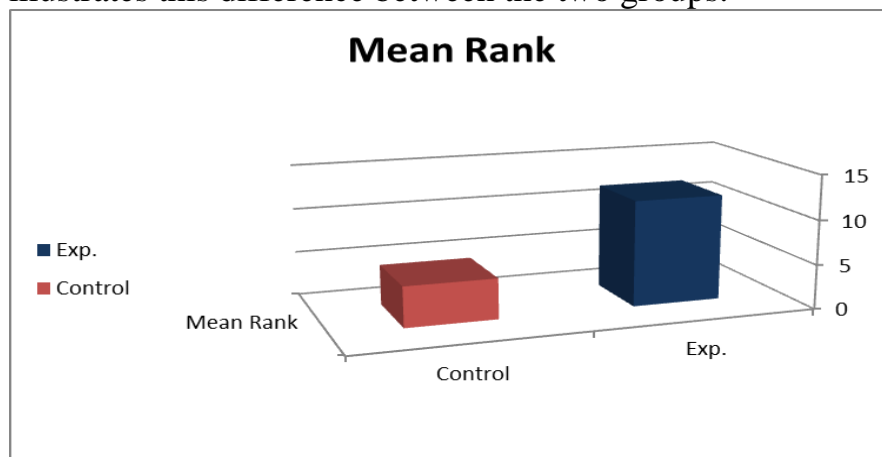


Figure 3. comparison between the experimental and control group' post-spelling level

The significant difference between the experimental and control groups illustrated in the previous figure in addition to the results presented in table (5) led to accepting the third

hypothesis.

### Testing the fourth hypothesis

Concerning the fourth hypothesis which is " there is a statistically significant difference at 0.05 level between the mean ranks of the experimental group pre-post administration of the EFL spelling test in favor of the post application.", table (6) shows the results of using Wilcoxon signed-rank test for its testing.

Table (6).

Comparing the pre-post EFL spelling performance of the experimental group

The spelling test	Ranks	N	Mean rank	Sum of ranks	Z	Value of effect size	Level of effect size	Sig. (2-tailed)
Total	Negative Ranks	7	.00	.00	2.388	0.90	high	Significant at 0.05
	Positive Ranks	8	4.00	28.00				
	Ties	0						
	Total	7						

Based on table (6), the estimated Z-value is significant at a 0.05 level.

This reflects the statistically significant difference between the mean rank of the experimental group's pre-post-administration of the EFL spelling test in favor of the post-administration due to using the proposed multisensory EFL program. The previous table also reflects the high effect size of the proposed program on developing the post-pupils' spelling level compared to their level before conducting the experimental treatment. Accordingly, the fourth and last hypothesis of the study is accepted.

### Discussion

The current research aimed at investigating the effect of using a proposed multisensory structured EFL program on developing phonological skills and spelling among primary dyslexic pupils. The reason behind the problems of

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dyslexics is not their intelligence level as some teachers and parents might mistake. Most individuals with dyslexia are, at least, average or above-average intelligence as indicated by previous literature. That is why Stanford-Binet intelligence scale was used to exclude pupils whose intelligence was below average. Besides, administering the dyslexia Screening Test — DST led to revealing that dyslexic learners' major problems are concerned with reading and writing.

This research focused on addressing the dyslexic problems related to EFL phonological awareness and spelling through the proposed multisensory structured program. The above mentioned results reveal that there was an obvious development in the experimental group pupils' EFL phonological awareness skills on the post administration of the phonological awareness test. In addition, the experimental group pupils outperformed the control group in their spelling performance. These significant results are due to conducting the proposed multisensory structured EFL program. Such findings are consistent with the results reached by Ashbaugh (2016), Mostafa & Ghani (2016) and Alwaqassi (2017) as they supported the use of multisensory approach for enhancing the reading and writing success of dyslexic learners.

The multisensory program provided learners with individualized learning experiences through engaging pupils' senses during the learning process. Employing different leaning modalities either visual, auditory and kinesthetic-tactile (VACT) supported the connection of oral language with visual language symbols and this led to developing dyslexic primary pupils' phonological awareness skills and spelling. These findings are also consistent with Pokrivčáková (2015), Hoisington (2015), Kelly & Phillips (2016) and Carr, et al (2017) who

indicated that multisensory instruction leads to activating learners' parts of the brain and internalizing the phonological awareness skills which affect learners' spelling performance through the engagement of their different senses.

Regarding the control group, it is worth mentioning that the control dyslexic pupils missed the multisensory experiences provided for the experimental dyslexic pupils; they were not involved and had poor performance in their phonological awareness and spelling despite having a good intelligence level. They were disengaged, bored and inattentive in their English classes due to the inappropriate teaching strategies that do not consider their individualized needs. This is highly supported by Yuzaidey, et al. (2018) and the international Dyslexia Association (2019) as it was indicated that using the appropriate approaches with dyslexics would help them overcome their problems and vice versa.

### **Conclusion**

Investigating the effect of a proposed multisensory structured EFL program for improving primary dyslexic pupils' phonological awareness skills and spelling was the major aim of the current research. The proposed program made use of multiple multisensory strategies addressing pupils' different senses (seeing, hearing, feeling-moving and even smelling and tasting) for helping dyslexics enhance the target phonological and spelling skills. Results of the research fostered the positive effect of the proposed multisensory program on developing the target skills. Further research on experimenting the multisensory approach integrated with e-learning for improving dyslexic learners' learning is highly recommended. Further, additional training programs for the teachers would provide them with the



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support they need to properly apply multisensory approaches to their classrooms. EFL classroom teachers should be encouraged to make use of the multisensory strategies in their teaching for the benefit of regular learners as well as those with special educational needs. Moreover, curriculum planners should enrich the EFL curricula of different educational stages with multisensory activities and tasks.

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