Using an Electronic Educational Program Based on Orton-Gillingham Approach for Developing Expressive Language Skills of Hearing-Impaired Pupils at Integrated Schools in Saudi Arabia

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Abstract

The current research aimed at investigating using an electronic educational program based on Orton- Gillingham Approach for developing expressive language skills of hearing-impaired pupils in the light of gender and age variables. The research sample consisted of (30) male and female hearing-impaired pupils from integrated schools in Saudi Arabia and their ages ranged between (4-7) years. The research utilized the quasi experimental design in which two groups were intentionally selected: an experimental group consisted of (15) participants and a control group consisted of (15) participants. The experimental group was treated through the electronic educational program whereas the control group was treated through the traditional instruction. A picture articulation test was adopted from Al- Amayyereh (1998) as a research instrument and the electronic computer program for developing expressive language skills was prepared by researchers after verifying the authenticity of its content by appropriate methods. The research was conducted during the academic years 2019/2021. The research results concluded that the electronic educational program proved to be effective in developing expressive language skills of pupils with mild hearing impairment.

Keywords: Expressive Language, Hearing Impairment, Hearing Impaired Pupils, Orton-Gillingham Approach, Special Education.

Introduction

The integration of technology in education has facilitated both learning and teaching especially for students with special needs. It makes learning setting more enjoyable and increases motivation to learn. This saves time and teacher's effort, contributes to simplifying information for learners, and provides instant feedback for students' performance. Furthermore, technology allows direct communication between learners and between teachers and their students, which Involves students to become active learners.

Persons with special needs are part of the fabric of society, and educating them represents an urgent demand that assures their engagement in society. They need to live their lives, and practice their activities with respect and appreciation, especially that if they have shortcomings in a certain aspect, they have strength and energy in other aspects, perhaps more than the ordinary. Hence, their abilities must be invested and properly employed (Abdel-Atty, 2010). They should have an appropriate education in order to develop their capabilities and skills to the maximum.

The inclusion of pupils with special educational needs is a focused topic in all education systems worldwide (Rose, R., 2001). Marfo, Mensah & Nantwi (2020) indicated that those who are without difficulty have enough attention towards them despite children with different learning needs

and low academic performances are neglected. Those children can cope with learning requirements if they are provided with adequate support and their special educational needs.

McIntyre, et al. (2017) illustrated that different persons can support children's language development, including family members, educators, and/or speech-language pathologists. Therefore, they should implement formal and informal assessments that provide them information on a child's use of language aspects in order to identify and support the receptive and expressive language learning needs of the children during their early learning experiences.

Language is an effective tool of communication. The success in communication is determined by the language ability, including the expressive language. Children with hearing impairment have obstacles to conduct expressive language attributed to the lack of auditory experience (Efrina, Iswari & Irwanto, 2018). One of the approaches that can enhance language development is the Orton-Gillingham Approach, an intensive, sequential phonics-based system while teaches the basics of word formation before the whole meaning. Thus, Orton-Gillingham approach using visual, auditory and kinaesthetic VAK modalities in teaching language could greatly cater to the needs of learning process (Bautista, 2019).

Children develop language at different rates (Everitt et al., 2013). Oral language skills underpin children's educational success and enhance positive life outcomes (Dobinson & Dockrell, 2021). Expressive language delay is an increasingly important area in language learning disabilities (Rescorla, 2011). The language development of hearing children has been related to the quality and quantity of communicative input they receive from adults in their environment (Pipp-Siegel et al., 2003).

The person with hearing impairment resulted from the damage of auditory organ will not acquire stimulation especially auditory stimulation. A child with hearing impairment has difficulty in identifying and connecting the symbols and the verbal signs of language. The expressive language is shown by facial expression, body and hand gestures as employed in sign language. The poor expressive language ability of the hearing impaired children may lead to bad impact to his social life. Thus, in order to develop the language ability, a method or technique should be applied for them (Efrina, Iswari & Irwanto, 2018).

Orton-Gillingham is a direct, explicit, multisensory, structured, sequential, diagnostic, and prescriptive approach to reading for students with or at risk for word-level reading disabilities (WLRD) (Stevens et al., 2021, p. 1). The importance of educational technologies for the hearing-impaired is becoming more and more important at the current time, which is witnessing an increasing growth in the use of educational technologies and technological devices. For education, educational technologies turn the teacher from instructing and transmitting knowledge into a guide and mentor to learners (Abu Al-Ula, 2017). This highlights the effective role of educational technologies in learning and teaching.

The general trend has also increased towards educational technologies and work to take advantage of these technological innovations, and modern technologies include studying by using the computer in the classroom, the laboratory, or even at home in the case of e-learning, using any place where the student can study in where the learner is using a mobile phone. This opens up new learning opportunities. Additionally, it enables the student to learn across space and time, and the student was enthusiastic about the new learning options provided by mobile technologies, and stated that it provides them with new study opportunities as well as provides flexibility to study at anytime and anywhere (Hlodan, 2010).

With the increasing interest in the education of persons with hearing impairment in recent years as a result of what international agreements, human rights and equality between members of

society have called for, and their employment opportunities, and this is what applies to the provisions of the United Nations Convention on the Rights of Persons with Disabilities in achieving the goal of "inclusive education" to ensure that students with disabilities have full access, on an equal basis with other students (Mobile learning the next generation of learning for students with disabilities, 2016).

Hearing impaired persons are categorized as individuals who need special education. Therefore, most international schools and universities for deaf and hearing impaired people, such as Gallaudet University in Washington, the School of the Deaf in California, and the Lyngston School in New York have relied on many different technical applications in teaching deaf and hearing impaired people at different educational levels (Mahmoud, 2015).

It is very important to provide proper and appropriate education for the hearing impaired persons. This is because using only traditional teaching methods is not sufficient for the education of this category. Hence, the use of modern technology makes training for hearing-impaired persons more useful (Baglama, Haksiz & Uzunboylu, 2018).

In the light of the amazing progress in educational technologies for those with special needs in general and the hearing-impaired in particular, interest in improving the academic achievement of the hearing impaired has increased, especially through these available technologies and technological innovations, and the use of these materials and the exploitation of many materials for the hearing impaired. For example, the study of Al-Amer (2009) demonstrated that there is a correlation between the use of educational technologies and the level of achievement in Saudi educational institutions. Similarly, the study by Jacobsen-Agar (Agar-Jacobsen, 2010) proved that hearing-impaired students prefer visual and sensory methods in relation to learning styles. When compared to their hearing peers, students with hearing disabilities can achieve higher levels of achievement when they are taught using visual tactile materials and visual kinematic materials, since the visual sense is one of the senses that they depend on. As for the study Al-Sayed (2011), it was found that the use of technology has an effective impact on developing achievement and reading ability of pupils for the hearing-impaired. This highlights the several advantages of incorporating technology in the education of children with special needs in general and hearing- impaired in particular.

The research problem and its questions

Some hearing-impaired pupils lack expressive language skills. Thus, the current research attempted to find out the effectiveness of an electronic educational program based on Orton- Gillingham approach in developing expressive language skills among a sample of pupils with mild hearing disabilities, and specifically, the current research tried to answer the following questions:

What is the effectiveness of an electronic educational program based on Orton- Gillingham approach for speech training in developing expressive language skills of pupils with mild hearing impairment at integrated schools in Saudi Arabia?

This major question can be divided into the following sub-questions

1. Is there a statistically significant difference between the mean scores of the experimental group pupils and those of the control group pupils in the pre testing of expressive language skills?

2. Is there a statistically significant difference between the mean scores of the experimental group pupils and those of the control group pupils in the post testing of expressive language skills?

3. Is there a statistically significant difference between the mean scores of the experimental group pupils in the pre-post testing of expressive language skills?

4. Is there a statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according do gender variable?

5. Is there a statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according to age variable?

Objectives of the research

The research aimed to investigate the effectiveness of an electronic educational program based on Orton- Gillingham approach in speaking training in developing expressive language skills among a sample of hearing-impaired pupils in the light gender variable (male, female) and age variable (4-5, 5-6, 6-7) years.

Significance of the research

All psychological and educational theoretical frameworks affirm that the early stages of development from the child's life are of utmost importance for the child's development, adaptation and compatibility with society in all developmental areas in general and linguistic ones in particular. Therefore, the acquisition of language by children is one of the important aspects of the child's life because it is related to different areas of life, whether mental, social, emotional or even physical. His environment helps him express his needs and desires as well as helps him to understand the desires of others and helps him to obtain information from the individuals around him (Smith, 2007).

Hence, the significance of this research emerges in light of educational calls for attention to children with special needs, especially with regard to the educational-learning process, represented by the use of modern educational and computer technologies in their learning.

The significance of the current research is represented in developing the expressive language of pupils with mild hearing impairment, due to the social, academic and emotional problems that these children suffer from as a result of the hearing impairment.

Literature Review

There are individual differences in children's performance because they develop differently and consequently have different learning needs (Marfo, Mensah & Nantwi, 2020). Moreover, special educational support has a positive effect on the learning of pupils with special needs. Thus, teachers should try as much as possible to provide more material or human support for pupils with special educational needs in order to enhance their academic performance (Mensah & Nantwi, 2020).

Hearing loss is divided into two; deaf and hard of hearing. Deaf refers to a severe hearing loss which is indicated by the difficulty in processing auditory information even with the help of auditory device. On the other hand, hard of hearing refers to a hearing loss where there may be enough residual hearing to catch process and acquire the language with or without auditory device (Hallahan & Kauffman, 2006).

A child's language development highly occurs in the first five years of life when brain development is most rapid. Supporting children's language development is beneficial for maximizing their developmental potential when children are experiencing a critical period of development (i.e., early childhood to 9 years of age) (McIntyre, et al., 2017). Similarly, Ching, Cupples & Zhang (2019) state that treatment can begin in infancy before language delays set in.

Children who are deaf or hard of hearing may suffer from persistent language delays despite early identification and interventions. However, the technology-assisted language intervention, which integrates augmentative with alternative communication technology into a speech-language therapy model, can consolidate language learning (Meinzen-Derr, et al., 2021).

There are different factors that can affect child's language development and one of them is hearing. In the process of acquiring language, when the child realizes the relation between the sign and the object or the event he encountered, he/she forms a receptive language. Further, when the

child expresses the ideas and his intentions through words, it is considered as the first stage of expressive language development. Moreover, the whole process is supported by the hearing ability (Bunawan & Yuwati, 2000 as cited in Efrina, Iswari & Irwanto, 2018).

Mustafa (2015), Yunus & Al-Sayed (2006), Sweidan & Al-Jazzar (2007), Al-Fayez (2010), Tuma (2013), Harris (2015), and Al- Sayed & Ali (2017) indicated the importance of educational technology for students with hearing disabilities in improving the quality of education and increasing the efficiency of the educational process, in addition to avoid falling into verbal communication, which helps the hearing impaired to comprehend in an easy way. Educational technology is suitable to work on the participation of the largest number of the learner's senses in the learning process in a way that compensates the handicapped for their disability. Furthermore, it raises the interest of the hearing impaired, satisfies their needs, helps in the acquisition of scientific skills and deepens scientific experiences to provide opportunities for developing thinking skills on a large level. In addition to modifying the learners' behavior and forming new directions for them, educational technology contributes to achieve learning within a framework of pleasure through an educational environment full of sensory stimuli.

Modern technologies contribute to the development of the educational level of hearing-impaired. Teaching hearing impaired requires more flexible classroom practices, or therapeutic activities that focus on strengths, and the use of the capabilities available to this group. Using educational technologies aims to adapt and enable them to learn (Aqel, 2012). Hence, educational technologies can help students to learn in a flexible and attractive way.

Hefni (2009) conducted a study aimed at identifying the role of assistive technology in activating the goals of educating deaf students in inclusion institutes and programs. The study used the descriptive and analytical method. The analytical study reached several results, including that supportive technology can activate the goals of deaf education as it has many benefits for them, including reducing or eliminating the impact of disability, and enriching curricula, but teachers 'use of this technology in educating the deaf is not as required. The study is similar to the current study in terms of it deals with technology supporting the hearing impaired and its role in achieving educational goals, including academic achievement. This study differs with the current study as the current study deals with the extent of development of education technologies for the hearing impaired in light of several international experiences and work to benefit from it in improving academic achievement.

Malkawi and Abu Alim (2010) conducted a study aimed to find out the effectiveness of a technical program for training speech in the verbal method for the hearing impaired in kindergarten. The sample number reached (30) children and children, and the study tool consisted of three axes to train children in Arabic sounds and letters. The sounds of the Arabic letters were pronounced at the beginning and middle of the word, and the study used the experimental method, and the results indicated that there are statistically significant differences between the experimental and control group on the scale instrument in favor of the current experimental study group. Where the current study deals with the extent of development of educational technologies for the hearing impaired in light of several international experiences and works to make use of them in improving academic achievement.

Sharadqa and Zariqat (2012) conducted a study aimed at discovering the effectiveness of an educational program by using educational techniques for speech training to develop an expressive language for a sample of (30) hearing-impaired students. The study used the experimental method. The results showed that there were statistically significant differences in the performance of the students on the total score of the post-measurement of the level of the expressive language in favor of the experimental group that underwent the program. Expressionism for the benefit of the age group,

and the study is similar to the current study in dealing with teaching techniques for the hearing-impaired and this study differs with the current study as the current study deals with the extent of development of education technologies for the hearing-impaired and its role in improving academic achievement.

Zamfirov & Saeva (2013) conducted a study aimed to identify the effect of educational technologies on the achievement of the hearing-impaired in the English language course in Bulgaria. The program was implemented for a year in 3 schools in the capital, Sofia, on students aged 16-23. After analyzing the results of the program, the study came out with several results, including the success of educational technologies in improving the level of academic achievement. The educational techniques contributed to improving the level of writing performance. The study used the experimental approach. The study is similar to the current study in terms of dealing with teaching techniques for the hearing-impaired and their impact on academic achievement. This study differs with the current study as the current study deals with the extent of development of education technologies for the hearing-impaired from a comparative perspective.

Al-Tweijri (2014) conducted a study aimed at identifying the problems that teachers of the hearing-impaired face in the use of audio technologies in Buraidah city. The results also indicated the lack of financial allocations for educational technologies for the hearing-impaired, the difficulty of transferring technology inside the halls, the lack of Internet networks inside the halls, the insufficient training for teachers of the hearing-impaired. The study is similar to the current study of dealing with educational technologies for the hearing-impaired, and this study differs with the current study, as that study deals with the problems of teachers in the city of Buraidah, and the current study deals with the extent of development of educational technologies for the disabled and its role in improving the academic achievement.

Bicas, Guijo & Delgado-Pinheiro (2017) conducted a study to analyze auditory and oral communication behaviors in a group of children and adolescents to establish a relationship with factors that interfere with aural rehabilitation. Standardized procedures were applied to check: the auditory and oral communication behaviors of participants and their relationships with the child's age at diagnosis period, the interval between diagnosis and intervention and the hearing age and aural rehabilitation period. Results showed that there was a significant impact on the development of oral communication when the period elapsed between the diagnosis and intervention was analyzed, in such way that the faster the intervention time, the better the results. It was also evident the longer the rehabilitation period, the better the scores in the procedures that evaluated auditory and verbal development.

Baglama, Haksiz & Uzunboylu (2018) conducted a study to examine the technologies used in the training of hearing impaired individuals. Document analysis method was used as a qualitative research method. Results showed that technologies contribute to the development of academic and linguistic skills of hearing impaired individuals.

Mireles (2018) conducted a study with the aim of using the single case research method to determine the effectiveness of an Orton-Gillingham (O-G) based multisensory reading intervention on a student who was diagnosed with a dyslexic reading disability. The study investigated instruction delivered twice weekly for fifty minutes, one on one, through the Orton-Gillingham approach using multisensory techniques. The study measured the effectiveness of this type of instruction. The findings of the study confirmed a positive relationship between the Orton-Gillingham method of reading intervention and student learning outcomes in word identification, word attack, spelling, comprehension, word reading fluency, and phonological awareness.

Meinzen-Derr, et al. (2021) Conducted a study to evaluate the impact of the technology-assisted language intervention (TALI) on spoken language outcomes in deaf or hard of hearing (DHH) children. 21 children aged 3 to 12 years with mild to profound bilateral hearing loss were randomly assigned to technology-assisted language intervention (TALI). Results indicated that technology-assisted language intervention allowed children to process and comprehend spoken language more fully. Such strategies can mitigate persistent language delays with the goal of improving life-long outcomes and independence across settings.

Methodology
Research Design
The research followed the two group quasi-experimental design (an experimental and a control group) to achieve the research purpose.
Research Sample
The research included (30) pupils with mild hearing impairment, their ages ranged between (4-7) years, who were intentionally chosen from the integrated schools in Jedda in Saudi Arabiafor reasons related to the continuity of training and good follow-up.
The participants were distributed randomly into two main groups: the first is an experimental group and the second is a control group, each group consisted of 15 male and female pupils, including children with mild hearing impairment, who were medically diagnosed in Jordanian government hospitals, and educationally through the integrated Schools for the Deaf affiliated with the Ministry of Education in Jedda in Saudi Arabia. Table 1 shows that.

Table 1. The Distribution of the study sample according to (group, gender, and age) variables

Group	Gender	Age			Total
		4-5	**5-6**	**6-7**	
Control	Male	3	2	3	8
	Female	2	3	2	7
	Total	5	5	5	15
Experimental	Male	3	3	2	8
	Female	3	2	2	7
	Total	6	5	4	15
Total	Male	6	5	5	16
	Female	5	5	4	14
	Total	11	10	9	30

Instrumentation
A picture articulation test was adopted from Al-Amayyereh (1998). The test consists of (65) pictures, in which the subject sees the image and expresses it in verbal sound words. These pictures allow the participating pupils to provide correct phonetic samples in the Arabic language, and these words consist of (214) sounds. The test is corrected by the number of votes that the examinee answered with sounds similar to those of adults, divided by the total number of votes, which is (214) votes multiplied by a hundred. The following equation illustrates that.
Pupil score = Total number of valid votes / Total number of votes x (100%)
Thus, this test is used to measure the sounds of the letters of the Arabic language with the movements of the short-tide, the long-term, and the syllables of letters and words. Colored pictures

and games were used in order to obtain answers from each pupil. This test aims to establish standards for children's acquisition of consonants. The test was modified on a sample of (180) children, whose ages ranged between two years and six years and four months, distributed among nine age groups (20) children. In each group, there are two equal distribution of males and females. Familiar pictures of the children of the sample were chosen, since the study aimed to measure spoken and linguistic abilities. The images were also modified to represent the prevalence of consonants, according to the results of the study conducted by the researcher and others on this topic. The test targeted the Arabic silences in three words sites: the beginning, middle and end of the word. The researcher made sure of the validity and reliability of the test. The test also showed the natural development of children, as the children's performance increased as they got older. The children's answers were analyzed twice: the first by comparing the answers with the formal form of the sound, and the second by taking the dialectal variation into account. The results are presented for each analysis.

The study determined the age at which children acquire each of the Arab silence. The researchers classified the votes according to the age of acquisition into three groups: early, medium and late. Whereas, early votes are acquired before the age of four years, while intermediate votes are acquired between the ages of four years, six years and eight months. The late votes would gain thereafter. It has been observed that there is a preference for the colloquial form of the sound at times, which makes it among the late sounds if we consider the formal form as a criterion for acquisition. There were no statistically significant individual differences between the performance of males and females in the study sample. One of the most important applications of the test is its wide use in the evaluation of children who suffer from delays or speech and language disorder, diagnosing their condition and building a treatment plan according to their performance on the test.

Validity and reliability of the test

In order to verify the reliability of the test, the reliability factor was calculated by Test- R-Test Method using the Pearson equation, two weeks after the first application, the application was made on a sample of (15) children with mild hearing impairment, who were selected from integrated schools in Jedda, who were outside the sample of the study. The reliability coefficient was reached by calculating the test and its re-application (0.71). The researchers also used the Coder-Richardson equation (20) (KR-20). Which measures the internal consistency of the test items, and the overall stability factor was (0.76). These values were considered sufficient for the purposes of the study. To ensure the validity of the test, it was submitted to specialized jury members to validate its items concerning suitability of the test items to the pupils' linguistic background and applicability for the research sample. Also, the subjective validity was calculated as an indicator of the validity of the test by calculating the square islands of the reliability coefficient, and it was equal to (0.84), which indicates that the test has a high degree of validity.

Materials of the research

The electronic educational program (the expressive language development program)

General aim of the program

This spoken educational computer program was developed with the aim of developing the expressive language skills of children with mild hearing impairment.

Objectives of the program

- Helping parents of children with mild hearing impairment to understand the concept of expressive language disorder, and the foundations of the proposed program to treat this disorder.
- Helping children with mild hearing impairment to realize the importance of expressive language, and the impact that this has on healthy linguistic and social communication in their daily lives.

- Improving the ability of children with mild hearing impairment to use expressive language by recognizing letters and how to pronounce them (their sounds) and increasing the number of vocabularies, words and language structures they understand.
- Improving the ability of children with mild hearing impairment to respond correctly to verbal commands directed at them.
- Improve the ability of children with mild hearing impairment to understand vocabulary, and the pronunciation of letters and syllables.
- Emphasizing the role of children with mild hearing impairment as active participants in the treatment process.

This spoken electronic educational program was developed with the aim of developing expressive language skills among children with mild hearing impairment. The electronic program was designed by following the following steps:

- Reviewing the literature related to the study problem. a study ((Karla, Leepir, and Stonell, (2010) and a study of (Cannon, 2010) and (Northern and downs, 2002) and others, with the aim of identifying the aspects of the language development of children aged 4-7 years.
- Designing the electronic educational program for speech training in developing expressive language using one of the simple programs (Microsoft Power Point). This technique has been used because it is one of the simple computer technologies that any teacher of the hearing impaired, after training in using this technique, can use it, in addition, this type of computer-designed software serves this study in terms of taking into account the educational situation.

The program included the following main frameworks:

The first frame: It contains the opening screen of the program to introduce its content, and the general and specific objectives of this program.

The second frame: It contains a list of the lessons' titles in terms of entering the lesson by clicking on its title with the mouse cursor. Amal

Program interaction level

The program used the multimedia of sound, (letter, syllable, word) written, image, and movement, and the program enables the student to achieve the following goals:

1. Reading the written (letter, syllable, word) and expressing the image.
2. Listening to read the written (letter, syllable, word) in a child's voice adapts to the nature of the lessons.
3. Hovering mouse over the pictures and hear their sounds.
4. Providing feedback on the student's response on the same computerized images, and some computerized tests, in addition to appropriate positive reinforcement.

Research variables

1. The independent variable: An electronic educational program based on Orton- Gillingham Approach in speaking training

2. The dependent variable: Expressive language skills.

Results

Testing the first question

Is there a statistically significant difference between the mean scores of the experimental group pupils and those of the control group pupils in the pre testing of expressive language skills?

To ensure the equivalence of the two research groups before the application of the study, the researcher applied the pre testing of expressive language skills to the sample participants, where the

arithmetic averages and standard deviations of the sample's performance were calculated on the tribal expressive language development test as a whole and according to the group variable (control and experimental), and Table 2 shows that.

Table 2. Indication of differences between the experimental group pupils and those of the control group pupils in the pre testing of expressive language skills (N = 30)

Variables	experimental group = 15		control group = 15		Value) (T	Type of significance
	Mean	Std. Deviation	Mean	Std. Deviation		
expressive language skills	54.08	2.35	54.89	2.79	-0.81	**Not statistically significant**

The results indicated no statistically significant difference between the mean scores of the experimental group pupils and those of the control group pupils in the pre testing of expressive language skills. This confirms adjusting the variables related to the research procedures, and the absence of factors that may contribute to increasing the expressive language skills of the research participants before conducting the experimental treatment. This ensures accurate experimental treatment steps.

Testing the second question
Is there a statistically significant difference between the mean scores of the experimental group pupils and those of the control group pupils in the post testing of expressive language skills?

Table 3. Indication of differences between the experimental group pupils and those of the control group pupils in the post testing of expressive language skills (N = 30)

Variables	experimental group = 15		control group = 15		(T) Value	Type of significance
	mean	Std. Deviation	mean	Std. Deviation		
expressive language skills	75.33	9.92	56.94	2.90	11.95**	**statistically significant**

Table 3 shows that there is a statistically significant difference between the mean scores of the experimental group pupils and those of the control group pupils in the post testing of expressive language skills favoring those of the experimental group.

Testing the third question
Is there a statistically significant difference between the mean scores of the experimental group pupils in the pre-post testing of expressive language skills?

Table 4. Indication of differences between the mean scores of the experimental group pupils in the pre-post testing of expressive language skills (N = 15)

Variables	Test	Mean	Std. Deviation	(T) Value	Sig	ETA square	Effect size
expressive language skills	pre	54.08	2.35	**14.52****	**0.00**	**0.934**	**Big**
	post	75.33	9.92				

Table 4 illustrates that there is a statistically significant difference between the mean scores of the experimental group pupils in the pre-post testing of expressive language skills at (0.01) favoring the post testing and (T) value is 14.52. Since Statistical significance indicates the extent of confidence in the results of differences, regardless of effect size of those differences; the effect size is calculated "ETA square"; and it is found that the effect size is "large" as the value of ETA square was (0.934). This indicates that the effect size of the independent variable on the dependent variable is high. This confirms the effectiveness of the electronic educational program based on Orton- Gillingham Approach in speaking training in developing expressive language skills of the experimental group pupils.

Testing the fourth question

Is there a statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according do gender variable?

Table 5. Indication of differences between the experimental group students and those of the control group students in the pre testing of expressive language skills (N = 15)

Variables	Male = 8		Female = 7		(T) Value	Type of significance
	mean	Std. Deviation	mean	Std. Deviation		
expressive language skills	74.01	10.79	76.92	10.56	4.32**	**statistically significant**

Table (5) clarifies that there is a statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according do gender variable favoring female pupils. This indicates that female pupils achieved a higher level of improvement in expressive language skills more than male pupils.

Testing the fifth question

Is there a statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according to age variable?

Table 6. One-way ANOVA analysis of the experimental group students in the post testing of expressive language skills according to age variable (N = 15)

Variables	The source of the contrast	Sum of Squares	df	Mean Square	F	Sig.
Expressive Language Skills	Between Groups	1074.667	2	358.222	1.017	.392
	Within Groups	19720.266	12	352.148		
	Total	20794.933	14			

Table 6 shows that there is no statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according to age variable. This means that age variable had no impact on the level of expressive language skills developed through the electronic educational program that was taught to the experimental group.

Discussion

Results obtained from the post testing of expressive language skills indicated that there was a statistically significant difference favoring the experimental group. Using an electronic educational program based on Orton- Gillingham Approach in speaking developed expressive language skills of hearing- impaired pupils. This agrees with the results reported by Hefni (2009), Malkawi and Abu Alim (2010), Zamfirov & Saeva (2013), Al-Tweijri (2014), Mireles (2018), and Meinzen-Derr **et al. (2021).** For instance, Meinzen-Derr, et al. (2021) Conducted a study to evaluate the impact of the technology-assisted language intervention (TALI) on spoken language outcomes in deaf or hard of hearing (DHH) children. 21 children aged 3 to 12 years with mild to profound bilateral hearing loss were randomly assigned to technology-assisted language intervention (TALI). Results indicated that technology-assisted language intervention allowed children to process and comprehend spoken language more fully and had significantly greater increases in the length of phrases they used to express themselves.

The analysis of data obtained by the researcher from testing expressive language skills revealed a higher degree of improvement of the participants of the experimental group than their counterparts of the control group. This improvement can be attributed to the effectiveness of the electronic educational program based on Orton- Gillingham Approach in speaking. This highlights the significance of using Orton- Gillingham Approach in teaching language. This result is consistent with Mireles (2018) who conducted a study with the aim of using the single case research method to determine the effectiveness of an Orton-Gillingham (O-G) based multisensory reading intervention on a student who was diagnosed with a dyslexic reading disability. The findings of the study confirmed a positive relationship between the Orton-Gillingham method of reading intervention and enhancing students' language learning. Furthermore, this result agrees with Baglama, Haksiz & Uzunboylu (2018) who conducted a study to examine the technologies used in the training of hearing impaired individuals. Results proved that technologies contribute to the development of academic and linguistic skills of hearing impaired individuals.

Results proved that there was a statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills favoring gender variable. Similarly, this finding agrees with AL-Qatawneh (2020) who conducted a study with the aim of exploring the effectiveness of a computerized program in the treatment of dyslexia among the fourth grade students. Results showed that there was a statistically significant difference between the mean scores of the experimental group students in the post testing of verbal skills favoring female students. However, this finding is not consistent with the study of Naba'h et al., (2009) which concluded that there were statistically significant differences between the students' achievement mean scores in language learning attributed to gender favoring male students.

Furthermore, results revealed that there was no statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according to age variable. This means that age variable had no impact on the level of expressive language skills developed through the electronic educational program that was taught to the experimental group. On contrary, this result does not go in line with Sharadqa and Zariqat (2012) who conducted a study aimed at discovering the effectiveness of an educational program by using educational techniques for speech training to develop an expressive language for a sample of hearing-impaired students. The results showed that there were statistically significant differences in the performance of the experimental group students on the total score of the post-measurement of the level of the expressive language according to age variable.,

Recommendations

In light of the results of the study, the two researchers recommended a number of recommendations that can be summarized as follows:

• The educational officials' adoption of electronic educational programs to develop expressive language for pupils with mild hearing impairment.

• Holding training courses for teachers to train on electronic programs for speech training in developing expressive language, targeting children with minor hearing impairments.

• The need to prepare other electronic programs targeting all types of language disorders as the results of studies have shown the effectiveness of this program.

• Providing schools with adequate and sufficient technological support.

Suggestions for further research

• Conducting studies dealing with electronic educational programs for the development of expressive language that shed light on other age groups of pupils with minor hearing disabilities, such as studying age groups from 8 to 12 years old.

• The current research could be replicated on a larger sample using other modern educational tool.

• The current research could be replicated on another sample for developing other language area.

• More research is needed to investigate the advantages and disadvantages of using modern technology in language development for students with special needs.

Conclusion

The main concern of the current research was to investigate the effectiveness of an electronic educational program based on Orton- Gillingham Approach in speaking training in developing expressive language skills among a sample of hearing-impaired pupils in the light gender variable (male, female) and age variable (4-7) years. The results showed that the experimental group pupils achieved a higher degree of improvement in expressive language skills than their counterparts of the control group. The results also showed that there was a statistically significant difference between the mean scores of the experimental group pupils in the pre-post testing of expressive language skills favoring the post testing. In addition, there was a statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according to gender variable favoring female pupils, whereas the results indicated that there was no statistically significant difference between the mean scores of the experimental group pupils in the post testing of expressive language skills according to age variable. It could be concluded that the electronic educational program indicated an effectiveness in developing expressive language skills of pupils with mild hearing impairment.

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