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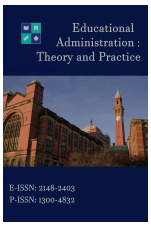

The Efficacy of a Training Program Based on Executive Function Skills in Developing Language Competence of Students with ASD

Atef Abdallah Bahrawi [1*]

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Abstract

The study aimed to identify the efficacy of a training program based on executive function skills in developing language competence for Students with autism spectrum disorder (ASD). The study employed the quasi-experimental approach. The study sample comprised 48 male and female students with autism disorder from mentally handicapped institutes in Saudi Arabia, during the academic year 2021-2022. The validity and reliability of the study tools were verified. The researcher designed a language competence scale for training on the development of executive function skills for such students, and concluded that there are differences with statistical significance at the function level (a ≤ 0.05) between the total means of students' grades on the scale of the two groups, experimental group (using the program) and the control counterpart (which uses the regular one). It also revealed differences with statistical significance between grade means of the two groups, the experimental and the control, in the two domains of language competence (receptive and expressive) that might be attributed to the training program variable. Furthermore, there were no differences with statistical significance between means of students' grades of the two groups: the experimental and control on the total post-application scale of language competence which might be attributed to gender variable. The researcher recommended employing an executive function skills program for all students with disabilities.

Keywords: Autism Spectrum Disorder; Executive Function; Executive function skills; Language Competence; Saudi Arabia

[1*]*Associate Professor, Special Education Faculty of Education, King Faisal University, Al-Ahsa, Saudi Arabia, abahrawi @kfu.edu.sa*

Introduction

The comprehensive guide of Saudi autism programs defines autism spectrum disorder (ASD) to be a complex developmental disability that affects any individual throughout his life. It usually appears at the early childhood stage and might affect an individual's social skills interaction, relations, and self-regulation. Qali (2021) indicated that the disability is revealed through a set of behaviors, a " spectrum case " that influences individuals differently and at varying degrees. Although no specific reason for autism spectrum was identified, early diagnosis might help the disabled to get the necessary support that ends up with better chances (Creedon et. al., 2021). Students with ASD should be taught through stages of learning that include the following skills: cognitive, self-reliance, adaptive behavior, kinetic, academic, and transitional (Tamm et. al., 2020).

Scientific researchers elicited that the most important variables, which should be considered when training those with ASD to be able to perform their activities and skills, are: (1) to use normal instruments to implement training programs in natural situations as far as possible, (2) To focus on training skills the disabled person actually and frequently needs for the environment where he lives, (3) To use the analytical method to determine training objectives, (4) To use team training to ensure active participation of students in training activities (Hutchison et. al., 2020).

The cognitive approaches with their interpretation of autism disorder and mitigation of its symptoms received great interest (Whalon & Cox, 2020). The foremost of these approaches are Mental Information Processing and Theory of Mind, which essentially reveals the ability to read others' beliefs, feelings, and desires (Shakhs et. al., 2014). Hillier et. al., (2021) affirm that educators of students with ASD should present knowledge to them in a receptive manner. Qali (2021) revealed how much that affects information storage, use, and retrieval, which in turn, helps such students understand the social and material ambiance. (Yuk et. al., 2020) suggest some forms of organizing knowledge such as: assimilating similar things, sorting them out, or presenting them in homogeneous groups in accordance with similarity in form, color, function, and concept, giving priority to item numbers to be memorized sequentially or serially 2, 4, 6, 8. (Hillier et. al., 2021) found out that the disorder did not result from the lack or weakness of understanding, but from an inability to stop obstacles that hinder creativity or practical planning which ended up in frequent stereotypical behaviors. Such a thing obligates designing programs that help develop students' skills and propensity for learning. Through that, the students get accustomed to sitting in seats, preparing the necessary tool to execute an education request or use the toilet, and making use of behaviour amendment procedures with the help of parents (Inga et. al., 2018). Shakhs et. al. (2014) State that the central coherence of those with ASD is weak because they get involved with secondary details, which lead to an inability to understand elements of the environment. In addition, such students suffer from executive function disorder, which affects regulation, control, planning, and problem-solving. These things negatively affect accomplishing duties and daily task performance (Kartin, 2018). This is why any teacher needs to know executive functions to refine students' executive skills to provide suitable levels of support and to relate executive functions to their language competence. It also supports the development of their functional skills in a way, which qualifies them to achieve self-independence. The statement of the current study is embodied in answering the following questions:

1. What is the efficacy of a training program in developing the language competence of Students with autism spectrum disorder?

2. Does the efficacy of such program differ according to the student's gender?

Literature Review

The study (Shakhs et. al. 2014) proposed a program based on developing some executive functions of those with autism spectrum in order to improve their social interaction skills and reduce behavioral disorders. Executive functions were limited to the following: response cessation, initiation, cognitive resilience, planning, and functioning memory. As for the technicalities of the proposed program, they were reinforcement, sequence, formation, and feedback, which made the program implementation successful. In the study of Rifae (2016) entitled "Efficacy of a Program in

Improving Executive Function and Communication Skills for Students with ASD", he used the executive function scale, besides the scale of assessing verbal and non-verbal communication skills. Results of the study showed that the program improved executive function and developed verbal and non-verbal communication skills for students with ASD.

The study of (Cascia & Barr, 2017) tackled the issue of the correlation between vocabulary and executive function skills, in addition to sympathy towards such students. Sample of the study comprised 20 adolescents suffering from autism. Receptive and expressive vocabulary were assessed. The results showed that good vocabulary and executive function skills correlated with increased sympathy. Non-parametric analyses revealed that the executive function rated medium between sympathy and vocabulary. Correlating vocabulary and executive function skills before, or paired with social skills in the educational and medical milieu might be helpful.

The study (Vogan, 2018) focused on the development of executive functions and language functioning memory of adolescents with an autism spectrum disorder. Their data is processed for comparison with the normal counterparts. The results revealed that there were disturbances in the executive functions of those with autism. The study (Miheiri, 2019) tackled the efficacy of a program for developing the language skills of children with ASD. The sample comprised 10 children. Results showed that there were differences with statistical significance in favor of training on language assessment forms in the receptive and pronunciation domains of the language.

The study (Ehlen et.al, 2020) aimed to unravel semantic language and its relation to fluency used by students with ASD. The study whose participants were 71 used a program based on a list of vocabulary with names and verbs linked to human beings and animals. The results revealed that the program enabled those students in that respect.

Another study conducted (Parola et. al., 2020) aimed to identify language use, expressive methods, and conversation in social contexts and their relation to executive function and mind theory. The study sample comprised 32 students in the experimental group and 35 in the control one. The results revealed that their conversation improved and there was a great correlation between executive function

Executive functions

These are the most important practices based on evidence of using self-management strategies in teaching students with ASD. It is useful for achieving greater levels of independence in professional, social, academic, and entertainment activities (Zreiqat, 2022). By using this strategy, students with a disorder might become more self-oriented and less dependent. Instead of teaching behaviors, they are taught the general self-management that might be used in various environments (Yuk et. al., 2020).

They are also some of the basic shortcomings of self-organizing which delay problem-solving and attention to self-control monitoring, besides judging whether such a behavior (self-assessment) is acceptable and whether the mission performed has been accomplished (Mohammed, 2020).

The theoretical development of executive functions helps to understand the complex structure of such functions. It was revealed that there is a behavioral structure and another cognitive, which emerge through behavior control. (Tse, 2020) noted that individuals with autism spectrum lack executive functions manifested in obstinacy, absence of resilience, and difficulty in switching from one subject to another, besides emotional stress. (Hong & Matson, 2021) affirm that the appearance of stereotypic and repetitive behavior, which such individuals have, might be traced back to the absence of resilience, rigidness, obstinacy, and inability to take initiative beyond the routine. They adhere to specific things related to executive functions. Among the basic functional elements that contribute to self-organizing in several daily life activities, are the following: (1) planning a process for guiding activities toward the goal to be achieved (2) functioning memory (3) intellectual resilience (4) structure (5) skillful planning (6) metacognition (7) initiative (8) emotional control (9) conduct cessation (10) time management (11) transformation (12) problem solving (Shakhs et. al., 2014). (Vaidya et. al., 2020; Yuk et. al., 2020 & Tamm et. al., 2020) all pointed out that the methods used in developing functions for ASD individuals had apparently achieved their objectives in the aforementioned functions with the following Numbers: 9, 11, 7, 2, 5.

The study (Bertollo & yerys, 2019) revealed that the benefits of the used methods include: the ability to initiate and maintain behavior, control external factors, set a goal for a task, plan strategies to solve and regulate problems, resilience, monitor and assess individuals, and finally storing knowledge in memory.

Language competence

Language competence: This implies the knowledge that the person possesses to understand and use the language. It is a concept that is based on the social and procedural maturity of language (Ehen et. al. 2010). The speaker in this case feels that he is able to convey the meaning to listeners easily and fluently (Andrés-Roqueta & Katsos, 2020). It is also identified to be the ability to use language in accordance with the culture and system of its society. Procedurally, it was measured via items of the study scale through expressive and receptive domains of the language. Language competence is one of the factors that help develop executive function (Hutchison et. al., 2020). Problems of language communication are basic for diagnosing ASD. The problems include the inability to speak, difficulty in using gestures, inability to respond verbally as reflected in their receptive language, understanding, body language, facial expressions, word choice, or using non-functional sentences that lead to weak social interaction (Qali, 2021). For example, students with autism spectrum mostly find difficulty in understanding implicit meanings and the speaker's tone (Andres-Roqueta & Katsos, 2020). Self-dialogue regarding important features of self-regulation motivates thinking through which the individual perceives the event before he responds to it. The verbal functioning memory helps in solving the problem and in setting rules and plans through which the students remember past events (Shogren et. al., 2021). (Zreiqat, 2022) pointed out that verbal communication skills are important for students with ASD which involves semantic language or meaning that incorporates the ability to use and understand words, sentences, paragraphs, and abstract concepts. (Vogan, 2018) attributes problems of fluency to the inadequate educational strategies used. Those that have to be used should improve fluency, and verbal memory and facilitate saving and retrieving information, which eventually reinforces the information-processing system. (Ehlen et. al., 2020). The semantic language features or meaning including: (1) Receptive verbal language which is the ability to understand words, uttered ideas, and processing of central-audio information. (2) Expressive verbal language, which is the ability to express ideas in words and the ability to pronounce each word correctly (Zreiqat, 2022). (Ehlen et. al., 2020) found a direct correlation between language disorders and difficulties in reading for ASD students and another correlation between remedy and the ability to increase learning and reading.

Methodology

Research Design

This study was conducted after obtaining the approval of the Scientific Research Ethics Committee at King Faisal University No. (Kfu-rec/2021-10-01). To achieve the study objectives the study adopted the quasi-experimental method because it suits its objectives. It tackled the influence of a training program on executive function skills, as an independent variable, and its influence on language competence, as a dependent variable.

Participants

The sample comprised (156) students with ASD from schools in Alhasa the ages of the participating students ranged from 7 to 12 years old. (48) Males and females of them randomly selected and divided into two groups: (25) quasi- experimental who were subjected to a training program on executive function, and (23), a control group, who were subjected a normal program from schools and institutes at Ihsa, during the academic year 2021-2022. Male and female teachers, in collaboration with students' guardians, applied to the program.

Research Tools

Language competence scale

The scale for measuring language competence was designed with the help of theoretically relevant literature like (Hasan, 2019; Parola et. Al., 2020 & Zreiqat, 2022). The scale in its initial

form consisted of two parts:

The first includes initial data about sample members. The second consists of (19) items that measure the language competence of students, with autism spectrum disorders, and is divided into two domains: the first which comprises (9) items measures receptive language, while the other with (10) items measure language competence. Responses to the items measured according to Likert's five-point scale are as follows: Applicable with a high degree, (3) points, medium (2), and low (1).

Before applying the scale to the sample of the study, validity and reliability wre verified as follows: The scale was presented to a group of specialists in the field of special education. The researcher modified the scale in accordance with their suggestions. The scale ended up with 19 items divided into two domains as stated before. Internal consistency verified by using Pearson's correlation coefficient that ranged between (0.507-0.788) pertaining to language competence that was acceptable and compatible with the domain.

The reliability of the scale was verified by using Cronbach's alpha which was applied to the exploratory sample comprising (30) male and female students. The reliability of language competence with its two domains was high: the coefficient for the domain of receptive language was (0.863), while the expressive one was (0.842). The total coefficient for the scale was (0.917), a value, propitious for the study, being more than (60%).

To activate students' language and social communication through creating class tasks such as: organizing learning devices, asking for participation in an activity, uttering words of thanks, raising suitable cards and pictures for request, recollecting some video words and sentences, and finally doing assignments.

To provide simple usable words to students reminding them of class and school situations in which they should be used.

Dividing the students into groups according to their potentials and desires and securing language patterns from videos, besides drawings, pictures, and cards.

To the upgrade language competence of autistic students besides securing actual situations to use the language for communication and responding to instructions.

Diagnosis tools: a medical report ratified by the center of growth and behavior disturbances which was applied to sample members (file for each case). The report mentioned that the diagnosis was done with reference to a ratified medical report issued by the center, affiliated with the maternity hospital, or with psychological health at Ihsa region. The report includes an exact diagnosis of the case stating that it is an ASD with all its associated disturbances. Additionally, Using the Stanford-Binet test for Intelligence, fifth edition. Mental ability was diagnosed at the service-support center or at diagnosis scale center affiliated with special education management at the education directorate. Degrees of sample members' intelligence ranged between (62-85).

A program for executive function skills for developing language competence

The program was designed for the group with autism spectrum disorder and applied standards of executive function to them to improve their language competence. Procedural objectives: The foremost of these objectives might be outlined in what the student should be able to do as follows:

Work with tasks, analyze them, and elicit important information.

Save information and process them for use in cognitive activities.

Put a deadline for handing in assignments.

Move from one activity or assignment to another smoothly and easily.

Take part in school long-term activities such as morning assembly, theater, and library.

Use words of request, thanks, permission, and sharing.

Imitate visual and audio models like stories, videos, and language games.

All of these skills are related to daily teaching tasks that are based on planning and organizing learning to help these students by enabling them to use the vocabulary they know. Program

structure and arbitration: (Zreiqat, 2022) points out that any language-training program for students with ASD should be based on the interactions between adults, children, normal education, direct reinforcement, and task diversification. The researcher adopted procedures that regulate executive function to improve the language competence of students with ASD. These include activities, games, designed practices ,and social stories that involve drawings, pictures, videos, and memory games. The program is designed by using computer and technical programs that include sound, pictures, and motion. The purpose behind that is to improve their language competence, motivate their potential, and create real language chances.

Program execution: The students are trained to listen to the teacher, video, mobile, and tablet in an attempt to improve their level of receptive language competence and to enable them to repeat and re-pronounce certain words to use them in school and at home. Those students were divided into groups with ages ranging from 7-14 years.

Program technicalities: This included reinforcement, providing information, modelling, role-playing, analyzing conversation skills, and feedback. The program included slides and pictures of training skills on executive functions that are:

1. Planning: This helps the student to put down objectives and to determine the steps or methods to achieve them. This involves his obtainment of the necessary tools to execute the objective or activity.

2. Cognitive resilience and initiative: The students here are able to switch from one idea to another in compliance with situation change.

3. Functioning memory and information processing: The student handles information that is processed at any moment and is able to retrieve them when needed.

4. Respond cessation and emotional control: Here the student gets used to maintaining positive behavior and abides by school instructions and time.

5. Productivity: This involves students' sharing in producing new vocabulary and in completing a partial drawing or sentence and accomplishing a portion of independent performance.

Program content and stages: The program covers the following:

1. Securing learning devices: This involves readiness, putting the tablet in a suitable place, getting learning devices, and following with up the teacher.

2. Using function words: this means using materials available at school and house and naming them. For example, when the student pronounces the word toy or ball, he brings and plays with them as a reinforcement substitute for the substantial one.

3. Abiding by the sequence of the steps: This includes learning steps and revising the step list of tasks and activities.

4. Abiding by management schedule: this includes specifying and arranging activities in a schedule, ticking the accomplished one, and using audio stopwatch. Whenever the activity is not finished, the student is given extra time.

5. Developing self-initiation skills: This includes teaching skills: asking for help when needed, asking for rest in order to improve participation in activities, and encouraging the student to verbally respond or raise his hand in order to communicate.

6. Individual work: This includes the completion of work steps individually.

7. Constant reinforcement: This involves the teacher's reward whenever the activity is done and a positive response is received.

8. Self-monitoring: This includes emotion control, conduct cessation, students' awareness of distractors, and what helps him accomplish the task.

9. Work value recognition: This includes students' awareness of accomplishing the task, activities sharing, and relating works to results.

10. Program presentation: The program is given over four months in the form of daily training on class situations and teaching platforms as scheduled. 60 Sessions on average given in a period

of 14-15 weeks. Every session covers 35-40 minutes.

Steps of execution: These include preparing study sample students and educators, organizing information of study members, specifying training time, projecting the skills study members need to train on, following up program application, daily training rotating activities of the program components and objectives in accordance with students' capabilities. The program includes:

Preparation sessions, compliance with instructions, developing program awareness and execution.

Daily training

Program sources: Theoretical framework, foreign and Arabic studies, besides relevant literature.

Program Philosophy: Training students on executive skills, accomplishing language competence, activation of function activities, interest in teacher's schedule and class activities, achieving mutual respect, and observing the sequence of training stages.

Results and Discussion

In answering the first question which states "what is the efficacy of a training program in developing language competence of Students with autism spectrum disorder?"

Arithmetic means and standard deviations of grades of autistic students in the two groups for the pre-and post-application domains calculated presented in Table 1.

Table 1. Arithmetic means and standard deviations of degrees of the two groups on the language competence scale with its pre- and post-application domains

Domains of language competence scale	Group (Training program)	No.	Pre		Post	
			Means	Standard deviation	Means	Standard deviation
Receptive language	Experimental	25	1.84	0.42	2.15	0.31
	Control	23	1.69	0.43	1.74	0.39
Expressive language	Experimental	25	1.85	0.38	2.22	0.24
	Control	23	1.76	0.42	1.78	0.36
Total scale	Experimental	25	1.85	0.38	2.19	0.24
	Control	23	1.73	0.41	1.76	0.35

Table 1 the virtual differences between the means of the two groups on the scale with its post and pre domains. MANOVA is used to highlight these differences. The results of the first question are illustrated as follows:

Differences between the means of the two groups, experimental and control, on the language competence scale as a whole are presented in Table 2.

Table 2. ANCOVA results of detecting functional differences between the means of two groups pertaining to total degrees on the language competence scale

Variance source	Square total	Degrees of freedom	Square means	(F)	Function level	n2 size of program impact
Pre-measurement	3.482	1	3.482	219.974	0.000	0.830
The group (Training program)	1.321	1	1.321	83.449	0.000	0.650
Error	0.712	45	0.016			
Total	6.317	47				

* Statistically significant at the function level (a ≤ 0.05)

The results in Table 2 show a difference with statistical significance between grade means of students of the two groups, control and experimental, at the post-total language competence scale, the (f) calculated value of the differences was (83.449) which is statistically significant at the function level (a ≤ 0.05).

Eta square value (n2) and its impact on the training program used for developing total language competence was (0.650), which is equivalent to (65%) of the variance, which goes back to the program. Such an impact is considered high. According to the criterion of Cohen (1977), the impact with 0.10-0.24 variance is considered low, while that with 0.25-0.39 is medium, but the one with about 0.40 variance and more considered high. To determine the differences between the means of students' grades for the two groups (experimental and control) on the total language competence scale, arithmetic means were elicited after isolating the pre-application effect on the post-application performance. The results are presented in Figure 1.

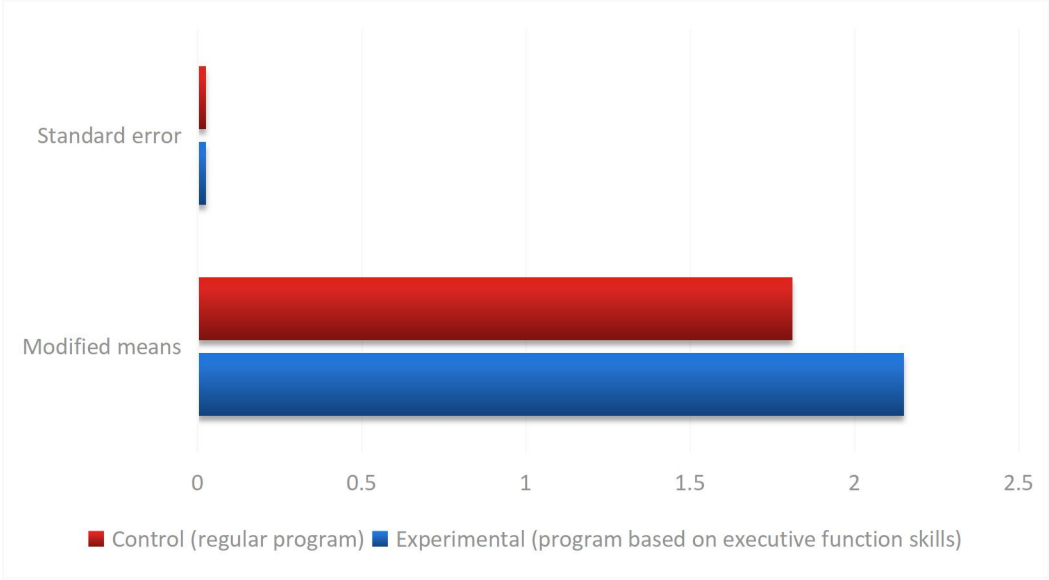

Figure 1. Difference between means of students' grades for the two groups

Results of the modified arithmetic means in Figure 1 reveal that the difference was in favor of the experimental group; the means of grades was 2.15, higher than that of the control counterpart which was (1.81). Such a result agrees with that of (Inga et. al., 2018) which also revealed a significant impact of executive function programs on the language fluency of the disabled. It also agrees with the result of (Shakhs et. al., 2014).

Differences between means of students' grades of the two groups (experimental and control) in the two domains of language competence (receptive language and expressive), are presented in Table 3.

Table 3. Results of MANCOVA analysis to detect statistical differences between the two groups in the two domains on the language competence scale.

Variance source	Dependent variables	Square total	Degrees of freedom	Square means	(F)	Function level	n2 Eta square
Receptive language pre-(common)	Post-receptive language	1.710	1	1.710	92.874	0.000	0.679
	Post-expressive language	0.003	1	0.003	0.093	0.761	0.002
Expressive language	Post-receptive	0.001	1	0.001	0.000	0.983	0.000

Variance source	Dependent variables	Square total	Degrees of freedom	Square means	(F)	Function level	n2 Eta square
pre-(common)	language						
	Post-expressive language	1.140	1	1.140	40.696	0.000	0.480
Training program Hotelling = 3 * 9.050	Post-receptive language	0.905	1	0.905	*49.172	0.000	0.528
	Post-expressive language	1.697	1	1.697	*60.565	0.000	0.579
Error	Post-receptive language	0.810	44	0.018			
	Post-expressive language	1.233	44	0.028			
Total	Post-receptive language	7.700	47				
	Post-expressive language	6.565	47				

*Function level (a ≤ 0.05)

Results in Table 3 reveal that the Hotelling value of the training program variable is (39.30) which is statistically significant at the function level (a ≤ 0.05). Such a result shows differences between means of student's grades for the two groups in the two domains of language competence attributed to the variable of the training program.

From the results presented in Table 3, it is clear that the difference between the means of the two groups pertaining to the domain of perceptive language in the post-application was statistically significant. The calculated (f) value was (49.172), statistically significant at the function level (a ≤ 0.05). Eta square value (n2) for the effect of the training program used for developing receptive language was (0.528) which indicates that (52.89%) of the variance pertaining to improving expressive language was high and attributed to the program.

It is also clear that the difference in the means of the two groups pertaining to expressive language in the post-application was statistically significant; the calculated (f) value was (60.565), statistically significant at the function level (a ≤ 0.05). Eta square value (n2) of the effect of the training program was (0.579) which indicates that (57.9%) of the variance pertaining to improving expressive language which was high and might be attributed to the program.

To identify the reasons behind the differences in the two domains (receptive and expressive), related to the program used, the modified arithmetic means, being isolated from post-application of the two domains, was elicited as presented in Table 4.

Table 4. Modified arithmetic means of student's grades of the two groups in the two domains of language competence scale

Scale domains	Training program (the group)	Modified means	Deviation error
Receptive language	Experimental (program based on executive function skills)	2.09	0.027
	Control (regular program)	1.81	0.029
Expressive language	Experimental (program based on executive function skills)	2.19	0.034
	Control (regular program)	1.81	0.035

The results in Table 4 show that the difference related to language competence (receptive and expressive) was in favor of the experimental group, as their modified means were higher than those of the control were.

In light of the preceding results, the hypothesis of the first question, which states that there are no differences with statistical significance at the function level (a ≤ 0.05) between means of students with autism of the experimental group and those of the control in language competence scale, is rejected. The alternative hypothesis, which shows that the training program used was effective compared to the regular one, was accepted. The study of Parola et. al (2020) revealed that there was a positive correlation between executive function components and language interaction. The study of (Hutchison et. al, 2020), as well, revealed that children with autism spectrum disorder can perfect verbal expression.

Results related to the second question which states: "Does the efficacy of such program differ according to students' gender?" Therefore, arithmetic means and standard deviations for both groups were elicited in accordance with the gender according to the language competence scale with its two domains, pre- and post- applications as presented in Table 5.

Table 5. Means and deviations of student's grade on language competence scale (pre- and post-) according to the training program and gender

Domains of language competence scale	**Group (Training program)**	**Gender**	**No.**	**Pre**		**Post**	
				Means	**Deviation**	**Means**	**Deviation**
Receptive language	Experimental (program based on executive function skills)	Male	14	1.79	0.50	2.06	0.37
		Female	11	1.91	0.30	2.26	0.18
		Total	25	1.84	0.42	2.15	0.31
	Control group (regular program)	Male	12	1.76	0.50	1.81	0.46
		Female	11	1.61	0.34	1.68	0.32
		Total	23	1.69	0.43	1.74	0.39
Expressive language	Experimental (program based on executive function skills)	Male	14	1.80	0.42	2.24	0.24
		Female	11	1.91	0.33	2.20	0.26
		Total	25	1.85	0.38	2.22	0.24
	Control group (regular program)	Male	12	1.83	0.45	1.81	0.35
		Female	11	1.68	0.39	1.75	0.38
		Total	23	1.76	0.42	1.78	0.36
Total scale	Experimental (program based on executive function skills)	Male	14	1.80	0.45	2.15	0.28
		Female	11	1.91	0.28	2.23	0.19
		Total	25	1.85	0.38	2.19	0.24
	Control group (regular program)	Male	12	1.80	0.46	1.81	0.39
		Female	11	1.65	0.34	1.72	0.33
		Total	23	1.73	0.41	1.76	0.35

Table 5 shows virtual differences between students' means of the pre and post-application in the domains of language competence in accordance with the training program (based on executive function skills, regular program) and gender. These differences were measured by ANCOVA

explaining the results of question two and testing its hypothesis.

Differences between grades of students of the two groups on the total language competence scale pertaining to gender variable.

Table 6. Results of 2-way ANCOVA analysis to detect functional differences between grade means of students at the total language competence scale pertaining to the variables of the training program and gender, besides interaction between them.

Variance source	Squares total	Degrees of freedom	Square means	(f)	Function level	n2 Eta square
Pre-measurement	3.399	1	3.399	205.724	0.000	0.827
The group (Training program)	1.299	1	1.299	78.635	0.000	0.646
Gender	0.001	1	0.001	0.060	0.808	0.001
Training interaction X gender	0.001	1	0.001	0.053	0.819	0.001
Error	0.710	43	0.017			
Total	6.317	47				

The results in Table 6, pertaining interaction between the two variables of the training program and gender, reveal that there are no differences with statistical significance at the function level (a ≤ 0.05) between grade means of students of the two groups that might be attributed to gender. The calculated (f) value for interaction between the two variables was (0.053) which is not statically significant at the determined functional level (a ≤ 0.05). Such a result indicates that there are no differences in grade means between the two groups of autistic students that might be attributed to gender. It also indicates that subjecting students to the training program helps in developing total language competence, irrespective of gender.

Differences between students' grade means of the two groups in the two domains of language competence (receptive and expressive) pertaining to gender variable.

Table 7. Results of 2-way ANCOVA analysis to detect the functional differences between students' means in the two domains pertaining to variables of training program and gender, besides interaction between them

Variance source	Dependent variables	Square total	Degrees of freedom	Square means	(f)	Function level	n2 Eta square
Receptive language pre-(common)	Post-receptive language	1.679	1	1.679	97.593	0.000	0.699
	Post-expressive language	0.002	1	0.002	0.055	0.815	0.001
Expressive language pre-(common)	Post-receptive language	0.001	1	0.001	0.004	0.950	0.000
	Post-expressive language	1.166	1	1.166	42.496	0.000	0.503
Training program	Post-receptive language	0.952	1	0.952	55.377	0.000	0.569
	Post-expressive language	1.596	1	1.596	58.145	0.000	0.581
Gender	Post-receptive language	0.034	1	0.034	1.973	0.168	0.045

Variance source	Dependent variables	Square total	Degrees of freedom	Square means	(f)	Function level	n2 Eta square
	Post-expressive language	0.011	1	0.011	0.412	0.524	0.010
Training program Hotelling = 3.2 24 a=0.130	Post-receptive language	0.050	1	0.050	2.922	0.095	0.065
	Post-expressive language	0.066	1	0.066	2.421	0.127	0.055
Error	Post-receptive language	0.722	42	0.017			
	Post-expressive language	1.153	42	0.027			
Total	Post-receptive language	7.700	47				
	Post-expressive language	6.565	47				

Results in Table 8 reveal that the Hotelling value for interaction between the variables of the training program and gender amounted to (3.224), a value that is not statistically significant at the function level (a ≤ 0.05). This unravels that there were no differences with statistical significance at the function level (a ≤ 0.05) between grade means of children of the two groups that might be attributed to the interaction within the aforementioned variables. (F) Calculated values for the interaction were (2.922) and (2.42) in sequence. Such values are not statistically significant at the determined function level (a ≤ 0.05) pertaining to the two domains (receptive language and expressive) that might be attributed to the student's gender. In addition, subjecting the students to a training program helps in developing these two domains in students with autism, irrespective of gender. Vogan (2018) confirmed such a finding which pointed out that reinforcing language competence in autistic students is possible through developing executive function.

The results of the study showed that behavioral and cognitive structures play a role in behavioral control; as it noted that individuals with autism spectrum disorder have deficits in executive functions that appeared in the form of intransigence and inflexibility, difficulty moving from one topic to another, in addition to their emotional tension. She also explained the benefits of the methods used, which included the ability to initiate and maintain behavior, control external influences, set a goal for the task, plan and organize problem-solving strategies, flexibility, individual monitoring, and evaluation, in addition to storing information in memory. Which opens wide horizons to modify the behaviors of individuals with special needs and address their problems in easy ways.

Conclusion

Educators, try to put down remedial programs and implement training methods to develop students' skills (Hasan, 2019) pointed out that verbal functioning memory is one of the constituents of executive function, which signifies, it refers to dialogue with oneself about important features of self-regulation. Through the results of the study, the conclusion has several beneficial effects on the practice field, despite the above-mentioned limitations. It became clear that training programs can develop language competence of ASD Students and apply standards of executive function to them to improve their language competence. The program detects the students' executive shortcomings and provides solutions related to daily teaching tasks that are based on planning and learning regulation to help those students by enabling them to use the

vocabulary they know. The teacher provides works that help them control their emotions and dissuade behaviors. It also helps them to switch from one activity to another and at the same time to organize, plan, and use the functioning memory. The research recommendations are arranged according to the results, as follows: Firstly, conduct studies that care for developing executive function skills by securing a supportive ambiance. Secondly, reinforce the role of training programs in order to improve the communicative domain for the disabled. Thirdly, constantly evaluate training programs to reduce difficulties that hinder the application.

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