The Effectiveness of an Executive Functions Program on Reducing Sociolinguistic Communicative Disorders in Children With Autism

Ahmed Mohamed Atef Azazzy [1][0000-0003-3364-2002]

[1]Prince Sattam Bin Abdulaziz University, KSA and Beni Suef University, BS 62511, Egypt
ahmedazazzy@ssn.bsu.edu.eg

Abstract. Autism is a common developmental disorder that leads to Sociolinguistic communicative disorders among autistic children. This study aimed to reduce Sociolinguistic communicative disorders in a sample of autistic children by using an executive functions program. The sample consisted of 10 children with autism spectrum disorders whose ages range between 6-9 years, divided into two groups of 5 children each (an experimental group and a control group). For data collection, the researcher utilized the Stanford-Binet intelligence scale 5th edition, the autistic child scale, the Sociolinguistic communicative disorders scale, and the executive functions program (by the researcher). The results of the study revealed that there were differences between the means of degrees ranks of the experimental group before and after applying for the executive functions program in reducing Sociolinguistic communicative disorders in favor of the post-application, there were differences between the means of degrees ranks of two groups after applying for the executive functions program in reducing Sociolinguistic communicative disorders in favor of the experimental group, and there were no differences between the means of degrees ranks of the experimental group in the post and follow-up application in reducing Sociolinguistic communicative disorders. it was concluded that Sociolinguistic communication is a key to reduce many symptoms of autism.

Keywords: Executive Functions, Sociolinguistic Communicative Disorders, Autism Disorder.

1 Introduction

Autism is a pervasive, complex, and a neurological developmental disorder that a child is exposed to by the age of three associated with him throughout his life and negatively affects his developmental aspects [1]. Mainly, it appears in the form of difficulties in interaction and social communication and is accompanied by stereotyped and repetitive behaviors and interests [2]. It may be associated with attention deficit disorder [3]. Different definitions of autism can be found in the literature. DSM-V (2013) defined it as a developmental disorder that affects the children in early childhood before the age of eight with symptoms appear only in two areas, namely social communication disorder and stereotypical repetitive behaviors [4].

The deficits of children with autism extend to include social communication disorders, which affect social skills, verbal and non-verbal communication skills (for example, eye contact and facial expressions, as well as difficulty making new friends. One of the most prominent symptoms of autism is that the autistic child characterizes by quantitative and qualitative deficits in the social communication process, a tendency towards isolation, and joining others is only under insistence. This child also has a deficiency in verbal and non-verbal communication, difficulty in understanding emotions, insistence on routine, and resistance to any change in the surrounding environment, and he suffers from challenges in language development [5]. Numerous studies agreed upon the correlative relationship between language development and executive functions, especially in meta-representations and syntactic awareness aspects among children with autism [6].

ASD More recently, autism and autistic children have become like the iceberg idea, that we only see the tip of it although the underneath is hidden. In this context, most literature confirmed their social failure, their inability to speak in general, and that they practice stereotyped behaviors and many other things, but we always differ in perspectives when talking about the causes that lead to autism disorder as illustrated by [7] study. [8] defined Sociolinguistic as the communicative verbal language usage and other expressive ways of communication such as non-verbal linguistic modalities as facial expressions in a specific context.

A child with autism spectrum disorder lacks the features of the typical child, and suffers from primary deficits that distinguish him from others as autism affects many different developmental aspects, and thus lead him to withdraw and introversion, as he refuses any external contact and connection with others [9]. Edwards & Crocker demonstrated that this is because this child lacks the ability to communicate and interact with others; as positive social interactions and good communications with others include the ability to understand the emotions and feelings of others and the reactions expected of them in different situations [10]. [11] explained that most autistic children suffer from late verbal communication in one or more aspect, and at least one-third of them will remain with this verbal deficit throughout his life, speaking few or no words. Certainly, such linguistic challenges will affect their life areas negatively as socialization, academies, independent life, and employment.

The deficiency in social skills represents the main problem for children with autism that refers to a lack of verbal and nonverbal communication skills and social understanding. Moreover, children with autism face problems in learning social interactions, in the initiation and in achieving reciprocal social interactions, therefore the researcher's idea of treatment with executive functions will positively affect their skills [12]. Many theories attempt to explain the symptoms and causes of autism. For example, [13] believe that autism is not the result of a single cause, but it is due to a combination of different factors. In general, it is usually challenging and impossible to have a single reason responsible for a specific disorder. One of the well-documented theories in this field is the executive dysfunction theory, which asserts that executive dysfunction can be recognized to underlie many of the fundamental characteristics of autism, whether in the social or non-social domains [14] and which indicates that the complex behavioral manifestations of autism are consequences of weak executive processes [15].

Consequently, executive functioning represents a useful approach to develop social communication skills. Thus, it is necessary to assess executive function skills in young children with autism [16]. The term executive functioning was used for the first time in the mid-twentieth century to describe functions associated with the frontal cortex. The executive functions (EF) refer to a group of high-level cognitive processes, emotional and motivational skills, mediated by the prefrontal cortex of the brain [17]. Besides, they are skills that begin to develop in childhood [16]. Executive functions are functions that affect primary abilities such as memory, attention, and motor skills. For example, a person who has a deficiency in some executive function is unable to find animal names and simple words [18].

Executive functions are considered as a general goal for all adjustment essential skills, goal-oriented behavior, which are necessary skills for success in performing daily life tasks, solving problems, assessing the situation, and adapting to unexpected situations and daily pressures [19]. It also helps the individual in organizing his behavior and controlling his emotions and feelings to complete the task and act flexibly according to the current circumstances in order to achieve the goal. Besides, it makes the individual think about the consequences of his behavior before conducting it [20]. From this standpoint, executive functions consist of a set of skills, including working memory skills, cognitive flexibility, and inhibitory control skill [21].

The executive functions skills that can affect children with autism are defined clearly in literature as follows: Working memory skill refers to the ability to keep the mental representation of information in mind while simultaneously engaging in other mental processes [20]. Cognitive flexibility skill refers to the ability to move smoothly between situations and activities according to the requirements of the situation and the sequence of events [14], [16]. Inhibitory control skill refers to the ability to stop the dominant response in favor of a more adaptive response [21]. Planning skill refers to the ability to anticipate future events for a set of objectives, establish a sequence of task execution steps promptly, and prepare information and reorganize it [14]. Initiation skill refers to the ability to initiate dialogue, participation, interaction, a conversation, the ability to assist, and the ability to initiate a request or ask questions [22]. Response inhibition skill refers to the ability to intentionally prevent and automatically control past responses from interfering with responses to the new situation, and not to interfere in the performance of other unrelated tasks [15].

Therefore, executive functioning is widely used for children with autism. In this regard, previous studies indicated the significant associations between executive functioning, Sociolinguistic communicative disorders, and restrictive and repetitive behaviors among children with autism [15], [23]. The impaired executive function may be one of the hypothesized factors limiting the development of the theory of mind, which causes difficulties in the social functioning of autistic children [24]. In addition, executive function is a better indicator of Sociolinguistic communicative problems in children with autism [25].

2 Methods

2.1 Participants

The sample of the pilot study consisted of 30 children with autism registered in some private centers for treating autism. Parents were contacted individually through special education centers, where their children were diagnosed with autism by licensed professionals, to ensure the psychometric competence of the study tools, and this sample was excluded from the basic study sample.

The basic study sample consisted of 10 children with autism disorder, divided into two groups, an experimental group and a control group of 5 children with autism spectrum disorder for each. The experimental group was exposed to the program and the control group was not exposed to the application.

Table 1. Participant characteristics (N = 10) 5 Control+ 5 Experimental.

	M	SD	Range
Age	7.8	0.894	6.4 -9
IQ	91.9	5.3	85 -100
Sociolinguistic communicative disorders	103.7	12.37	81 -114

The researcher homogenized the characteristics of the two groups in terms of age, intelligence, and Sociolinguistic communicative disorders using the Mann-Whitney Test as shown in table 2.

Table 2. Mann-Whitney Test Results for the Experimental and Control Group.

Pretest	Group	N	Mean Rank	Sum Ranks	U	Z	P
Age	Control	5	5.6	28	12	0.106	0.916
	Experimental	5	5.4	27			
Intelligence	Control	5	5.7	28.5	11.5	0.211	0.833
	Experimental	5	5.4	26.5			
SCD	Control	5	5	25	10	0.530	0.596
	Experimental	5	6	30			

The results of Table 2 indicate that there are no statistically significant differences between the mean scores of the experimental and control groups in age, intelligence, and Sociolinguistic communicative disorders, thereby guaranteeing the homogeneity of the sample.

2.2 Research methodology

This study used the experimental approach of the two-group experimental design (the experimental group and the control group) for its relevance to the characteristics of the study sample "children with autism". In this regard, the researcher utilized the pre and

post-measurement for the experimental and control groups and then the follow-up measurement for the experimental group only.

2.3 Measures

Stanford-Binet Scale 5th Edition (Prepared by [26]): It is used to measure the individual's cognitive abilities and intelligence from the age of two to 85 years old. The well-known use of the Stanford-Binet scale includes the diagnosis of various cases of cognitive delay in young children, mental retardation, learning difficulties, and mental giftedness Sample.

The Autistic Child Scale (Prepared by [27]): This scale consists of 28 items to which the specialist or parents answer with (yes) or (no). These items manifest the symptoms of autism.

Sociolinguistic communicative disorders Scale (Prepared by the Researcher): The scale consists of 39 items, distributed on three sub-dimensions, which are: the social skills disorder 12 items, verbal Language skills disorders 14 items, and Non-verbal Language 13 items, participants have to choose one answer from three alternatives according to Likert's three points scale method always 3 scores, sometimes 2 scores, rarely 1 score. All statements are negative expressions, and thus the children's scores on the scale ranged from 39:117. A higher score on the scale indicates an increased presence of Sociolinguistic communicative disorders in children with autism, and a low score indicates a lower presence of Sociolinguistic communicative disorders for them. the researcher calculated the Alpha Cronbach coefficient that was 0.854 for the social skills disorder dimension, 0.706 for the verbal Language disorders dimension, and 0.784 for the Non-verbal Language, where all values were statistically significant at the 0.01 significance level, thus the scale is reliable. Besides, the researcher verified scale validity through inter-rater validity and internal consistency. Therefore, the scale of Sociolinguistic communicative disorders as a whole has internal validity.

The Executive Functions program for children with autism (prepared by the researcher): The executive functions program relies on brain functions to regulate other functions of the child with autism disorder, and the ability to manage his life activities through a set of higher cognitive processes, emotional and motivational skills that mediate the prefrontal cortex of the brain that aims to direct the child's behavior to achieve the goal and regulate his behavior in order to achieve a great deal of meaningful social communication [19]. The current program aims to Sociolinguistic communicative disorders in children with autism by using an executive function program and monitoring the extent to which individuals participating are retaining training gains after the program ends. The number of sessions consisted of 39 sessions, and the duration of each session was 45 minutes in which a set of techniques was used, including positive reinforcement, role-playing, modeling, prompting, shaping, repetition, organization, and homework.

3 Results

Table 3. The Wilcoxon signed-rank test of the two correlated samples (Pre-test & post-test)

Variables	Scale	N	Mean-R	Sum-R	Z	P
Social Skills Disorder	Negative rank	5	3	15	2.04	0.041**
	Positive rank	0	0	0		
	Equal	0				
Verbal Language	Negative rank	5	3	15	0.03	0.042**
	Positive rank	0	0	0		
	Equal	0				
Non-verbal Lang	Negative rank	5	5	25	0.02	0.043**
	Positive rank	0	0	0		
	Equal	0				

** $p<0.05$.

Results demonstrated that there were statistically significant differences between the pre-post measurement application scores of the experimental group in favor of the post-application in social skills disorder ($z= 2.04$; $p<.05$), verbal Language disorder ($z= 2.03$; $p<.05$), Non-verbal Language ($z= 2.02$; $p<.05$) indicating the strong effect of the program used in the current study in reducing the level of Sociolinguistic communicative disorders among children with autism- the sample under study.

Table 4. The results of the Wilcoxon Signed-Rank test of the two correlated samples (Posttest-3wks after)

Variables	Scale	N	Mean- R	Sum-R	Z	P
Social Skills Disorder	Negative rank	1	1.5	1.5	-0.82	0.414
	Positive rank	2	2.25	4.5		
	Equal	2				
Verbal Language	Negative rank	1	2	2	0.45	0.655
	Positive rank	1	1	1		
	Equal	3				
Non-verbal Lang	Negative rank	1	2.5	2.5	0.27	0.785
	Positive rank	2	1.75	3.5		
	Equal	2				

Besides, results revealed that there are no differences between the experimental group post and follow-up measurement application (after three weeks) in the social skills disorder ($z= -, 816$; $p>0.05$), verbal Language ($z= -, 447$; $p>0.05$), Non-verbal Language ($z= -.272$; $p>0.05$). This indicated the stability of the program's effect for a period of time among children with autism- the sample under study.

Table 5. The results of The Mann-Whitney test of two independent samples (Posttest)

Variables	Scale	N	Mean- R	Sum-R	U	Z	P
Social Skills Disorder	Control	5	8	40	0.00	-2.65	0.008*
	Experimental	5	3	15			
Verbal Language	Control	5	8	40	0.00	-2.63	0.009*
	Experimental	5	3	15			
Non-verbal Language	Control	5	5	40	0.00	-2.64	0.008*
	Experimental	5	3	15			

*p<0.01.

Moreover, results illustrated there were differences between the means of scores of the experimental and control group post measurement in the social skills disorder (z= -, 2.652; p<.01), verbal Language (z= -2.627; p<.01), Non-verbal Language (z= -2.635; p<.01), indicating the stability of the program's effect for a period of time among children with autism- the sample under study.

4 Discussion

The purpose of this study was to investigate the effectiveness of an executive functions program in reducing Sociolinguistic communicative disorders in children with autism. Previous studies have shown that executive functions can be used with children with autism to improve a set of practices or to reduce a group of disorders, especially Sociolinguistic communicative disorders using effective training of executive functions. Numerous studies agreed upon the correlative relationship between language development and executive functions, especially in meta-representations and syntactic awareness aspects among children with autism [6], [13], [28].

Analyzing results revealed that there were differences between the experimental group in the pre and post-scale application in favor of the post-application and that there were statistically significant differences between the experimental and control group in the post-scale application in favor of the experimental group, indicating that the program applied in this study that is based on using the executive functions has contributed significantly to reduce Sociolinguistic communicative disorders among children with autism in the experimental group compared with those in the control group. These results are inconsistent with the results of many previous studies [29-30].

In this regard, previous studies showed that children who suffer from behavioral symptoms have executive functions impairment than their peers because they are unable to direct their behaviors to achieve a specific purpose, and they do not have any initiation to plan, organize, and develop strategies to solve a problem, this was confirmed by many studies as [31]. While there executive functioning is broadly related to ASD, few studies expecting the relationship between executive functioning and autism. In this regard [15] revealed a significant relationship between executive functioning and restricted and repetitive behaviors. Besides, they asserted the relationship between the two variables especially, in the social domain in children and adolescents with and

without ASD. Other researchers concluded that EF dysfunctions are associated with language deficits [32].

In the current study, the program sessions were conducted over a period of 15 weeks. The results indicated that executive functions helped in reducing three main areas of Sociolinguistic communicative disorders (social skills disorder, verbal Language and Non-verbal Language), compared to the control group whose Sociolinguistic communicative disorders remained without a decrease. The researcher attributes these results for different reasons. Firstly, children of the experimental group received effective training on executive function strategies that are characterized by modernity in their approach and application and based on the scientific and methodological basis in reducing communication disorders among people with autism. The effect of this program was evident in the experimental group, and in contrast, the control group received regular training without targeting their behavior and social skills. Secondly, executive functions are considered as one of the most important strategies used nowadays all over the world to modify the behaviors of children with autism in particular and those with special needs in general in integrated classrooms, or in behavior modification rooms and centers. That this program is based on scientific foundations and theories, which asserted in the importance of taking into consideration individual differences through learning more about their abilities, learning styles, and intelligence preferences. This is consistent with the scientific method and the psychological logic as asserted in the findings of [25], [33] studies.

The researcher attributes the improvement in Sociolinguistic communicative disorders among the children of the experimental group to the content of the training program on the executive functions that were selected, starting with the techniques that were used such as the technique of reinforcement, shaping, sequencing, modeling, prompting, gradual exclusion, task analysis, feedback, and the role-playing. In addition to the set of skills targeted in the current program such as the skill of positive communication with others through the methods of visual communication with others via activities and play, the skill of attention, the skill of developing response inhabitation that was done by reducing the child's movement, developing his awareness of the desired behavior, and replacing the unwanted behavior to a desirable one. The program targeted also the skill of initiation such as initiation of greeting others, initiation of a request to play with others, the initiation of daily life activities, and the initiation to help others, all of which are behaviors that develop Sociolinguistic communicative, the ability to make new friends and increase verbal and non-verbal communication skills.

Moreover, the researcher utilized the cognitive flexibility skills such as accepting others in play and place, and classification skills such as classifying types of food and similar shapes, the planning skills such as arranging steps for brushing teeth, and working memory skills such as remembering the places of things and remembering the names of games. Undoubtedly, all these skills and experiences provide an opportunity for the trainees to arouse their strengths and try to develop their weaknesses as training differed from one child to another and from one executive function to another. This result id logical and consistent with study results [24].

The results also confirmed that there were no statistically significant differences between the post and follow-up measures of the experimental group in Sociolinguistic

communicative disorders, and this indicates that the experimental group had received training in Sociolinguistic communicative disorders such as social skills, verbal Language of Non-verbal Language with others for children with autism. This result demonstrated the effectiveness of the program in improving the personal, social, and performance aspects of children with autism. We find that the development of Sociolinguistic communicative that has become acquired and trained in it increased assistance, compassion, obedience, and responsibility towards others and this was a treat for many behavioral and social disorders, including social communication disorder that these children suffer from. These results were consistent with study results [34] confirming that there were no differences between the post and follow-up application of the experimental group in Sociolinguistic communicative disorders for children with autism disorder.

5 Conclusions

From the above-mentioned, the results of the current study supported training through executive functions in improving the Sociolinguistic communicative skills of children with autism and developing their academic, personal, social, and interactive capabilities which are closely related to their progress in behavioral skills and result in the use of positive behavioral skills in interaction with life situations. Communication, attention, response, initiation, cognitive flexibility, classification, planning, and working memory skills should be developed because they are essential skills for these children with autism disorder that helps to improve communication between the child and his surroundings. Besides, the use of techniques must be diversified with these children so that the child does not become bored. So, the researcher suggests the application of the executive functions training program used in this study on other groups such as the mentally handicapped, Asperger's, the hearing impaired ... etc., and measuring tools must be developed to identify and diagnose Sociolinguistic communicative disorders for children of preschool age so that these disorders do not worsen in the future.

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