

The Impact of an Applied Behavioral Analysis-Based Training Program on the Development of Communicative Skills among Children with Autism Disorder

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Abstract

This study aimed to identify the effect of a training program based on the method of applied behavioral analysis in developing communicative skills among children with autism spectrum disorders in Jeddah. The sample consisted of 20 children with autism spectrum disorder, and their ages ranged from 5 years - 10 years old. The sample was divided into an experimental group consisting of 10 children, 5 females and 5 males, and a control group consisting of the same number and order. To achieve the objectives of the study, the researchers developed two instruments, whose validity and reliability was verified. The first was a training program based on applied behavior analysis, and the second was a specialized scale to measure the communicative skills of children with autism spectrum disorders. The results of the study indicated statistically significant differences in the development of communicative skills between the children of the experimental group. Based on the results of the study, the researchers recommended the need to focus on applied behavioral analysis as a systematic training method for acquiring communication skills for children with autism disorders.

Keywords: Children with autism disorders • Applied behavioral analysis • Communicative skills

Introduction

Autism is one of the disabilities that began to be increasingly given attention during the second half of the twentieth century, which became clear through research and studies related to cases of autism. This disorder has its diagnostic criteria in institutions and centers designed especially for children with such disorder [1]. Even several educational and behavioral programs were designed to help children and their parents to treat and deal with Autism. Educational programs are one of the important elements in the treatment of autistic children, as many programs have been developed to work with autistic children. In addition, there are treatment programs related to medical treatment, based on the presence of potential organic causes that could be causing the disorder. Some of them depend on the stimulation of the senses among children with autism, and some of them deal with the behavioural and educational aspects as a basis through which treatment programs are provided [2].

There are several international programs used with autistic children, which have proven their effectiveness in teaching and training them on verbal and nonverbal communication skills. Examples of these programs are the Teach Program, the Lovas Program, and the Higashi Program. The programs offered to children with autism to improve their communicative

skills have varied, as these programs focus on specific aspects of improving verbal and nonverbal communicative skills [3]. The Applied Behavioural Analysis Program is one of those programs that focuses on using specific behavioural educational strategies to develop children's communication skills. Through the researchers' work in the field of language and speech rehabilitation for autistic children, they noticed the children's love for programmed communicative activities and their interaction with them [4]. Therefore, the researchers felt the importance of training children on communication skills related to new skills such as instructions and guidance, functional language skills, and communication skills, which are based on a theory that supports structured behavioral training in the acquisition of communicative skills.

Problem statement

The purpose of this study is to design a training program based on the principles of applied behavioural analysis in developing communicative skills for children with autism disorders in Mecca, Saudi Arabia. The most important communicative characteristics of autistic children were the absence of verbal communication skills (reception and expression) and nonverbal communication or what is known as social communication skills (attention, visual communication, motor imitation, pointing to what is desired, and understanding facial expressions). All of these directly affect their interaction and their communicative and social relationships with others. This explains the emergence of many unacceptable and common patterns of behaviour and communication, which they resort to because they are unable to communicate with others, and express their needs using alternative methods and techniques of communication. That is why a child with autism faces problems that limit his/her ability to learn effectively, such as the inability to communicate with others, the different way they play, the difficulty of understanding others' feelings, and the inability to form friendships.

Research objectives

This study aimed at achieving the following objectives:

- Using the method of applied behaviour analysis as a systematic

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behavioural procedure to teach autistic children sequential steps to acquire non-verbal communication skills.

- Ensuring the effectiveness of the structured training program by focusing on only two verbal communicative skills: listening and speaking, and limiting the comprehension of the components of listening, and the naming of the components of speech.

Research questions

The study attempted to answer the following questions:

- Are there statistically significant differences in the degree of acquiring communicative skills between the mean scores of the experimental and control groups in the post-test?
- Are there any statistically significant differences in the degree of acquiring communicative skills of the experimental group in the post-test according to gender?
- Are there statistically significant differences in the degree of acquiring communicative skills between the mean scores of the experimental group in the post-test and follow-up test?

Significance of the study

The significance of the study is reflected in the fact that the program deals with exercises for some communicative skills and controls the behaviour of children in their practical and academic lives as different environments change through the development of communicative skills. Such development facilitates psychological and social adjustment and the most difficult educational problems faced by special education teachers. For this reason, the study represents an addition to the educational literature related to the linguistic and communicative aspects of children with special needs in general and autistic children in particular. In the application field, there is a big possibility of applying the program based on applied behavioural analysis to develop and treat the communication skills of autistic children in centres and schools interested in autism.

Delimitations of the study

The study was limited to a sample of 20 autistic children aged 5years -10 years from the Saudi Autism Society in Jeddah for the year 2012. The results of the study were limited to the instrument used and its validity and reliability. The results were also limited by the application of the training program based on the method of applied behavioral analysis.

Literature review

Autism disorder is one of the most complex developmental disorders due to the diversity of models of people affected by it and their varying abilities and skills. Although there are basic common characteristics between them, the symptoms and characteristics that refer to it appear in the form of many overlapping patterns ranging from mild to severe. Various terms were used at the beginning of its discovery, such as the term Early Infantile Autism, Childhood Autism, Childhood Schizophrenia, and Childhood Psychosis among various other names such as the ruminant child due to his insistence on repeating the same behaviour and speaking in the same way [5,3] identified three main criteria for diagnosing autism as follows.

First, the criteria for diagnosing autism disorder include six or more characteristics of the items included in the three basic criteria 1, 2, 3. They include at least two characteristics of the first criteria 1 and at least one characteristic of the second and third criteria 3,2. Criteria number one is a qualitative shortcoming in social interaction, which is a clear inability to use multiple non-verbal behaviours and employ them in social communication, such as direct eye contact, facial expressions, physical posture, and physical gestures to regulate social interaction. Criteria number two is a qualitative deficiency in communication represented in a delay or a total deficiency in the development of the spoken language (with a weak ability to show attempts to compensate for this delay or deficiency through the

use of other means of communication such as signs or gestures). Criteria number three means doing stereotyped behaviours frequently and tending to engage in specific activities and interests [6].

Second, delayed or abnormal behaviour in at least one of the following areas, which appears before the age of three years, social interaction, the use of language in social communication, and symbolic or imaginative play. Third, the child's symptoms should not be similar to the characteristics of Rett's Disorder or Childhood Disintegrative Disorder.

Applied Behavioral Analysis (ABA)

At the beginning of the study of human behaviour, psychologists were studying human behaviour as a result of the nature of environmental stimuli surrounding a person, considering the behaviour as a natural reaction to these stimuli, and then they came up with the term "stimulus-response psychology. This term was the base for establishing the theory of behaviourism. Psychologists performed several applications, experimentations, studies, and research on human behaviour. One of these theorists was the behavioural psychologist B.F. Skinner, formulated a basic foundation for the concept and analysis of human behaviour, as he differentiated between two basic concepts in the science of human behaviour [7].

The first concept is Operant conditioning or conditional learning, which states that the form of human behaviour and how it occurs is affected by everything that results from this behaviour, i.e., the consequences of the behaviour and which themselves will control the way and the possibility of repetition of the behaviour later on [8].

The second concept is "classical conditioning" or "responsive learning." It is the theory that says that all the circumstances surrounding the behaviour and preceded its occurrence are responsible for the occurrence of this behaviour. By these conditions, we mean antecedents, which by themselves will control how and whether the behaviour is repeated later [9].

Applied behaviour analysis is one of the applications of behaviour change. It is defined as the systematic application of behavioural principles to address deficits in social behaviour, verbal skills, and thinking skills [4]. Applied behaviour analysis describes human behaviour in observable measures, and its strategies include increasing desirable behaviour such as reinforcement and its types, strategies to reduce undesirable behaviour such as punishment, extinguishment, response cost, exclusion, and overcorrection. Other strategies also include maintaining desirable behaviour such as fixed proportions, variable proportions, fixed time, and variable time, and strategies for building new behaviour such as formation and sequencing and masking, and data recording strategies such as repetition, duration of behaviour, time intervals, and instantaneous sampling [10].

Previous studies

Almutlaq (2021) explored the perceptions of special education teachers on behaviour management strategies in Saudi Arabia. The participants of the study included five special education teachers, who teach students with autism. The teachers were interviewed to ask about their opinions on applied behaviour analysis. The teachers described their experience in teaching kids with autism and the challenges they face. The participants also described the factors that affect students' behaviour in the classroom. The study found also that teachers lack the necessary knowledge on the use of applied behaviour analysis.

Al-Anazi (2022) explored the level of using applied behaviour analysis with autistic students by teachers of special education. The study included 80 teachers from Al-Ahsa area in Saudi Arabia. The study used the descriptive-analytical approach. The findings revealed that teachers are aware of the importance of the APA strategy and that they should apply it to students with autism. The results showed the lack of cooperation from parents as the main obstacle in the face of applying the APA strategy.

Abdel Fattah (2022) identified the impact of using applied behaviour

analysis on improving the repetitive stereotyped behaviours among children with autism. The study used a quasi-experimental design and was applied to a sample of 60 autistic children, who were divided into two equal groups. The findings revealed the improvement of the experimental group over the control group in modifying their repetitive behaviour. The findings found the training program effective and recommended its usage in different educational institutions.

Fisher (2020) conducted a randomized clinical trial to assess the use of APA by parents in the environment of e-learning. The study also explored how parents implement the APA skills by observing the steps they follow. The findings revealed that using a special program on the use of APA helped parents to improve their skills to deal with their children who have autism. The online tools become helpful if used in the right way to treat students with autism. The study recommended using the program with parents in other schools and areas.

Khaleel (2019) investigated the level of knowledge teachers have about the need to use applied behaviour analysis with students with autism in Zarqa city, Jordan. The study was applied to 60 teachers, who answered a questionnaire on the use of APA. The findings showed that teachers have a high interest in paying attention to students with autism. The results also revealed that there is no impact of gender and training on the views of teachers.

Research methodology

The current study relied on the quasi-experimental approach, and also relied on the mixed experimental design, which consists of two homogeneous groups (the control and experimental) to identify the effect of the program on the dependent variable. The study also used the design for one group to compare the pre and post-tests, and post- and follow-up tests of the experimental group.

Sampling

The study population consisted of all 40 autistic children in the Saudi Autism Society in Jeddah, whose age is from 6 years -12 years, and who attended the study in the second semester of the 2021/2022 academic year.

The study sample consisted of 20 boys and girls officially diagnosed as autistic, as indicated in their files, and their ages ranged between 5 years -10 years. They were deliberately chosen due to the specificity of the study community and the age group dealt with in the current study. The sample was divided purposefully into two groups. The control group, included 10 children, including 5 males and 5 females. This group did not receive the program that was developed for this study, so it remained on the services provided at the centre, during the application of the skills program Communicative on the experimental group. The experimental group included 10 children, 5 males and 5 females, and it is the group to which the communicative skills development program was applied.

The study sample was distributed into two equal groups in terms of gender and age. The sample was divided after looking at the cumulative files in the center, and the initial application of the communicative skills scale - the researchers were keen not to overlap the experimental and control group in learning, by training the experimental group at times when the control group is outside the centers. The two groups were adjusted for communicative skills by filling in the communicative skills scale the two groups. The mean scores of the control and experimental group were calculated and were close, as well as the Mann-Whitney U test, and the difference was not significant statistically between the two groups in the degree of acquisition of communicative skills.

Table 1. Mann-Whitney test for equivalence between the experimental group and the control group

| Variable | Group | N | Average rank | Sum of ranks | U | Z | Sig. |
|----------|--------------|----|--------------|--------------|------|-------|-------|
| Gender | Control | 10 | 10.85 | 108.5 | 46.5 | 0.266 | 0.796 |
| | Experimental | 10 | 10.15 | 101.5 | | | |
| Age | Control | 10 | 7.86 | 55 | 22 | 0.321 | 0.805 |
| | Experimental | 10 | 7.14 | 50 | | | |

Research Instrument

The study used the following instruments:

First: Communicative Skills Scale.

The scale included 20 skills with 40 items divided into two areas: verbal communicative skills, which include 20 items, and non-verbal communication skills, including 20 items as well. The scale aimed to identify the level of communicative skills of children with autism. Each item on the scale includes three options (rarely, sometimes, often), corresponding to the degrees (zero, 1, 2, respectively).

Validity and Reliability of the Instrument

To ensure the validity of the scale, it was presented to 10 judges from faculty members and workers with autistic children, who agreed on the scale's suitability and its applicability. The coefficient of their agreement on each of the items of the communicative skills scale ranged between 85%-100%, which is a high coefficient of agreement.

The second version of the scale was applied to a sample of 20 children, their ages ranged from 5-10 years. According to the correlation coefficient between the degree of each paragraph and the total score of the scale, it was statistically significant at the level of significance 0.01.

The reliability of the communicative skills scale was verified on the same sample of 20 children through the internal consistency coefficient using Cronbach Alpha. The researchers applied the scale to a sample of 20 children, and the internal consistency coefficient of the scale was calculated, which was 0.92.

Second: The training program

The researchers prepared the proposed program intending to develop the communicative skills of children with autism in the age group between 5 year -10 years, based on applied behavioural analysis.

The procedural objectives of the program included developing the skill of paying attention to the visual stimuli presented to children with autism. The program also aimed at developing a visual communication for children with autism, developing an understanding of the facial expressions of children with autism, and developing the skill of pointing out what is desired.

The study used behavioural strategies in implementing the program. The first strategy is the behavioural theory strategy (applied behaviour modification). Part of this strategy is the indoctrination strategy, which provides physical, verbal, or visual assistance to the child, to show the required response. Then verbal indoctrination was used when the child can perform the skill, without assistance. Visual indoctrination, includes gestures, signs, and the use of images.

The second is the strategy of skill analysis. It is about dividing the task required of the individual into small episodes and sequentially arranging them and then starting to learn the episodes in order until the whole series is completed Al-Khatib, 2010. Third, is the modelling strategy. It is the use of the method of imitation and learning by observation so that sufficient explanations are provided for the target child to learn from. The child's attention should be drawn to the required task, providing the child with appropriate directions, and starting with a relatively simple behaviour.

Table 2. The results of the Mann-Whitney test for the differences between the mean scores of the experimental and control groups after implementing the program

| Variable | Experimental N=10 | | Control N=10 | | U | Z | Sig. |
|----------------------|-------------------|--------------|--------------|--------------|---|-------|------|
| | Mean ranks | Sum of ranks | Mean ranks | Sum of ranks | | | |
| communication skills | 5.5 | 55 | 15.5 | 155 | 0 | 4.359 | 0 |

Table 3. The significance of the differences between the mean ranks of the experimental group scores in the communicative skills in the pre and post-tests

| Variable | Experimental | | Average ranks | Sum of ranks | Z | Sig. |
|----------------------|----------------|----|---------------|--------------|-------|------|
| communication skills | Negative ranks | 10 | 10.5 | 210 | 3.922 | 0 |
| | Positive ranks | 0 | 0 | 0 | | |
| | Equal | 0 | | | | |
| | Total | 10 | | | | |

Table 4. The significance of the differences between the mean ranks of the experimental group scores in the level of skills acquisition in the post and follow-up tests (a month after the end of the program).

| Variable | Experimental | | Average ranks | Sum of ranks | Z | Sig. |
|----------------------|----------------|----|---------------|--------------|-------|-------|
| communication skills | Negative ranks | 10 | 10.5 | 210 | 1.681 | 0.093 |
| | Positive ranks | 0 | 0 | 0 | | |
| | Equal | 0 | | | | |
| | Total | 10 | | | | |

Fourth, is the reinforcement strategy. It is a procedure that follows the behaviour and leads to the possibility of repeating the behaviour the next time. Each child has his/her reinforcers, and it does not work with many autistic children with natural reinforcers or internal reinforcement. Some of them reinforce through foods and games, and children are reinforced in this study including physical reinforcers such as preservative-free potato chips, colours, and various social reinforcers.

Fifth is the sequence strategy. It is a procedure through which the individual is helped to carry out a behavioural chain by strengthening it when performing the loops that make up the chain. These loops are the small parts that make up the behaviour, and the sequence is based on the analysis of the aforementioned skills [11].

Results

Results of the first question

To answer the first question, the mean scores and standard deviations of the experimental and control groups were calculated in the pre and post-test for the degree of communicative skills acquisition first, as shown in Table 1. The Mann-Whitney test was used to indicate the differences between the small independent averages.

It is clear from the results shown in Table 2 that there are statistically significant differences between the average ranks of the communicative skills scores of the experimental group and the control group in the post-test in favour of the experimental group.

Results of the second question

To answer the second question, the Wilcoxon test and Z-value were used as one of the non-parametric methods to identify the significance of the differences between the mean ranks of the experimental group scores in the communicative skills in the pre and post-tests as shown in Table 3.

The results contained in the previous Table 3 indicate that there are statistically significant differences between the mean ranks of the experimental group scores in the pre and post-tests in the list of communicative skills in favour of the post-test.

Results of the third question

To answer the second question, the Wilcoxon test and Z-value were used as one of the non-parametric methods to identify the significance of the differences between the mean ranks of the experimental group scores in the communicative skills in the post and follow-up tests as shown in Table 4.

It is noted from Table 4 that there are no statistically significant differences between the mean ranks of the experimental group's scores in the post and follow-up tests in the list of communicative skills.

Discussion

The results of the analysis showed that there was a statistically significant difference in the communicative skills between the control and experimental group after the post-test level of communicative skills. The results of the current study have demonstrated the effectiveness of the training program based on the principles of applied behaviour analysis. The researcher attributed this to the fact that individual education organized using this strategy is highly effective in improving many skills, and that autistic children show a significant improvement in language skills and need direct instruction, forming to respond, and provide stimuli to acquire those skills. This was taken into account in training the experimental group members on skills, and the attempts based on strengthening and forming behaviour by gradual convergence provide the child with an opportunity for more correct responses.

The results of previous studies confirmed the effectiveness of communicative skills training programs, as training improves these skills and increases the level of speaking skills, making it easier for these children to establish relationships with the family first, and the community second [12-14]. The mastery of the communicative skills of the children of the experimental group was enhanced due to the organized way of presenting the skills in terms of sequencing in difficulty, and the cumulative building of skills, as well as due to the use of behavioural strategies that suit each child individually, such as reinforcement, modelling, memorization, formation.

The results of the test showed that the reinforcement in acquiring communicative skills after each behaviour of the child has clear effects on improving their self-reliance skills, which works to strengthen their self-confidence. Multiple autistic people have strong visual skills and may understand the information presented to them in a visual way better than that which is presented to them orally. The senses play a major role in learning communicative skills, and researchers have followed the technique of coupling behaviour with a hand signal, allowing it to participate in the learning process more smoothly [15-17].

The results of the third question showed that there were no statistically significant differences between the level of acquiring communicative skills in the post and follow-up tests. The program, as well as the effectiveness of the program, focused on practical aspects of the child's life and led to no relapse after its completion.

Conclusion

Training autistic children on communicative skills contribute to showing positive communicative attitudes. This leads to the use of learned communicative skills in new social situations, which can be explained by the fact that the program used included new skills. Students were trained to understand facial expressions, respond to commands, and speaking skills, which had the greatest impact on an improvement in their communicative skills. This result indicates the effectiveness of the program used in developing their communicative skills. When using the communicative skills scale prepared by the researchers, it became clear to the researcher, after conducting the follow-up test for the experimental group, that the members of the experimental group had relatively developed a set of communicative behaviours, which were observed according to the follow-up lists that were distributed to the parameters after a month of implementing the program. The researchers refer to the fact that some communicative skills have developed that was not visible to them in a way that makes the change tangible in communication.

Recommendations

The study recommended adopting the proposed program for developing nonverbal and verbal communication skills based on applied behavioral analysis for autistic children enrolled in autism centers in Saudi Arabia, considering it one of the important programs for autistic children. It is also recommended to design other local behavioral educational programs to benefit from the global programs for autism and measure their effectiveness. It is important to focus on the study of females within the category of autism disorder to derive new ideas, as studying this variable in the Arab world alone is rare within the limits of the researchers' knowledge.

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