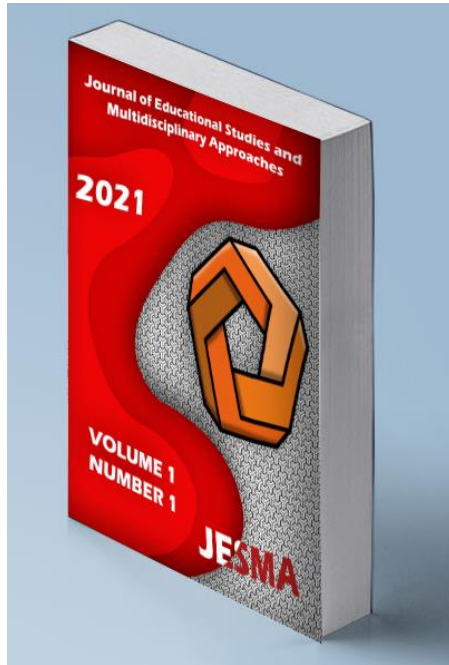




Journal of Educational Studies and Multidisciplinary Approaches (JESMA)

www.jesma.net

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To cite this article:

Hassan, Ayman Salim Abdullah (2022). Effectiveness of a Program Based on Central Cohesion Tasks to Develop Visual attention in Children with Autism Spectrum disorder. *Journal of Educational Studies and Multidisciplinary Approaches (JESMA)*, 4 (1), 1-14. <https://doi.org/10.51383/jesma.2024.75>

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Effectiveness of a Program Based on Central Cohesion Tasks to Develop Visual attention in Children with Autism Spectrum Disorder

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ARTICLE INFORMATION

Original Research

DOI:10.51383/jesma.2024.75

Received 15 December 2022

Accepted 08 November 2023

ABSTRACT

Previous research has indicated that there are deficits in visual attention skills in children with autism spectrum disorder (ASD). The current research aims to verify the effectiveness of a program based on some tasks of central coherence (visual sensory perception and non-verbal communication) in developing visual attention skills (visual communication, visual crossing out, visual tracking, flexibility in transferring visual attention, visual joint attention) for children with ASD. The experimental method was used. The sample consisted of 10 children at the four-T Rehabilitation Centre, with age average (8-10) years, and autism disorder level (55-70), divided into two equivalent experimental and control groups. The study tools consisted of the Stanford-Binet Intelligence Scale to determine the intelligence coefficient, the Gilliam-3 scale for diagnosing ASD, a visual attention scale for children with ASD, and a program based on central coherence tasks. The data were analyzed using appropriate non-parametric statistical methods (Mann-Whitney, Wilcoxon). The results indicated the effectiveness of the central coherence task program in developing visual attention in children with ASD. This study supports the use of central coherence tasks in improving the response of children with ASD to emotional expressions and recommends the continuation of efforts in developing visual attention, which is the main entrance to providing these children with all positive behaviors and skills.

Keywords: Autism Spectrum Disorder, Central Cohesion Tasks, Visual Attention



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Introduction

Children with autism spectrum disorder have frequent patterns of behavior, activities, concerns, and inadequacy in interaction and social communication. These symptoms together represent the necessary conditions for diagnosing autism spectrum disorder. Although we were unable to determine the direct cause of this disorder with relative weight for neurological causes. However, the exerted efforts with these children alleviate these symptoms, and lead them reaching a mild or moderate level of disorder.

On the basis of the integration of senses in introducing different environmental experiences, there is a consensus on the priority of relative weight in favor of the sense of sight, which is responsible for most of our experiences from the environment and represent an input for visual processing that involves the introduction, storage, restoration, and use of acquired visual thrills, from visual attention through perception and memory to visual thinking. Nevertheless, many studies have observed an obvious deficiency in the stages of visual processing in children with autism spectrum disorder, primarily visual attention, which may be one of the causes that further deepen these children's isolation and social avoidance. Children with autism disorder show a non-conforming visual response early on, indicating hypersensitivity to visual deviation. Therefore, this corresponds to the hypothesis that there is an unusual visual treatment to detect a change in children with autism disorder that may contribute to their intolerance to change (Cléry et al., 2013).

On the other hand, central cohesion theory refers to the ability to form a meaningful macro image of the stimuli around us as opposed to focusing on the details without forming a general link between them. Therefore, it extends on both sides strong central cohesion and reflects the ability to form a macro image and weak central cohesion and reflects the ability to focus on parts without all. This theory includes many functions found in the literature in three areas. These are sensory-visual, verbal-auditory, and non-verbal-communication tasks. Most of these are distributed between tasks that reflect the child's Consider reviewing or deleting this word, depending on the context. Such words are called hedge words as they are used to reduce the certainty or directness of an argument. If used unnecessarily, it can lessen the impact of your message. Use such words selectively. ability to concentrate and familiarize himself with parts and details and indicate a weakness in central cohesion, as opposed to tasks (mostly) that reflect the child's ability to create a holistic picture of environmental effects and indicate the strength of central cohesion. In this regard, children with autism spectrum disorder suffer from visible deficiencies in central cohesion functions, mainly macro functions, where they suffer in the formation or integration of sensory information with exceptional visual efficiency, indicating a weakness in their central cohesion (Nayar, Voyles, Kiorpes & Di Martino, 2017, Olu-Lafe, 2013., Van Eylen, et al., 2017). When assessing the relationship between autism disorder and total and partial visual treatment in 290 individuals (twins) with autism disorder ranging in age from 8 to 31 years, a fragmentary image test was used to assess and test the total processing. The results indicated a relationship between autism disorder and inadequate total visual treatment in children, adolescents, and adults, which is consistent with the explanation of poor central cohesion in children with autism disorder (Neufeld, et al., 2020)

This research problem has arisen through the cohabitation and field observation of special education centers with visual deficiencies in the visual treatment levels of children with autism. Although approximately 80%–90% of the information the brain receives comes through a sense of sight, this indicates that the human brain tends to favor visual imaging to process information (Amer, & Al-Masri, 2016). However, it has been reported in literature that 65% of children with autism disorder have low visual processing efficiency, which may be attributed to the impact of clinical problems associated with the disorder, such as attention deficiencies and overactive activity (Speirs et al., 2014). In addition, children with autism spectrum disorder suffering from problems related to social behavior, communication, and imagination in addition to many sensory processing disorders, which may appear in overreaction/lack of responsiveness to these triggers, whether visual or auditory (Griffiths & Milne, 2007).

Assessing visual spatial maps within the visual cortex of young people only with autism disorder and noting that some individuals with autism disorder tend not to focus on the target (meaning that their focus is outward-directed focus). It was also found that the extent of the response to external stimuli is strongly associated with stereotypical behaviors and restrictive concerns, which are the main features of autism disorder (Monk, 2013). Research on visual treatment mechanisms in children with autism disorder falls under three frameworks: greater reception area size, high internal noise, and shortage of prediction capabilities. Using the motor visual distinction task, the results indicated that individuals with autism disorder suffer from insufficient mobility sensitivity when the stimulus size is small and that high internal noise was associated with severe behavioral symptoms in children with autism disorder and showed a lack of prediction of movement in children with autism disorder, which was accompanied by unusual patterns of eye movement during the performance of the task. These results reveal deficiencies in visual processing in children with autism disorder during various treatment stages (Park, 2017).

When verifying visual survey patterns in individuals with autism disorder and their normal peers, while processing complex emotional scenes and using the task of reading the mind during movies, both groups demonstrated similar accuracy in identifying feelings and emotions. By examining each excitement through eye movement tracking to verify the visual installation time of places and social scenes, individuals with autism disorder showed a significantly longer installation time but toward non-social scenes (Tang et al., 2019).

On the other hand, normal children tend to combine many aspects of the information to obtain a full and meaningful picture which is known as (Central Coherence). Children with autism spectrum disorder have difficulty in combining information to form knowledge, where they discover the world in a holistic way and focus more on detail than on the overall picture of information. which is known as (weakness of Central Coherence) (EL Shami, 2004, p. 336).

In the same context, the nature of total versus partial processing in children with autism spectrum disorder is an input that is closely related to the idea of central coherence tasks. While analyses revealed lower accuracy and longer reaction time in ASD in the condition with local interference only, when verifying the overall and partial visual processing pattern of the (28) children with autism disorder, and (22) normal children were found to have lower accuracy and longer reaction time in children with autism disorder only in case of partial interference, indicating a lack of overall cognition and partial treatment (Nayar, et al., 2017). In another study, researchers assessed the criteria for operational functions and total and partial visual treatment of relatives with autism disorder in a sample of 113 autistic relatives and 100 normal relatives. Relatives with autism disorder showed a lack of response, cognitive flexibility, and operational functions during daily life. In contrast, they showed no deficiency or partial visual treatment. (Van Eylen, et al., 2017).

The relationship between inadequacies in visual processing, primarily visual attention, and deficiencies in central cohesion functions is evidenced by the high rates of weak central cohesion, visual treatment, joint attention, and verbal communication of patients with autism disorders compared with their normal peers (Morgan, Maybery, & Durkin, 2003). There is also a clear correlation between functional visual anomalies and repetitive stereotypical behaviors (Adamson, O'Hare, & Graham, 2006) and a reverse relation between selective attention and stereotypical behavior in children with autism spectrum disorder (El-Bebrawi, Hassan, Sayed, Abdel Ghaffar, 2020).

Considering the previous presentation indicating a lack of visual attention in children with autism spectrum disorder with a clear association with a lack of central cohesion functions, the current research seeks to determine the possibility of developing central cohesion functions, especially those associated with visual orientation, and the extent to which this improvement can be reflected in the levels of visual attention of children with autism spectrum disorder, and to verify the program's

continued effectiveness after the intervention period. The problem of current research can therefore be identified in the following research question:

What is the effectiveness of a program based on some central cohesion functions in developing the visual attention of children with autism spectrum disorder?

Methods and Materials

Research approach

Quantitative research encompasses a range of methods concerned with the systematic investigation of social phenomena, using statistical or numerical data. Therefore, quantitative research involves measurement and assumes that the phenomenon under study can be measured. Quantitative research sets out to gather data using measurements, to analyse this data for trends and relationships and to verify the measurements made (Watson, 2015). There are two broad categories of research design in quantitative research, experimental designs and survey designs. And There are different kinds of measurement, which can be placed in a hierarchy, using a theory of measurement. Generally, measurement in quantitative research is made at the ordinal and interval levels of measurement (Watson, 2015).

In this study based on the experimental approach “Experimental designs an experiment is a study where the researcher can manipulate one variable, the independent variable, and study its effect on a dependent variable” (Watson, 2015). There are many types of experiment, in this study based on the randomized controlled trial experimental design. The experimental method with two groups design of the experimental and control groups was used, with pre, post and follow-up measurements. The independent variable was represented in the program based on central coherence tasks (visual sensory perception and non-verbal communication) and the dependent variable in visual attention (visual communication, visual crossing out, visual tracking, flexibility in conveying visual attention, visual joint attention). The Gilliam-3 scale was used to diagnose the research sample as having autism spectrum disorder, and the use of the intelligence scale was used to verify that the research sample had autism disorder with high functioning. In addition, social level measuring was used to verify that the research sample belongs to close social levels to exclude any social differences in the research results.

Sampling

Quantitative research questions lend to either probability or non-probability sampling methods. The current research relied on a non-probability sampling method, specifically purposive sampling. Purposive sampling Uses sampling techniques that rely on the researcher’s judgment for selecting persons. These techniques include maximum variation sampling, expert sampling, and typical case sampling (Berndt, 2020).

The simplest form non-probability-controlled trial requires at least two groups of participants: a treatment (also referred to as experimental or intervention) group and a control group. The treatment group receives the treatment being tested and the control group does not. However, the control group should be treated in exactly the same way as the treatment group, or as closely to this as is possible, except that they do not receive the treatment. The initial sample consisted of 96 children with autism spectrum disorder from six centers. The sample was selected in several steps. Children with moderate autism spectrum disorder were excluded; children with a low intelligence coefficient (within the limits of Intellectual disability) were excluded, and children were limited to 8-10 years of age, suitable to accommodate training in central cohesion tasks. After this selection process, eligible children were selected on the visual attention scale. Thus, the primary study sample consisted of 10 children with autism spectrum disorder who had deficiency in the levels of visual attention and ranged in age between 8-10 years, and the autism index ranged between (55-70) on the Gilliam-3 scale.

There are many possible methods of allocating individuals who have agreed to participate in the non-randomized controlled trial to either the treatment group or the control group. Randomization is used to minimize bias in allocating individuals to the two groups, The 10 children were divided into two equal groups, experimental and control, each of which consisted of 5 children, 3 males and 2 females.

Table 1. The results of the Mann–Whitney test to indicate the differences between the mean ranks of the scores of the two groups in the pre-measurement variables of intelligence, age, autism disorder, and visual attention

Variants	Group	n	Average calculation	Standard deviation	Average grades	Total grades	U	Z	significance	significance
Intelligence	Experimental	5	88.2	2.588	6.70	33.50	6.5	1.273	0.212	insignificant
	Control	5	88	1.581	4.30	21.50				
Lifetime	Experimental	5	8.8	0.836	6.60	33.00	7.0	1.167	0.310	insignificant
	Control	5	8.4	0.547	4.40	22.00				
Social Level	Experimental	5	31.8	3.030	5.20	26.00	11.0	.316	0.841	insignificant
	Control	5	32.2	2.810	5.80	29.00				
Autism disorder	Experimental	5	34.6	1.341	6.20	31.00	9.0	0.745	0.548	insignificant
	Control	5	34	2.000	4.80	24.00				
Visual Attention	Experimental	5	28.0	2.236	5.10	25.50	10.5	0.423	0.960	insignificant
	Control	5	28.6	2.509	5.90	29.50				

Table 1. shows that there were no statistically significant differences indicating the parity of the two research groups in IQ variables, age, social level, autism disorder, and visual attention in the pre-measurement. Therefore, the improvement in the post-measurement is due to the central cohesion program.

Materials/tools

Stanford Binet Scale of Intelligence (Arabic version) Abu al-Nil, Taha, Abdel Samie, (2011)

The Stanford-Binet Intelligence Scale (Fifth edition) was used to verify that the research sample doesn't suffer from any intellectual disability. This scale was applied individually, and it consists of 10 sub-scales, distributed over two main domains, verbal and non-verbal domain and the verbal domain, to measure five main factors in each of the previous two domains: fluid reasoning, knowledge, quantitative reasoning, and visual-spatial processing. Working memory. The application of the scale results in three intelligence coefficients: the total intelligence coefficient, the non-verbal intelligence coefficient, and the verbal intelligence coefficient.

Gilliam-3 scale(Arabic version) El-Beblawi, Hassan, Abdel Moneim,(2022).

The scale was used to diagnose the research sample and determine the level of severity of autism spectrum disorder, this tool was used. The first edition of this scale was printed in 1995, the second edition in 2006, and the third (current) edition in 2014. The Gilliam Autism Rating Scale-Third Edition (GARS-3) consists of 6 subscales across 58 items. These include specific/repetitive behaviors, social interaction, social communication, emotional responses, cognitive style, and inappropriate speech. The scale is graded from (0-3), where (0) does not apply at all, (1) applies rarely, (2) applies slightly, and (3) applies often. The scale provides a determination of the severity of the disorder.

the socioeconomic and cultural level of the Egyptian family Scale (Hassan, 2018)

The scale was used to recognize the social, economic, and cultural background of the families of the research sample, this scale was used. The measurement was designed to review the social, economic, and cultural level of the Egyptian family in light of the current changes, on a sample of Egyptian families amounting to 701 families, which varied between urban (rural and city) governorates in Upper Egypt and coastal areas in the north of Egypt. The most important variables identified to build a predictive equation for this level education level, job or profession, income level, and lifestyle, with a quantitative estimate for each level.

Visual Attention Scale (Author's preparation):

The visual attention scale was prepared and used to diagnose children with ASD and achieve the objective of the current study. The correlation factor between the degree of each situation and visual attention was calculated and ranged from 0.969 to 0.492. In general, the term statistical function was 0.01, excluding (2) statistically non-statistical terms.

Validity

The scale's validity was examined by:

- a) Construction validity: The scale items and the measure's procedural definitions were derived considering the analysis of previous theories and metrics to benefit the construction validity and composition.
- b) Test credibility:
The Optical Spatial Treatment Scale was used for children with autism disorder (Abdul Fatah & Yusuf, 2016) and applied to the same sample, and its coefficient values with Pearson (0.889) and Spearman (0.483) were 0.01.

Reliability

The constant has been calculated in several ways:

- a) The alpha Cronbach method: The optical processing scale constant coefficients were calculated using Cronbach's alpha method of 0.979, reflecting an appropriate degree of stability.
- b) Retest method: The scale was applied to the same sample after a month, and the Pearson correlation coefficient (was 0.993).

The Final form of the scale

The final visual attention scale comprises (13) graphic performance positions directly applied to the child, and each phrase has three alternatives. (Correct Response - Partially Assisted Response - Total Assisted Response) in order and quantitative weight (3-2-1), thus ranging between 13 -39 degrees of the quantitative scale. The high degree indicates a high level of visual attention and vice versa, and is based on the preceding presentation of the scale's psychometric properties. Therefore, it can be argued that these procedures require rigorous use.

A program based on central cohesion functions (Author's preparation)

The program's construction involved the identification of its objectives, the foundations on which it relied, its significance statement, and the strategies and techniques used therein, as follows:

a) The program's objectives:

Overall objective: To develop visual attention in children with autism spectrum disorder through a program based on central cohesion functions.

Sub-objectives: To ensure the objectives of the independent variable, the program is based on central cohesion

- Improve visual perception tasks
- Improving non-verbal communication functions.

b) Principles on which the program was based:

- A relationship of familiarity exists between the researcher and the sample.
- The program's content is suited to the characteristics and needs of children with autism disorder.
- The program's activities are primarily visual and natural.
- Diversification in both material and moral reinforcement methods.
- The program's activities should be based on individual work and collective activities.
- Gradually moving from simple to complex skills.
- Learned behaviors have practical value and usefulness in children's lives.
- Continue training for sufficient time until the child's behavior is discovered.
- Use up to 70% for sometimes required performance, not 100%.
- Ensure that the impact of education is transmitted from the training environment to the home through homework.

c) Importance of the program:

There is no doubt that information processing goes through many complex knowledge processes, and visual processing occupies a significant space. Approximately 90% of our information is generated through the sense of sight, as well as the characteristics of children with autism disorder. Most of them may suffer from visual sensory problems that may result in an increase or lack of visual response, adding value to the intervention through this program to develop the visual attention of autism disorders.

d) Procedural limits of the program:

The research sample was selected from children with autism spectrum disorder at the 4-T Center in the Giza Governorate. The program was implemented with a total of (20) sessions, at the rate of (3) sessions per week. The duration of the session ranged from (10-20) minutes for each child individually, according to the content of the session, with a total time for each session ranging between (50-100 minutes) during the months of January and February 2021.

e) Techniques and methods used in the program:

The most important strategies and techniques used in the current program were: individualizing education, directing attention, modeling, role playing, reinforcement, homework, task analysis, and following instructions.

f) Program implementation:

The program sessions were implemented by training on tasks (16 tasks) of central coherence, focusing on visual sensory perception. 11 of these tasks allowed the child, through training on them, to reach an appropriate level in all visual processing skills. For example, in the repetitive forms task, the child is asked to complete an array of geometric shapes with specific colors to achieve the same rule. This requires complex visual processing that includes the skills of attention, perception, and remembering, leading to visual thinking about the rules that govern the pattern and its completion. Additionally, four additional tasks relate to non-verbal communication. Through training in the tasks, the child can reach an appropriate level in the skills of visual perception and memory. For example, in the task of processing the full face, the child is asked to collect the parts of the face that are divided into small parts to form the face. This task requires children to perform complex visual processing that includes whole face recognition and memory skills.

g) Program Evaluation:

The program was evaluated through the following: pre-evaluation: applying the visual processing scale before applying the program, structural evaluation: at the end of each stage, post- and follow-up evaluation: applying the visual processing scale after implementing the program and one month after the end of the program.

Ethical Considerations

Research ethics consists of a core set of scientific norms, developed over time and institutionalized in the international research community. The truth norm is indispensable to all scientific activity: The search for truth, commitment to truth, integrity, and honesty are preconditions for quality and reliability in research. Research is also based on methodological norms, such as factuality, accuracy, transparency, and accountability (Becin, & Saginur, 2016).

The researcher has responsibilities towards all children involved in or affected by the research. This made him highly respect the human dignity of the participants and took into account their personal safety and well-being. Participation in research, as a rule, is also based on information and consent. But in this study, when it was difficult for the participating children to be able to provide consent, the researcher took the responsibility of protecting their freedoms, rights and human dignity. and also get it from parents or. Especially since the participants in the research are children with autism spectrum disorder, so it was necessary to obtain the consent of the parents for the child's participation in the rehabilitation program.

With full clarification of the nature and duration of the training program, the place of training, the number of training sessions, and a full explanation of the procedures followed to ensure the confidentiality and privacy of the child, and that these sessions were not subject to filming, with the existing opportunity to withdraw from training at any time. Quantitative data were collected through the Center's childcare providers, with confirmation that the names of the participants were anonymized and inferred from the first letter of each participant's name. There was freedom in the possibility of participants completing or withdrawing during the experiment, and participation in the research did not result in minimal risks to children.

Findings

First Hypothesis

There were statistically significant differences between the mean scores of the experimental group in the pre- and post-measurements in visual attention in favor of the post-measurement.

Table 1. Wilcoxon results in differences between the means of the grades of pre- and post-measurements of the experimental group in visual attention

Dimensions	Test	Monotonic function	n	Average rank	Total rank	z value	significance	rprb	effect size
visual attention	Pre	Negative grades	0	300.	1500.	2.032	0.05	1.0	very large
			5	000.	000.				
	Post	Positive grades	0						
		Equality Total	5						

It is clear from Table (2) that the value of (z) amounted to (2.032), which is statistically significant at the level of (0.05), which indicates that there are differences between the mean ranks of the scores of the children of the experimental group in the pre and post measurements in visual attention in favor of the post measurement, and that the coefficient (rprb) reached (1.0), which indicates that the effect size of the program is very large.

Second hypothesis

There were statistically significant differences between the mean scores of the experimental and control groups by telemetry in visual attention in favor of the experimental group.

Table 2. Mann –Whitney results in differences between the two groups' grade averages experimental and control in visual attention by dimensional measurement

Variants	Group	n	Average rank	Total rank	z value	significance	rprb	effect size
visual attention	Experimental	5	8.00	40.00	2.677	0.01	1.0	very large
	Control	5	3.00.	15.00				

It is clear from Table (3) that the value of (z) amounted to (2.677), which is statistically significant at the level (0.01). This indicates that there are differences between the mean ranks of the scores of the children of the experimental and control groups in the two post-measurements in visual attention in favor of the experimental group. In addition, the coefficient ((rprb reached (1.0), which indicates that the effect of the program is significant.

Third hypothesis:

There were no statistically significant differences between the mean scores of the experimental group in the post- and follow-up measurements of visual attention.

Table 4. Wilcoxon results in the differences between the mean scores of the post- and follow-up for the experimental group in visual attention

dimensions	Test	Monotonic function	n	Average rank	Total rank	z value	significance
visual attention	Pre	Negative grades	2	1.75	3.50	0.272	insignificant
			1	2.50	2.50		
		Positive grades	2				
			5				

Equality
Total

It is clear from Table (4) that the value of (z) amounted to (0.272), which is not statistically significant. This indicates that there were no statistically significant differences between the mean scores of the experimental group children in the post- and follow-up measurements in visual attention. Consequently, this indicates the maintenance of the level of improvement in visual attention of the experimental group.

Discussion

The findings of the current research point toward the effectiveness of the program based on central coherence tasks in visual sensory perception and non-verbal communication; developing visual attention skills (visual communication, visual crossing out, visual tracking, flexibility in transferring visual attention, visual joint attention) in children with autism spectrum disorder; and the continuation of the positive effect of the program after the end of the intervention for a month.

This research findings consistent with several studies aimed at improving the visual attention of children with autism spectrum disorder, such as Al-Farra (2012) noted the effectiveness of a computerized program in improving visual attention. And Al-Ghalilat Study (2018) noted the effectiveness of a program based on symbolic enhancement in the development of audiovisual attention skills. Abdulhameed, & Younis (2018) noted the effectiveness of an animation-based program in developing visual attention, and Abdul Ghaffar (2020) indicated the effectiveness of an optical-based program in improving selective attention and its impact on stereotypical behavior.

The improvement in the experimental group may be due to the activities, content, and strategies of the program, as it relied on central cohesion tasks in its first dimension, sensory– visual perception. The third dimension, which is non-verbal communication, consisted of four tasks, all of which allowed the child, through training, to reach an appropriate level in visual perception and memory skills. Hence, the passage and visual performance of the child through these tasks reflected their positive effects in improving the levels and visual processing skills intended to be improved in children with autism disorder.

Based on the fact that the nature of cognitive processes is inferred through the different performances that can be observed and measured, the clear deficiency in visual attention appears, as the attention of children with autism disorder is abnormal, and what is normal for them is their ability to sustain their attention for long periods of the things that interest them. They suffer from deficiencies in other forms of attention, the first of which is the difficulty in directing their attention toward the source of the stimulus and in paying attention to something in its complete form (EL Shami, 2004, p. 295).

Visual communication is one of the most significant non-verbal communication problems in children with autism spectrum disorder. These children cannot communicate with their surroundings, which negatively reflects their response to social interaction and emotional exchange (Dawson, Hill, Spencer, Galpert, & Watson, 1990). They also show a lack of attention to the communication partner, the ability to transform their eyes between people and objects, or even follow their eyes or gestures to share interests and experiences (Meindl & Cannella-Malone, 2011).

To overcome these attention problems, the central coherence tasks were appropriately employed during the intervention sessions by employing the skill of visual search for a stimulus in a specific color, larger or smaller size, or a specific shape. Here, the child passes through many visual attention skills, such as maintaining eye contact, visual crossover of stimuli, visual tracking of these shapes and their connection, and access to the joint visual attention of the trainer in the process of visual search for the stimulus until the completion of the connection.

Strengths and Limitations

1. The research focused on some central coherence tasks related to visual processing, and not all central coherence tasks.
2. The research determined the age of the sample children from 8 to 10 years ignoring, older and younger children.
3. The study sample consisted of only 10 children with autism spectrum disorder who met the characteristics of the sample, and the researcher couldn't reach a larger number of individuals due to the scarcity of these characteristics combined together, in the children with ASD.
4. The individuals of the sample were selected intentionally, to consider the homogeneity, which may affect the reliability of the results.
5. The sample children are from one governorate only, which may limit the possibility of generalizing the results to all children in all regions.
6. The research relied on measures that depend on the examiner's personal evaluation, and this may affect the reliability of the results due to the possible occurrence of measurement error.

Conclusion

In light of previous research indicating deficiencies in visual attention skills in children with autism spectrum disorder, the current research concluded that training on some central coherence tasks (visual perception, non-verbal communication) enhanced the development of visual attention skills (visual communication, visual crossing out) among children with autism spectrum disorder. The current research concludes the possibility of developing different visual attention skills through the use of training based on the employment of attractive visual stimuli for children with autism spectrum disorder. The research continues to accept many contributions about the employment of other visual stimuli in this regard. Considering these results, some recommendations and researches can be developed.

Recommendations and suggested research

- Using of central cohesion functions (verbal audio communication) in developing hearing therapy in children with autism spectrum disorder.
- Using central cohesion functions to improve responsiveness to emotional expressions in children with autism spectrum disorder
- Using modern technology to develop visual attention skills for autism disorders.
- Comparison of visual attention skills of low- and high-functioning individuals with autism disorder
- Comparison of total and partial central cohesion functions in low- and high-functioning individuals with autism disorder
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