Effectiveness of the TEACCH Method to Improve the Executive Function Ability of Children with Autism Spectrum Disorder (ASD)

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Abstract. In addition to experiencing difficulties in the aspects of communication, interaction, and behavior, children with ASD also experience problems in executive function, especially in the aspect of flexibility. This study aims to describe the executive function ability (flexibility) of children with ASD before, during, and after the implementation of the TEACCH method. This study used an experimental method with the type of Single Subject Research (SSR) and the A-B-A design, which aimed to determine the effect of the treatment on the desired behavior within a certain time. This study concludes that the TEACCH method effectively improves the ability of executive function (flexibility) in children with ASD when combined with other behavior modification strategies or techniques that are linear to the principles of teaching.

Keywords: TEACCH · Executive Function · Flexibility · Autism Spectrum Disorder

1 Introduction

Every human being always dreams of a better life. A set of skills or abilities in terms of planning, controlling, and adjusting is crucial for the attainment of a better life. These skills include cognitive skills, which are also known as executive functions. Similarly, children with ASD also want to have full opportunities to live their lives. However, Geurts' findings showed that people with autism and executive dysfunction have a lower quality of life than individuals without autism [1].

In general, children with Autism Spectrum Disorder (ASD) experience problems during their development. This disorder is characterized by difficulties in aspects of communication, interaction, and behavior. Nurhastuti [2] defined autism as a developmental disorder that occurs in aspects of communication, social interaction, and behavior patterns. Meanwhile, Pasapan [3] defined autism as a lifelong developmental disorder caused by a disturbance in the central nervous system interfering with the growth and development of children in terms of communication, interaction, and behavior. As a

A. P. Wibawa et al. (Eds.): ICE 2022, ASSEHR 736, pp. 82–89, 2023.
https://doi.org/10.2991/978-2-38476-020-6_9

result of the damage to the central nervous system, children with ASD also experience deficits in executive function, resulting in difficulty in planning, making decisions, solving problems, adjusting to new situations, and doing daily activities. This opinion is in line with the opinion of Ozzonof & Jensen in an article written by Irvan [4], where children who have disorders or damage to the central nervous system are also found to show problems in their executive functions. This problem can occur because the executive function is located in the central nervous system of the brain, precisely in the frontal lobe. This area is tasked with regulating human cognitive skills or abilities including problem-solving skills, processing information, planning plans, self-control, and also flexibility in the environment. Mezzacappa [5] revealed that executive function is a cognitive process that regulates the ability of individuals to adapt to environmental changes, new situations, and changes in daily life. According to Irvan [6], children who experience behavioral disorders caused by deficits in cognitive abilities generally show maladaptive behavior in their daily lives.

Based on the results of previous observations, children with ASD had difficulty dealing with changes in daily routines and new activities they had never experienced before. This difficulty causes students to show aggressive behavior, such as tantrums, suddenly pushing the teacher's head until it hits the classroom wall, along with pinching, scratching, kicking, and hitting people around them. This behavior is shown as a form of rejection of the new activity being carried out. In this case, the maladaptive behavior shown by the students is caused by a disorder centered on executive function abilities, especially in the aspect of flexibility.

Improving executive function (flexibility) in children with ASD requires appropriate teaching methods following the characteristics of children. The TEACCH (treatment and education of autistic and related communication-handicapped children) method is a learning method for children with ASD capable of improving their cognitive abilities and adaptive behavior. The TEACCH method is deliberately designed for children with ASD by optimizing their strengths and overcoming weaknesses. In its implementation, the TEACCH method uses a structured approach with four basic principles. Mesibov [7] describes those four basic principles of teaching with the TEACCH method, including 1) environmental arrangement, which aims to identify a place or location and the possible activity that can be completed at the location; 2) visual information as an information medium that aims to provide information on structured routines that will be carried out by students; 3) special interest used as reinforcement given after students finish their assignments to increase their enthusiasm in completing assignments and increase the frequency of their positive behaviors; and, 4) meaningful communication in the form of visual symbols or more expressive communication which aims to help students understand the instructions and activities.

Previous studies show the effectiveness of the TEACCH method in dealing with problems in children with ASD. A study carried out by Cahyani [8] reported an increased ability to brush their teeth among children with ASD after they use the TEACCH method. Furthermore, research conducted by Tiasari [9] showed that the TEACCH method also affects the eating ability of children with ASD, as evidenced by an increase in their average level in each condition and the overlap results of data. Based on some previous

studies, the TEACCH method has a positive impact in various aspects when applied to children with ASD.

Thus, this study aims to examine the effectiveness of the TEACCH method in improving executive function (flexibility) abilities in children with ASD. The use of the TEACCH method in this study was expected to improve executive function skills in children with autism, especially in terms of flexibility. If the flexibility ability of children with autistic barriers can increase, then the child will be easier to adapt to new things so that they do not display dangerous behaviors themselves and other people around them. Thus, children with ASD can carry out daily activities like the usual children.

2 Method

In this study, a quantitative approach was used with single-subject research (SSR) and an A-B-A design. The single subject research is an experimental research method carried out by repeatedly giving treatment to one subject to determine the effect of the treatment on the behavior within the specified time limit [10]. In this study, we used the A-B-A design with three phases. In the first phase, the subject's behavior before the intervention was measured, which is commonly known as the baseline-1 phase. The second phase is the measuring of the target behavior during the treatment. This phase is commonly known as the intervention phase. The third phase measures the subjects' behavior after being given treatment, and this phase is commonly known as the baseline-2 phase.

In this study, the data was collected using observation and interview techniques with related parties. We also used an observation checklist containing indicators of flexibility as research instruments and assessment criteria described in the assessment rubric validated by material experts. The obtained data were analyzed using a descriptive statistical technique focusing on individual data influenced by the research design. Yuwono [11] revealed that research with a single subject should use descriptive statistical analysis to describe research variables.

3 Results and Discussion

The presented data were obtained during the study from the baseline-1, intervention, and baseline-2 phases. In the first phase, we measured the ability of the executive function (flexibility) before being given intervention using the TEACCH method. This condition is called the baseline-1 condition. In this condition, the student's ability was measured without any intervention. In practice, students carried out the common learning activities at school. Data collection in the baseline-1 condition was carried out for five days, with one session completed each day in 60 min.

The next stage was the repeated intervention using the TEACCH method in learning activities until stable data was obtained or until the predetermined time limit. This intervention was given to increase the ability of executive function (flexibility) in children with ASD. The implementation was more structured and could be demonstrated through a transparent work system, with predictable activities through the activity schedule, organizing student learning environment areas, and mentoring. The use of visual media in the form of images or symbols as connections assist teachers in providing

Table 1. Recapitulation of Research Result Data on Executive Function Ability (Flexibility)

Condition	Session	Score	Percentage (%)
Baseline 1 (A1)	1	8	38.09
	2	7	33.33
	3	8	38.09
	4	8	38.09
	5	8	38.09
Intervention (B)	1	10	47.61
	2	10	47.61
	3	10	47.61
	4	11	52.38
	5	11	52.38
	6	13	61.90
Baseline 2 (A2)	1	13	61.90
	2	13	61.90
	3	11	52.38
	4	12	57.14
	5	12	57.14
	Average		**49.10**

understanding to children with ASD characteristics. This media is commonly known as visual support. In this study, the researchers provided intervention or treatment for six meetings (sessions), and one session was carried out each day at 60 min. To measure the ability of executive function (flexibility) on the subject receiving the treatment, we used an observation guide that had been prepared previously. This assessment was carried out after the treatment session was completed.

The last step is to measure the final ability of the subject after being given treatment. This condition is known as the baseline-2 phase. This stage is a repetition of the baseline-1 phase, where the measurement is carried out without any intervention to observe the effectiveness of the treatment on the flexibility of children with ASD in carrying out learning activities. This stage was carried out for five days, with one session per day for 60 min. The progress of the subject in the baseline-1, intervention, and baseline-2 stages is presented in Table 1.

Table 1 shows that in baseline-1, the highest obtained score is 38.09% obtained in the 1st, 3rd, 4th, and 5th sessions, while the lowest score is 33.33% in the 2nd session. Thus, starting from day 1 to day 5, the executive function ability (flexibility) was stable and slightly increased.

Furthermore, in the intervention stage, the highest score of executive function (flexibility) of children with ASD was 61.9% on the 6th day, while the lowest was 47.61%

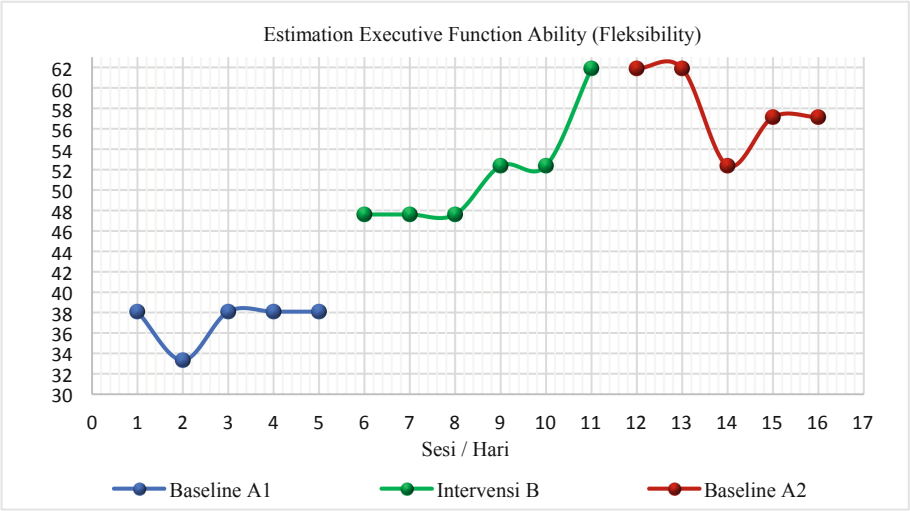

Fig. 1. Obtained Data in Baseline-1, Intervention and Baseline-2

on the 1st to 3rd day. As presented in Table 1, from day 1 to 6, the executive function ability (flexibility) tended to increase constantly, compared to the score obtained in the A1 baseline phase.

The highest ability of executive function (flexibility) in the baseline-2 phase was 61.9% on the first and second days, while the lowest was 52.38% on the third day. Thus, starting from day 1 to day 5, the executive function ability (flexibility) research was stable at the beginning and experienced a slight decrease, although the obtained scores were still higher than the baseline condition (A1). The increasing ability of executive function (Flexibility) during this study is illustrated in Fig. 1.

3.1 Discussion

Our data showed that the subject's executive function ability (flexibility) before the application of the TEACCH method was deficient. Before the treatment, the subject still experienced difficulty adapting to new activities, new environments, and new people, difficulty carrying out instructions, problems following rules & routines, along with difficulty focusing on the activities being carried out. As a result, the subject showed refusal through crying, shouting, hitting the head, hitting the table, hitting the wall, attacking, not allowing anyone to approach, and not wanting to follow the lesson. According to DSM-V, children with ASD have problems in social interaction, communication, imagination & flexible thinking [12]. Our findings are also linear with the research conducted by Irvan (2020) reporting executive function disorders in ASD children, primarily in the flexibility aspect.

In contrast, the ability of executive function (flexibility) of children with ASD during the TEACCH treatment was increasing. The increasing score is influenced by the provided visual support, such as daily schedules, environmental structures, and activity plans displayed visually in a sequence of pictures. From the beginning to the completion

of the learning process, this media is highly beneficial for the subject when engaging in school activities, especially in determining their next steps. The behavior of children with ASD can be controlled by implementing TEACCH intervention through a daily visual schedule for the children, aiding them in understanding the activities to be completed [13]. However, in providing the visual support, we encountered a number of issues, such as the visual support's small size, the subject's constant attempts to grab the image and put it in his mouth while constantly squeezing, tearing, and throwing the learning materials, accentuating the need to consider the children's need, its durability and portability in preparing the media [14].

Another inhibiting factor in the implementation of TEACCH was the characteristics of the subject, such as being too active, having an unstable emotional condition, and having difficulty receiving instructions. Consequently, we had to repeat the instructions and provide physical assistance to help the subject complete the activities in order while the subject kept jumping, clapping, kicking, pinching, hitting, and having difficulty adapting to the situation. The subject even tried to leave the room during the learning process. Thus, the researchers carried out behavioral modification techniques approaches. In line with Surtikanti's opinion [15], a special approach is needed during behavior therapy to ensure the children are comfortable during the therapy activities, either at home, the therapy place, or at school. In line with Kazdin's opinion that behavior modification is a behavioristic approach that aims to increase adaptive behavior and reduce excessive, maladaptive behavior in daily life [16].

Miltenberger [17] classified the types of prompts from high to low, namely physical prompts, modeling prompts, gesture prompts, and verbal prompts. Meanwhile, in using the prompt technique, it is suggested to use the prompt with the lowest level of assistance [18]. Thus, in the implementation of this intervention, a prompt sequence from low to high level was used, from verbal prompt, gesture prompt, modeling prompt to physical prompt.

In this study, the increase in executive function ability (flexibility) was not directly proportional to the increasing application of the TEACCH method and higher provision of visual media support. The application of the TEACCH method increases the ability of executive function (flexibility) when combined with teaching methods or basic techniques of behavior change for children with ASD, such as prompting, modeling, reinforcement, and extinction. This finding is in accordance with Lal & Shahane [19] who revealed that the TEACCH should be carried out with specific steps, such as giving instructions that are tailored to the child's abilities, for example, simple and concise teacher instructions since children with autism have difficulty understanding the use of long and complex language. Additionally, we used prompts to shape the children's behavior. Besides we also provided reinforcement for positive behavior so that the child would repeat the positive behavior. In providing the reinforcement, the teacher must identify the children's interests and provide motivation and appreciation for their positive behavior.

However, we also observed a decrease in baseline-2, which was caused by this condition. Skinner argued that behavior is a person's response or reaction to external stimuli [20]. In this study, the stimulus is the use of the TEACCH method and visual support as learning media to increase the desired behavior with a visual-based communication

system. This is in line with the opinion of Freed & Parsons that in helping children with ASD to easily respond and prevent maladaptive behavior, visual aids in the form of photos and pictures are effective visual helping them understand the stimulus [21]. The other stimulus used in this study includes prompting, modeling, reinforcement, and extinction.

4 Conclusion

Generally, the results of this study suggested that interventions for children with ASD should be carried out continuously, along with the principles of teaching children with autism. The use of the TEACCH method is considered effective for improving executive function abilities in children with ASD. The effectiveness of the TEACCH method is induced by its combination with the teaching methods or basic changing behavior techniques for children with ASD, such as prompting, modeling, reinforcement, and extinction, and other teaching principles for children with ASD.

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