



# The Effect of Interactive Hand Puppet on Joint Attention Ability in Children with Autism

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**Abstract.** Children with Autism (CWA) have neurodevelopment disorders that impact their social interaction, communication, and behavior. This study was conducted to identify the joint attention ability of CWA before, during, and after being given an intervention using interactive hand puppet media. Besides, this study also analyzes the effect of interactive hand puppet media on the ability of CWA. This study uses a quantitative approach with a single subject research (SSR) experimental research method with an A – B – A design and a combination of prompting behavior modification and positive reinforcement techniques. The obtained data were analyzed in conditions and between conditions. The results showed that before the intervention was given, the child's CWA was low, as presented by the limited frequency and intensity, with the results of 26 times and 73.02 s. During the intervention, there was an increase in the ability of joint attention as indicated by the increasing number of frequencies, but it did not affect the intensity of the joint attention ability. After the intervention, the average frequency and intensity were higher than the initial baseline. Therefore, the use of interactive hand puppet media significantly increases the frequency of joint attention abilities. However, it does not affect the duration of the joint attention ability of CWA. The use of media is essential for students in the learning process. It is expected that educators will develop more interactive media to help students during the learning process.

**Keywords:** Joint Attention · Autism · Hand Puppet

## 1 Introduction

Initially, every child can socially communicate, interact and behave. Social interactions carried out by each child must be accompanied by verbal and non-verbal communication, such as body language, movements, facial expressions, and eye contact. However, not all children have the ability to interact properly. Children with special needs, including children with autism (CWA), have developmental difficulties in social interaction, communication, and behavior. According to Davison, one of the characteristics of children with autism disorder in verbal and non-verbal communication [1]. Autism Spectrum Disorder (ASD) is an abnormal disorder that occurs in a person with symptoms such as underdeveloped social and communication skills with repetitive behavior and interest disorders [2].

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Joint attention is one of the most critical aspects when communicating with the other person. Joint attention is the initial ability when two or more people socialize and interact together using body language and eye contact when looking at particular objects [3]. In communication, it is not only the mouth that speaks but the eyes and body movements as well. From the age of nine months, children must be able to present joint attention, which is a necessary skill for observing their future growth [4].

In social interaction, CWA often lacks joint attention, so they are less focused when interacting and communicating with other people. CWA who experience disturbances in social communication mostly do not like to play with their peers, prefer to be alone, do not make or avoid eye contact when communicating, and like to pull other people's hands to do something [5]. Learning using media is suitable to improve the joint attention ability of CWA because the media can attract CWA's attention so that the learning process will run smoothly. Media is often referred to as a tool to stimulate students' thoughts, feelings, concerns, and skills in the teaching and learning process [6]. Learning media covers the tools, methods, and technology used by teachers and students in the learning process in schools to facilitate more effective communication and interaction [7]. However, during the observation, researchers often found CWA who did not do joint attention such as starting and responding during the learning process with teachers at school. This is because of the use of less interesting media in the learning process. Learning media has a vital role in the learning process, particularly in constructing children's interests and motivation while increasing children's learning activities.

From the problems that have been discussed, this study used media in the form of interactive hand puppets during the learning process in the classroom to build children's joint attention. In line with the statement put forward by [8], learning using visual media, such as dolls, can help the learning process in CWA because they can understand and get interested in visual media easily, compared to verbal ones. When children do joint attention during the learning process, they will be more focused and concentrated so that they can easily understand the material or information, and the learning process will run smoothly.

In this study, to increase the joint attention ability of CWA, we emphasized the activities of seeing, switching gazes, pointing, picking up, and playing with objects. As stated by [9] that the components of joint attention are divided into two, namely responding to joint attention and initiating joint attention. Where the activities of responding to joint attention include (1) seeing and paying attention to objects or other people; (2) diverting views between people and differences; (3) showing emotion to others; (4) following the point of view of others. Meanwhile, the aspects of initiating joint attention behavior include (1) showing an object or event; (2) designating an object or event; (3) giving something; (4) taking objects; and (5) defending by playing with an object.

In this study, we focused on several aspects of the two components of joint attention. Because at the age of 10, children should be able to maintain joint attention longer when communicating and interacting with others. Behavioral indicators that were used in this study include 1) staring at colored objects; 2) changing of gaze from object to letter or vice versa; 3) pointing to colored objects; 4) picking up colored objects; 5) selecting a colored object, and 6) playing with objects by making mosaics.

## 2 Method

This study used a quantitative approach with experimental research and a single-subject research (SSR) design. This experimental study aimed to examine the effects of the experimental treatment. According to Tawney and Gats, SSR is an experimental study carried out to determine changes in target behavior after repeated intervention or treatment within a certain time [10].

The design used by the researcher in this study was the A – B – A research design to identify the consequences of the intervention given to the subject. The examination was carried out by comparing the baseline conditions before being given treatment and after the treatment. The baseline condition (A1) was an illustration of the initial ability of joint attention when interacting with us. This condition was observed for five days with a duration of 30 min per session. The intervention condition (B) was a description of the subject's joint attention ability after being given treatment, measured for six sessions with a duration of 30 min in each session. The baseline condition (A2) was the final condition after the intervention. In this condition, the researcher examined the effects of the learning media on the ability of joint attention. Measurements in A2 were carried out for five sessions, with 30 min in each session.

## 3 Results and Discussion

The data for this study were collected in 16 days, with five days at the baseline condition (A1), six days at the intervention condition (B), and five days at the baseline condition (A2). The data collected are intensity (duration) and frequency in each aspect. The joint attention ability of CWA is listed in Table 1 (Fig. 1).

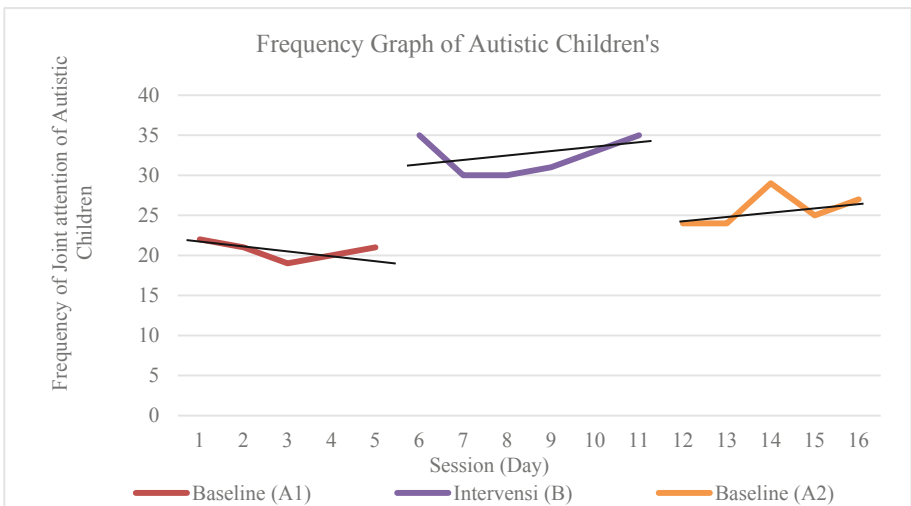
The joint attention ability of CWA in the baseline condition (A1) is relatively low, as presented in the unstable results obtained from the first to third sessions. The number of frequencies on the first and second days decreased from 22 times to 21 times and then to 19 times. Then on the third to the fifth day, it increased from 19 times to 20 times and then 21 times. The intensity (duration) of joint attention in the first to third sessions tends to be unstable as the total intensity (duration) of the first to third days has decreased from 74.37 s to 73.43 s and then 71.49 s. Then on the third to fifth day, it increased from 71.49 s to 72.24 and then 73.56 s (Fig. 2).

Meanwhile, the measurement results during the intervention condition (B) showed participants' varied abilities of joint attention. On days 1 and 2, the data decreased from 35 times to 30 times. Then on day 2 and day 3, it was stable at 30 times. Furthermore, from day 4 to day 6, it increased from 31 times, 33 times, and 36 times. Even though the intensity (duration) of joint attention tended to increase on the 1<sup>st</sup> and 2<sup>nd</sup> days, it decreased once on the 2<sup>nd</sup> and 3<sup>rd</sup> days, from 106.17 s to 100.86 s. Then on the 4<sup>th</sup> to 6<sup>th</sup> day, it increased from 101.72 s to 102.61 and 112.59 s.

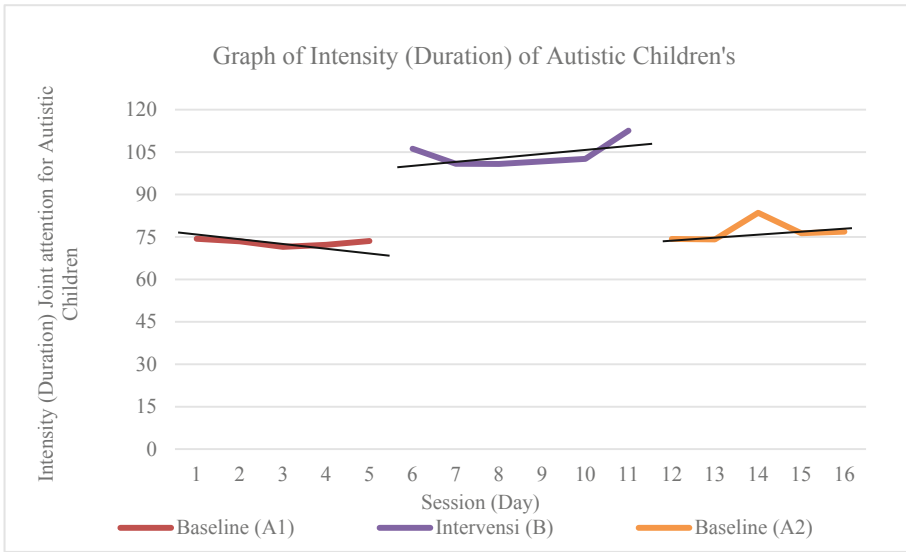
The measurement results of the baseline condition (A2) showed that the joint attention ability in the first and fifth sessions tended to be stable 24 times. Meanwhile, from the 3<sup>rd</sup> to the 4<sup>th</sup> session, it decreased from 29 to 25 times. Furthermore, from the 4<sup>th</sup> and 5<sup>th</sup> sessions, there was an increase from 25 times to 27 times. The duration of joint attention ability in the first and second sessions tended to be stable at 74 s, then from

**Table 1.** Recapitulation Data of the CWA Joint Attention Ability

Condition	Session	Frequency	Duration
A1	1	22	74.37
	2	21	73.43
	3	19	71.49
	4	20	72.24
	5	21	73.56
B	1	35	106.17
	2	30	100.86
	3	30	100.78
	4	31	101.72
	5	33	102.61
	6	36	112.59
A2	1	24	74.27
	2	24	74.13
	3	29	83.56
	4	25	76.32
	5	27	76.88



**Fig. 1.** Data on Frequency of Joint Attention Ability



**Fig. 2.** Recapitulation of Research Results of Joint Attention Ability

**Table 2.** Summary of Data Analysis Results in Conditions

Condition	A1	B	A2
Condition length	5	6	5
Estimated trend direction	(-)	(+)	(+)
Stability tendency	stable	stable	stable
Trace data	(-)	(+)	(+)
Stability level and range	Frequency <i>Stabil</i>	Frequency <i>Stabil</i>	Frequency <i>Stabil</i>
	19 – 22 kali Intensity <i>Stabil</i>	30 – 36 kali Intensity <i>Stabil</i>	24 – 29 kali Intensity <i>Stabil</i>
	71,49 – 74,37 detik	100,78 – 112,59 detik	74,13 – 83,56 detik
Change level	Frequency 21 – 22 times	Frequency 36 – 35 times	Frequency 27 – 24 times
	(-1)	(+1)	(+3)
	Intensity 73.56 – 74.37 seconds (-0.81)	Intensity 112.59 – 106.17 seconds (+6.42)	Intensity 76.88 – 74.27 seconds (+2.61)

the 3rd to 4th sessions, decreased from 83.56 s to 74.13 s. Furthermore, from the 4th and 5th sessions, there was an increase from 74.13 s to 76.88 s. The summary of data analysis under conditions results is presented in Table 2.

**Table 3.** Summary of Data Analysis Results Between Conditions

Compared Conditions	B to A1	A2 to B
Number of variables changed	1	1
Changes in trend direction and their effects	(-) (+)	(+) (+)
Stability change	Stable to stable Frequency 35 - 21 = <b>14 times (+)</b>	Stable to stable Frequency 24 - 36 = <b>12 times (-)</b>
Level change	Intensity 106.17 - 73.56 = <b>32.61 seconds (+)</b> Frequency	Intensity 74.27 - 112.59 = <b>38.32 seconds (-)</b> Frequency
Overlapping percentage	$\frac{0}{6} \times 100\% = 0\%$ Intensity $\frac{0}{6} \times 100\% = 0\%$	$\frac{0}{5} \times 100\% = 0\%$ Intensity $\frac{0}{5} \times 100\% = 0\%$

In addition, the analysis results between conditions are shown in Table 3.

### 3.1 Discussion

Based on observations, students with the initials APDA with the age of 10 years have one of the characteristics of CWA, namely difficulty maintaining attention or joint attention. This is in line with Hadith's statement [11] that the characteristics of CWA are divided into six. One of the characteristics is the problem of social interaction, namely obstacles in focusing attention and having empty eyes. The fundamental ability that CWA lacks is initiating attention, which is included in the communicative social disorder of CWA [3].

The problems encountered by CWA require solvency, such as by enhancing their ability of joint attention. This study used interactive hand puppet media to improve joint attention skills. With the interactive hand puppet media, it is hoped that CWA can maintain joint attention and concentrate on learning activities in class.

The participant's ability to joint attention before the intervention using interactive hand puppet media was lower than their condition during and after the treatment. In the initial condition, students often present little or even almost no joint attention when they receive instruction. The frequency of students' joint attention was an average of once in five instructions with an average duration of about 1 to 2 s in 1 joint attention. In the initial baseline condition (A1), the calculated mean of participants' joint attention ability was 20.6 times. This finding shows a trend of stable decrease, from the first day at 22 times, the second day at 21 times, the third day at 19 times, the fourth day at 20 times, and the fifth day at 21 times. Meanwhile, for the duration, the obtained mean level was 73.02 s. This finding also indicates a trend of decreasing duration, from the first day at 74.37 s, the second day at 73.43 s, the third day at 71.49 s, the fourth day at 72.24 s, and the fifth day at 73.56 s.

According to Budiman, one of the traits of children with ASD is that they struggle to focus attention and switch their gazes quickly between an item or activity [12]. Another study reported that CWA's low frequency and intensity of joint attention is caused by CWA interference with concentration [3]. Besides, that study also reported that one of the CWA characteristics includes the absence of basic skills to focus attention. The joint

attention ability of CWA will increase if they are given the appropriate treatment or intervention.

In the intervention phase, we used media in the form of interactive hand puppets and prompts method. According to Kazdin, prompts directly guide behavioral performance so that the subjects are facilitated to carry out an instruction [13]. In this study, we used verbal prompts and modeling prompts. Verbal instructions are instructions or information given verbally to assist the subject in doing something, such as “come on, clean the table!” [13]. Verbal instructions were given when the researcher gave instructions to the subject to take, see, and point at the object. While modeling prompts were given to demonstrate the ways to practice the instructions so that the subject carries out the same instructions, such as throwing a ball [13]. In this study, the modeling prompts were used to evaluate the aspect of pointing and taking an object. Thus, during the intervention, we asked the CWA to point and take an object using the hand puppet to help the CWA understand the instruction.

In addition, we also used positive reinforcement techniques during the learning process. Positive reinforcement is a positive action that aims to enhance the frequency of CWA behavior [14]. Examples of positive reinforcement are praising the children, giving thumbs up, applause, high-fives, and preferred items such as toys [15]. In this study, positive reinforcement was given in the form of praise, applause, and giving toys. Praise and applause were given when the child carried out the instructions, while the toys were given after the child finished the learning process. The toys given to the subject were cars that the subject takes every day at school.

The use of media in learning CWA is very much needed. The value obtained in this intervention phase increased due to the treatment in the form of visual media of the interactive hand puppets. The highest frequency and intensity obtained in this study were 36 times and 112.59 s, respectively. This is per the statement [16] that visual learning media is one of the media used by CWA. In the learning process, the role of media is significant for students, especially for students with ASD barriers. According to Caslin, dolls function as teaching aids that can attract students' attention [17].

The baseline phase was conducted in five meetings, with 30 min for each meeting. The increase in frequency and intensity in the baseline condition (A2) was not compared to the baseline (A1). A significant increase was observed in the frequency but not in the intensity. This result is signified by the average frequency in the baseline condition (A1) of 20.6 times to 25.8 times in the baseline condition (A2). Meanwhile, the average intensity (duration) in the baseline condition (A1) was 73.02 s to 77.03 s in the baseline condition (A2).

In conclusion, the use of media in learning, especially for autistic students, is essential. Learning for children with autism can be maximized with the visual senses. This is in accordance with research from [18] which tested visual media on the emotional intelligence of CWA, which results in students tend to be able to communicate well, make eye contact when interacting, and make students more focused when learning. However, in this study, we only use interactive hand puppet media in the learning process to improve the joint attention ability of CWA. Our results showed no significant increase in the duration of the joint attention ability of CWA because of the subject's low ability to focus. This is in line with Zwaigenbaum's opinion that CWA has low

joint attention abilities, characterized by a lack of spontaneous efforts by children to share pleasures, interests, or achievements with others, for example, lack of behavior in showing, carrying and seeing objects when interacting with others [19]. Researchers also use the prompting method or assistance in the form of verbal prompts and modeling prompts. In addition, researchers also use positive reinforcement techniques in the form of praise, clapping, and giving toys. Using the appropriate learning media, methods, and techniques, the joint attention ability of CWA has increased in the baseline (A2) compared to the baseline phase (A1).

## 4 Conclusion

Our analysis results showed that CWA faces a problem in the learning process, especially in joint attention abilities, before being given an intervention. However, after receiving intervention in the form of learning using interactive hand puppet media, CWA experienced an increase in joint attention in the intervention and baseline phases. Besides, the use of interactive hand puppet media affects the frequency of joint attention ability of CWA, but the effects were not significant. Therefore, based on the evidence, the interactive hand puppet media has a significant impact on the joint attention ability of CWA only on the aspect of frequency if combined with suitable learning methods and techniques. Meanwhile, on the aspect of intensity (duration), the significant effect was not observed.

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