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| RESEARCH ARTICLE

Effectiveness of Smart Applied Behavior Analysis Intervention in Teaching Non-Verbal Autism to Speak and Read

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| ABSTRACT
Not being able to speak is one of the Autism Spectrum Disorder symptoms, which, if not treated properly, will remain unable to speak. Teaching them to speak and read is beneficial for cognitive development as well as its social and educational purpose. The aim of this study is to teach/train speaking and reading abilities in children with ASD (Autism Spectrum Disorder) who had been declared as non-verbal and should not expect to speak by clinics in the United States and Indonesia, using Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method). This study used an experimental method with a single-subject research design that focused on behavioral changes as a result of the treatment using Smart Applied Behavior Analysis on the subject. The participants were two nonverbal Autism Spectrum Disorder individuals, N (female, 12 years 6 months) and E (male, 9 years 8 months). This study showed that therapy with the Smart ABA resulted in the verbal abilities of both subjects. Both subjects eventually became verbal, and their verbal and nonverbal abilities continued to improve. The study was only on two children with non-verbal Autism Spectrum Disorder, using Indonesian with the Smart Applied Behavior Analysis method for autism that has been developed from the Applied Behavior Analysis Lovaas Method. It requires multi-center experimental research with large samples of various ages with multiple languages to further increase the validity and reliability. This novel Smart Applied Behavior Analysis method was developed by researchers based on the Lovaas Method's Discrete Trial Training/Applied Behavior Analysis.

| KEYWORDS

Autism, ABA, Applied Behavior Analysis, Therapy, Teenagers, Speak, Non-Verbal, Lovaas, Discrete Trial Training

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1. Introduction

Autism is a developmental disorder that causes disturbances to various aspects such as physical, motor, cognitive, verbal, and social development in children (Morales-Hidalgo et al., 2018). The Center for Disease Control and Prevention (CDC) reported that in 2006 it was estimated that out of every 110 children, there was one child with autism; this figure increased to 1:88 in 2008 and increased to 1:68 in 2010 (Knopf, 2020). According to the World Population Review, it can be known that the prevalence of autism in Indonesia reaches 83.60 out of every 10,000 children (Autism Rates by Country 2021, n.d.). Generally, the appearance of this disorder can be seen during childhood by observing the symptoms that appear in children (Kodak & Bergmann, 2020).

One of the common symptoms found in children with ASD (Autism Spectrum Disorder) is the presence of communication impairment; this problem makes it difficult for children to express their thoughts and feelings both verbally and through gestures (Kuzminskaite et al., 2020). This condition will certainly impair the child's ability to adapt and socialize. Communication becomes the most important factor that needs to be considered in the psychosocial aspect (Sun et al., 2019). There are two types of communication, oral and written. Oral communication is easier for everyone to do and is easy to be understood by others. To conduct effective oral communication, individuals have to master their verbal ability. Unfortunately, not everyone has good verbal

skills; one such individual is a child with ASD (Autism Spectrum Disorder). To aid in the development of children with ASD, therapy is required (Liu et al., 2019).

A method of therapy that is often used to aid in the development of children with autism disorders is the Applied Behavior Analysis (ABA) method. Applied Behavior Analysis is a branch of applied psychology that focuses on training individuals to acquire specific skills or abilities by using behavior modification procedures. Conceptually, Applied Behavior Analysis is a procedure that breaks down complex abilities into smaller/simpler parts/components to make them easier to acquire and master so that the individuals have the abilities that meet the standards of society. Ivar O. Lovaas, an American psychologist, was the first professional to apply the principles of Behavior Modification to autism, which he referred to as DTT (Discrete Trial Training), which later became known as Applied Behavior Analysis (ABA) for autism. Behavior modification is the consolidation or development of two major theories: Operant Conditioning, from B.F. Skinner and Respondent Conditioning from I. Pavlov. Behavior modification aims to eliminate undesirable behavior and to cause and improve intended or desired behavior so that the individual's behavior will match with the standards of social behavior in society (Baer, 2019).

2. Literature Review

2.1 Autism

Autism is one of the many developmental disorders in children. Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder characterized by difficulties in interest, activity, communication, and social interaction, with limited and repetitive behavioral patterns. The symptom appears early in the development period and impairs daily functioning (American Psychiatric Association, 2013). Autism is a developmental disorder that affects a person from birth or during infancy and impairs their ability to engage in typical social or communication interactions (Steinbrenner, 2020). Autism symptoms can be detected from a variety of perspectives, including neurological symptoms, a syndrome, or sensory symptoms (Steinbrenner, 2020). Autism is a neurobiological developmental disorder characterized by behavior differently in language and cognitive abilities. The basic symptoms that often occur in children with ASD are impaired communication or social interaction, a pattern of repetitive behavior, and limited interest. This includes a lack of understanding of other people's intentions, decreased eye contact, and different from other children in expressing emotions (Hyman, 2020).

The problem with behavior in ASD children is their inability to respond appropriately to external stimuli, which impairs their capacity to develop normally (Steinbrenner, 2020). ASD children do not recognize or understand their environment's oral and gestural behavior, causing them to ignore gestural and social cues such as facial expressions that facilitate social interaction (Lee et al., 2016). Communication handicaps in autistic children can cause difficulties for caregivers to transfer knowledge or life values to children impeding their development. In some cases, these communication handicap results in losing caregivers' patience due to their inability to understand children. This frequently results in both physical and psychological violence against children with Autism. This violence towards autistic children is due to parenting stress (Chan &Lam, 2018).

2.2 Smart Applied Behavior Analysis

Applied Behavior Analysis is an applied science that is used to train individuals in mastering abilities using behavior modification procedures. Baer (2019) defines Applied Behavior Analysis conceptually as a procedure of breaking down behavior into simpler parts/components to make it easier to learn and master so that abilities are achieved that meet the standards found in society. Ivar O. Lovaas, an American psychologist, was the first professional to apply Behavior Modification principles to autism, which he called DTT (Discrete Trial Training), which later became known as Applied Behavior Analysis (ABA) for autism. Behavior Modification is a development of two major theories: Operant Conditioning, from B.F. Skinner and Respondent Conditioning from I. Pavlov. In Behavior Modification, undesirable behavior is eradicated, and the intended behavior is developed and improved so that the behavior of the individual conforms to community standards (Baer, 2019).

Since 1997 researchers began studying ABA for autism from various sources, including the researcher's own kid, who was diagnosed with autism. After 6 months of treatment with the ABA method, significant progress was observed, and then the researcher began teaching other parents, therapists, and various professionals. In 1999 researchers opened a special clinic for the treatment of autism to demonstrate that what researchers had done to researcher's kid and taught to others was not just a theory on paper but an applicative thing that can be replicated by everyone/professional.

But while observing, mentoring, and supervising autism therapists in applying ABA to children with ASD, the researcher discovered that many things needed to be developed and improved. The researcher then assembled and developed and/or improved what the researcher had already known from various training, workshops, textbooks, journals, literature, and articles. Assembling, developments, and/or improvements made by researcher such as SOP (Standard Operating Procedure) in the implementation of therapy/teaching sessions, as well as in the curriculum. Intensive assembling, development, and/or improvement began in 2009 in collaboration with Arneliza Anwar, who is the owner and director of KID-ABA Autism Center, Grand Wisata, Bekasi, and West Java,

Indonesia. In 2011, researchers launched Smart ABA for ASD. Then in 2016 was duplicated/replicated by Chairita Miranda at Anak Cemerlang Clinic, Pekanbaru, Riau, Indonesia.

The assembling, developing, and improving include, but are not limited to, the DTT structure/SOP for the non-verbal and verbal programs, initial prompt, immediate prompt, DT (Discrimination Training), EO (Establishing Operation), escalation prompt, shaping/chaining, split prompt, modeling prompt, prompt-delay (delayed prompt), full prompt, partial prompt, verbal prompt, initial visual prompt, immediate visual prompt, visual prompt, the combination of the initial and immediate prompt with or without and with visual media aid, score calculation system (DTT, DT, Maintenance), passed/achieved system (DTT, DT, Maintenance), system maintenance, curriculum block, curriculum systematics, etc. and so forth that require approximately 1,000 pages of explanation, which is certainly beyond the scope of this research discussion.

Researchers define Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method), which is an applied science/method (technical-practical) that uses behavior modification procedures to teach someone (in this case, an ASD child) to master various abilities/activities that conform to the standards/values in the community. By breaking down various complex activities into small parts (if necessary to be the smallest part), according to the ability concerned, which are then taught/trained intensively and systematically (taught/trained in scientific order), structured (the use of standard techniques in teaching/training), and measured (the use of quantitative measurement to determine the success of children), and intervene/modify where necessary (according to the identified problem).

What is meant systematically is that there is a defined curriculum/program that is organized linearly, beginning with the easiest program/activity for children (smallest/simplest that is most likely to be done/achieved by the child according to his ability at that time. If the prerequisites have not been met, then first taught/trained the prerequisites, then after being mastered then furthermore there is a clear what programs/activities are taught/trained later, both as a continuation and combination with other programs/activities to form complex/more complex abilities until finally, the child reaches the abilities that meet with the standards in the community, then they can live independently and work like everyone else in society.

What is meant by structure is that there is a clear and standard structure (based on the child's response to various stimuli/instructions given) for teaching/training various programs/activities ranging from simple to complex.

The development carried out by researchers on the structure/SOP, including but not limited to the DTT Non-Verbal Program, DTT Verbal Program (Vocal Imitation / Syllable / Word / Sentence, Reading Cards of Vocal / Syllables / Words / Sentences, Answering, etc.), Initial Prompt, Initial Visual Prompt, Immediate Prompt, Immediate Visual Prompt, Prompt, Visual Prompt, Split Prompt, Modeling, Prompt, Verbal Prompt, EO (Establishing Operation), DT (Discrimination Training), Time-delay Prompt, etcetera and so on.

The technical structure of teaching/training autistic children with Smart ABA is one of the most important things as a how-to (technical know-how). Whatever curriculum/program/activity that will be taught/trained will be mastered by children if taught with the right techniques according to the correct structure. Thus, not only what-to-teach, but the most important thing is how-to-taught it. Because if the technique is incorrect, then the child may have mastered the wrong concept, which will be more difficult to correct than teaching a new one from the start using the correct technique.

What is meant by measurable is that there are quantified scores and passed/achieved criteria so that it can be easily and clearly stated whether a program/activity has been mastered or has not been mastered by the child.
One study (Savitri et al., 2020) found that Smart ABA was regarded as an effective and efficient method for improving language function and skills, communication, and social skills in children with autism. In addition, in improving the various abilities of children with ASD, the Smart ABA method is also useful for minimizing symptoms experienced by individuals. The Smart ABA method is a fairly representative method to improve these capabilities in a measurable, purposeful, and systematic manner.

3. Methodology

3.1 Method

This study uses an experimental method with a single-subject research design (SSR) which focuses on behavioral changes as a result of treatment with Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method) on the subject. In the SSR design, each individual's data is analyzed independently and compared to oneself with no control group (Zuidersma et al., 2020).

3.2 Subject

The study involved two children with Autism Spectrum Disorder who had previously been declared non-verbal autism by clinics in Indonesia and the United States of America and were not expected to talk. Both were N (female) and E (male), who received 31

months of therapy using The Smart ABA (Smart Applied Behavior Analysis) or Applied Behavior Analysis Rudy Sutadi's Method. Subject N was 12 years 6 months old, and subject E was 9 years 8 months old when the Smart ABA therapy began.

Subject N was diagnosed with autism at the age of two, as was subject E with mild (!) autism also at the age of two. After being diagnosed at age 2, subject N was treated using SI (Sensory Integration), OT (Occupational Therapy), and ST (Speech Therapy). While subject E was said to be treated using ABA (Applied Behavior Analysis). At the age of 8, subject E was declared non-verbal autism and informed that the parent should not expect the child to be able to speak verbally. Then the child was treated using picture cards, referred to as PECS (Picture Exchange Communication System) or COMPIC (Communication Pictograph / Communication Assisted by Picture). There has been a little progress in communication, but it was very limited because, according to the parent, one image only applies to one single object/clothing/food/toy/etc. ; therefore, multiple images must be created for a single object/clothing/food/toy / and others with various variations, for example, pizza with various toppings and variations in edges, as well as various sizes. Thereafter, subject N was treated at KID-ABA Autism Center, Grand Wisata, Bekasi, West Java, Indonesia, starting at the age of 12 years and 6 months, using Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method).

Subject E, after being diagnosed with mild (!) autism at the age of 2 years, then directly treated as well, said to use ABA (Applied Behavior Analysis). But after the child was 5 years old, both psychiatrists and therapists/clinics who handled the child gave up on continuing therapy. Then the child was taken to San Diego, USA, to continue receiving ABA therapy from a team of therapists at a government-funded clinic and a private-funded team of therapists who came to the family's house. But when the child was 8 years old as well as the subject N, the subject E was also said to be non-verbal and should not be expected to be able to talk. Then the child was trained in sign language, but the child had difficulty mastering sign language, and his stimming increased. So, it can be said that there was no meaningful progress while the child was being treated in San Diego, USA. Then the child was brought back to Indonesia to be treated at KID-ABA Autism Center, Grand Wisata, Bekasi, West Java, Indonesia, starting at the age of 9 years 8 months, using Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method).

3.3 Instruments

This study aims to teach/train speaking and reading abilities in children with ASD (Autism Spectrum Disorder) who have been declared as non-verbal and do not expect to be able to speak anymore. For that purpose, there is the main program for that purpose, and there is also a parallel program.

The main program consists of learning readiness, motor movement imitation ability, speech ability, and reading ability. The learning readiness program consists of self-sitting exercise activities in a chair, eye contact, and following oral directions of compliance. Motor movement imitation program consists of a program of imitation of gross, fine, mouth motor movements and blowing. Reading ability consists of a program to read cards of vowels, consonants, syllables, words, and sentences of 2-5 words. Speech ability consists of a program of imitation of vocal sounds, syllables, words, and sentences of 2-5 words.

Parallel programs consist of a variety of programs to practice receptive, cognitive, and expressive non-verbal abilities. It consists of hundreds of programs with thousands of activities. The intervention is Smart Applied Behavior Analysis (Smart ABA), which was developed from Applied Behavior Analysis (ABA) for autism.

4. Results and Discussion

The following are the various outcomes achieved after therapy using the Smart Applied Behavior Analysis Method (Applied Behavior Analysis Rudy Sutadi's Method) for 31 months in subject N, which started at the age of 12 years 6 months, and subject E, which started at the age of 9 years 8 months. Both ASD children, before being treated with Smart ABA, had been declared at the age of 8 years as non-verbal and should not be expected anymore to be able to speak or communicate verbally. Subject N was said to be so by a clinic in Jakarta, Indonesia, while subject E was stated so by a team of therapists and a clinic in San Diego, USA. After that, N was trained to communicate using images and photographs (with PECS/COMPIC), while E was trained to communicate with sign language. Parents of both children were not satisfied because there was only a little progress in the children in communicating, and its use was very limited because everyone in the environment did not understand both kinds of non-verbal communication. Plus, in N, the parent had to create various kinds of variations of images/photos for a single type of object/clothing/food/toys / etc., resulting in thousands of images/photos that must be selected one or several images/photos for a very simple communication though. While in E, it caused an increase in stimming behavior (self-stimulatory behavior).

Then the parents of the two children discontinued all previous therapy that had been done during that time and then switched to therapy using the Smart ABA method carried out at KID-ABA Autism Center, Grand Wisata, Bekasi, and West Java, Indonesia.
The following are outcomes that were achieved. Researchers divide the results of programs and activities achieved by each subject N and E separately, as well as a comparison between their achievements. These are the ability of learning readiness, the ability to the imitation of pre-speech needed for speaking skills, and the speaking and reading abilities. Additionally, achievements are also

presented in programs and activities other than those mentioned previously and all total programs and activities. It is also presented separately and in comparison between the two.

4.1 Learning Readiness

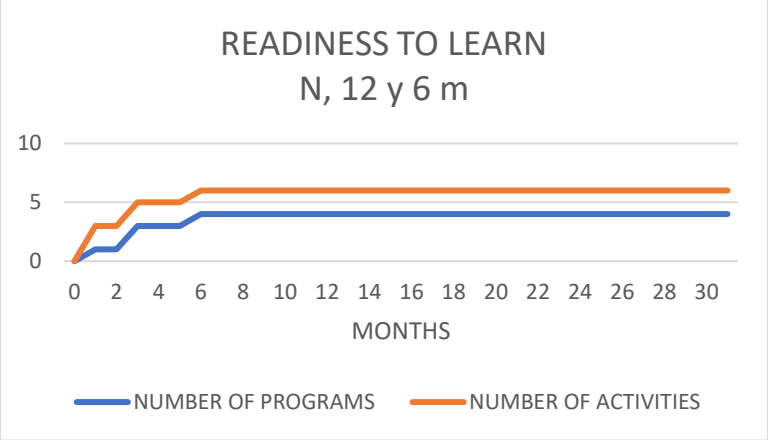

Figure.1. Readiness to Learn; Subject N; Number of programs and activities

The learning readiness ability on subject N (Fig.1.) Within 31 months of therapy with the Smart ABA method, showed significant progress and then remained stable, according to the target number of programs and activities. At the beginning of therapy, Subject N did not understand the commands instructed by the therapist. In the following month, N began mastering one program, and the next month began to increase to 3 programs. After 5 months of therapy, N was able to master an entire 4 programs consisting of 6 activities. This can be seen in Fig.1. Which shows an increase occurred and then was stable in the 6th month of Smart ABA therapy.

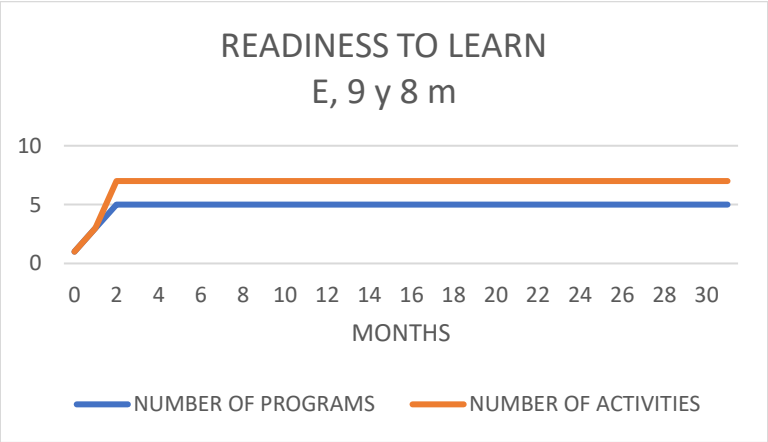

Figure 2. Readiness to Learn; Subject E; Number of programs and activities

The learning readiness skills possessed by subject E (Fig.2.) During the treatment of smart ABA, within 31 months increased then stable. After the first month of therapy, subject E was able to understand the commands instructed by the therapist by mastering 1 program and 1 activity. Then it increased month by month so that in the 3rd month, the subject E mastered 5 programs with 7 activities, and this condition continued to persist. The improvement in the learning ability of subject E can be seen in the graph in Fig.2. While the comparison of the two (Subject N and Subject E) on learning readiness ability is shown in Fig.3. And Fig.4.

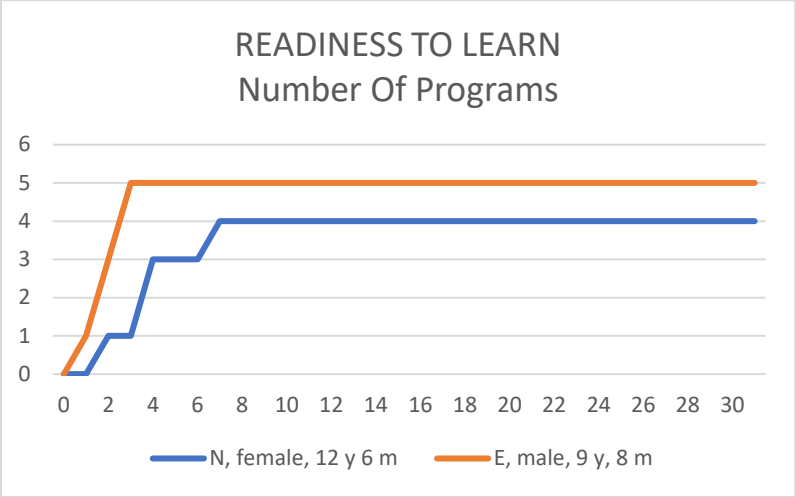

Figure 3. Comparison of Learning Readiness between subjects N and E; Number of programs

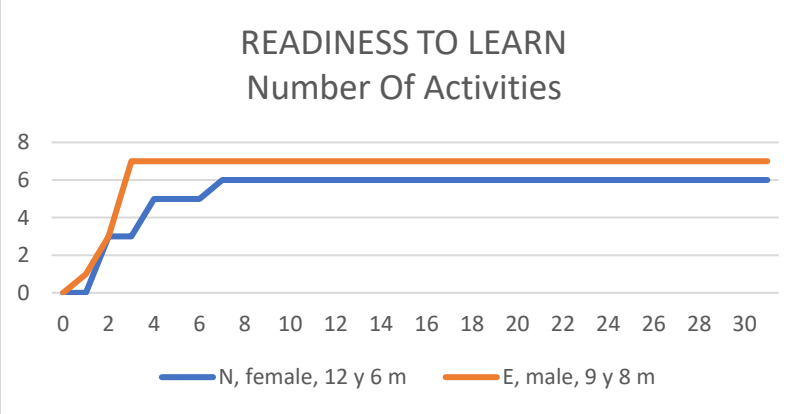

Figure 4. Comparison on Learning Readiness between subjects N and E; Number of activities

Fig.3. and Fig.4. Demonstrate that subject E is superior in learning readiness compared to subject N, both in the number of programs and the number of activities and the speed of achievement. Subject E mastered 5 programs and 7 activities in the 3rd month of treatment using Smart ABA, whereas subject N mastered a maximum of 4 programs with 6 activities. So that the number of programs and the activities, subject E is greater than subject N.

4.2 Imitation Ability

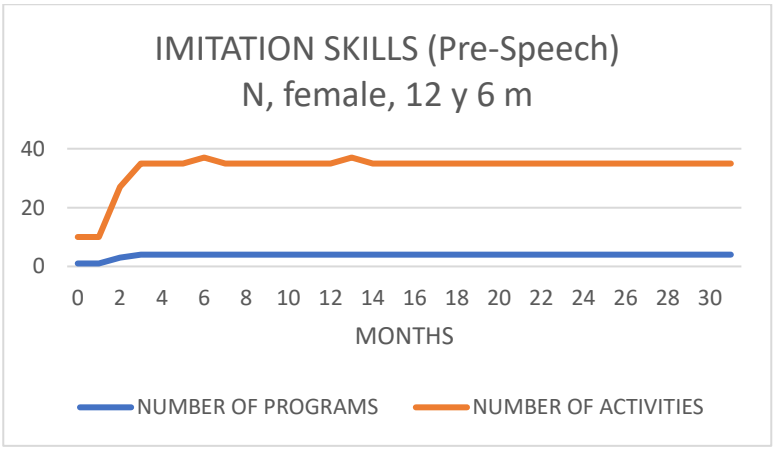

Figure 5. Imitation Skills (Pre-Speech); Subject N; Number of programs and activities

At the time of entrance, subject N had already been able on 1 program consisting of 10 activities (Fig.5.). The first increase occurred in the 3rd month of therapy. Then increased steadily until finally, at 31 months of therapy, she mastered 4 programs with 35 activities. The ability improved to 37 activities two times but then decreased to 35 activities until the end of the 31 months of therapy.

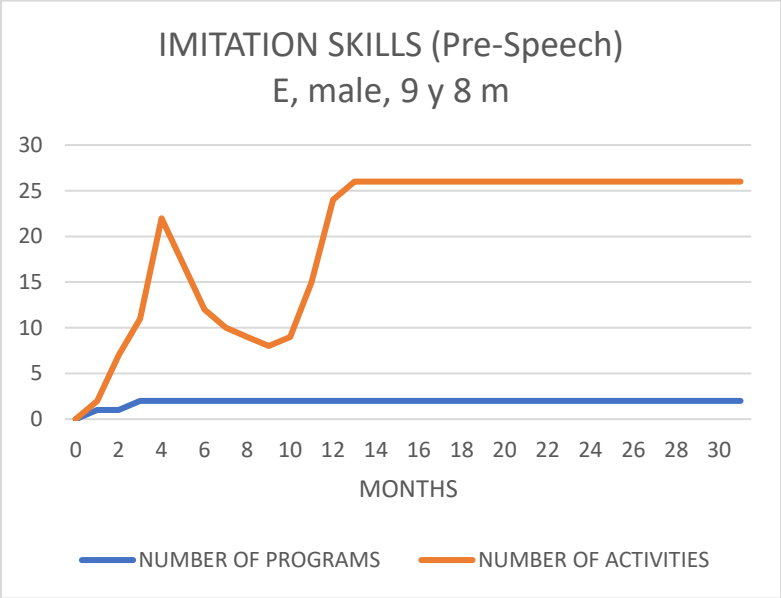

Figure 6. Imitation Skills (Pre-Speech); Subject E; Number of programs and activities

Subject E's imitation abilities also improved significantly during the 31-month of Smart ABA treatment. At the beginning of the treatment, he did not yet have imitation abilities, but in the 1st and 2nd months, it increased to 1 program with 2 and 7 activities, respectively. Furthermore, it increased so that in the 4th month, subject E mastered 22 activities but subsequently declined after the 4th month. This was due to the occurrence of epilepsy attacks that needed an increasing dose of drugs and the addition of the type of drug, which was handled by a pediatric neurologist. So, in the 9th month of therapy, subject E's ability decreased to 8 activities and then gradually increased again to 15 in the 11th month, 24th in the 12th month, and then to 26 in the 13th month. Furthermore, he was stable in 2 programs with 26 activities until the end of therapy.

The comparison of imitation abilities in both can be seen in the graph in Fig.7. and Fig.8.

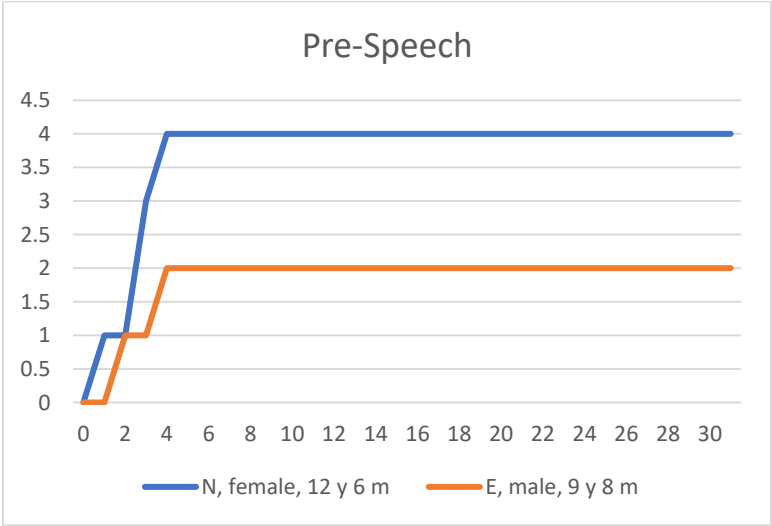

Figure 7. Comparison of Imitation Skills (Pre-Speech) between subjects N and E; Number of programs

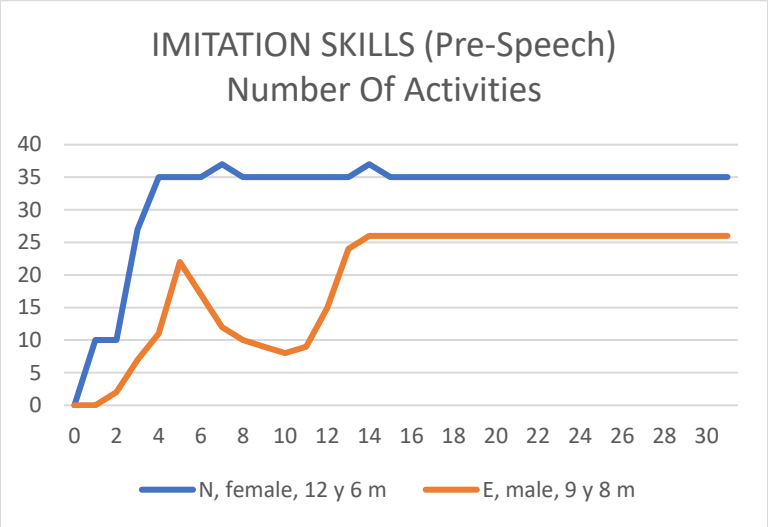

Figure 8. Comparison on Imitation Skills (Pre-Speech) between subjects N and E; Number of activities

Fig.7. and Fig.8. Demonstrate imitation abilities. Subject N is superior to subject E, both in the number of programs and the number of activities. Subject N's abilities increased significantly in the number of programs, with a greater number of programs than the number of subject E's programs. Subject N was able to master 4 programs with a total of 37 activities, although eventually returned down and stabilized at 35 activities. While subject E eventually mastered 2 programs with a total of 26 activities. After the 4th month, subject E experienced a decrease in ability due to the onset of epilepsy attacks that needed an increase of the drug's dose and also the addition of the type of drug, which was handled by a pediatric neurologist. So that in the 9th month of therapy, subject E's ability decreased from 22 activities to 8 activities, but gradually increased to 15 activities in the 12th month, up to 24 activities in the 12th month, and finally to 26 activities in the 13th month. Furthermore, it was stable until the end of therapy on 2 programs with 26 activities.

4.3 Ability to Speak

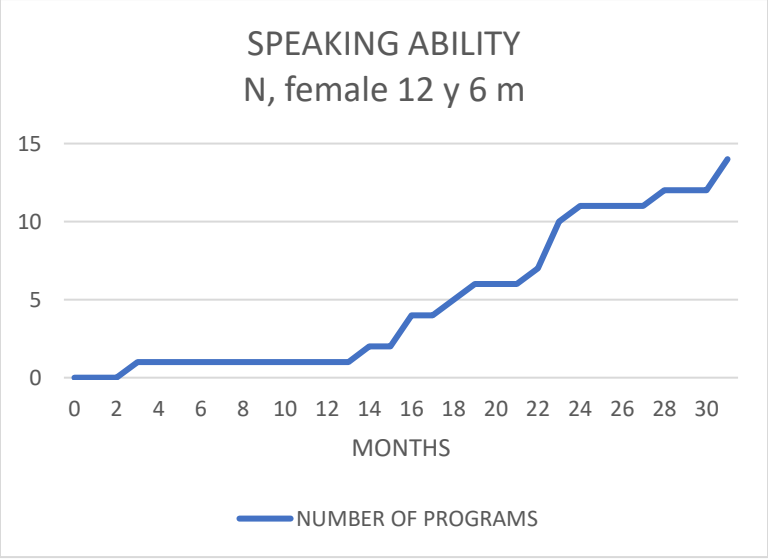

Figure 9. Speaking Ability; Subject N; Number of programs

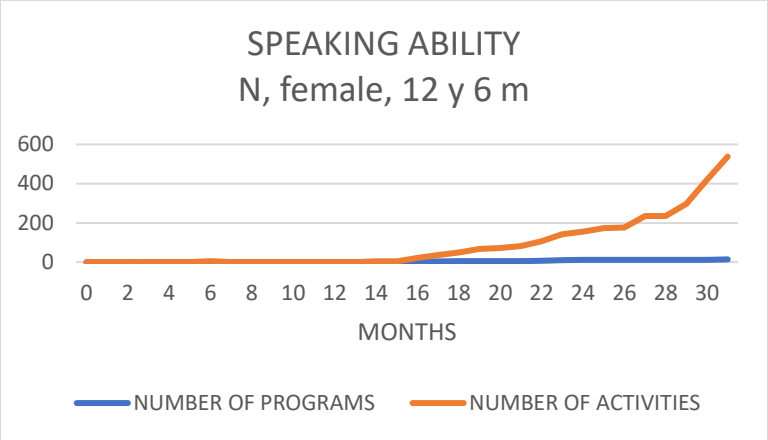

Figure 10. Speaking Ability; Subject N; Number of programs and activities

Subject N, at the beginning of the treatment, could not speak at all (Fig.9. and Fig.10.). In the 3rd month of therapy, subject N began to master one program and one activity. In the 6th month, the subject N mastered 5 activities but then dropped to 1 activity. In the 14th month, subject N began improving her speaking abilities, both in the number of programs and in activities. In the 13th month of therapy, subject N's ability began to increase significantly, both in the program and the activities and finally reaching 14 programs and 538 activities.

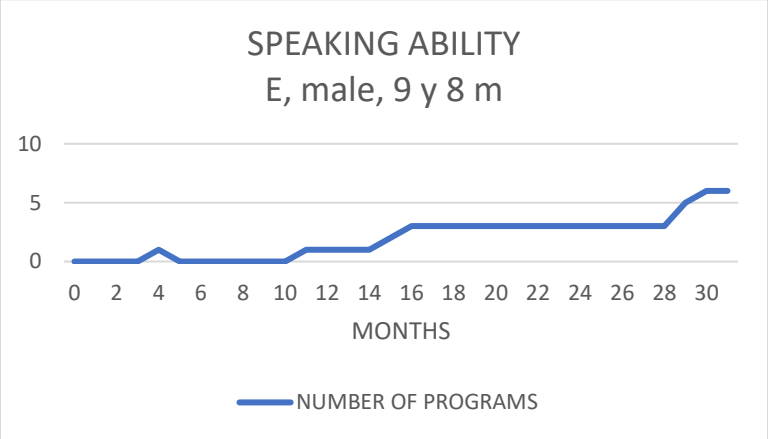

Figure 11. Speaking Ability; Subject E; Number of programs

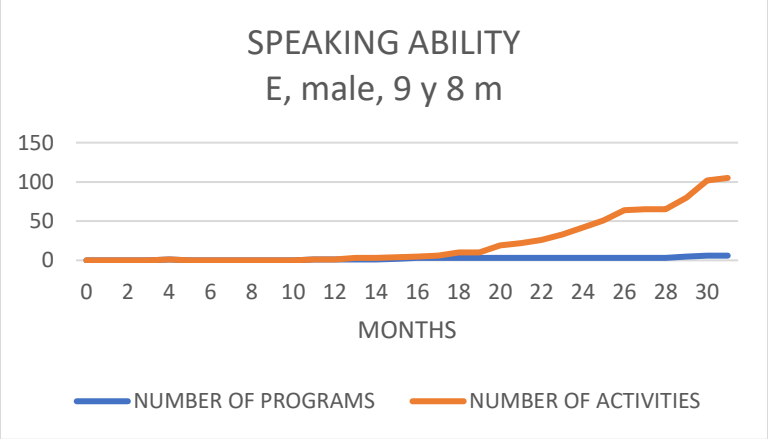

Figure 12. Speaking Ability; Subject E; Number of programs and activities

Subject E (Fig.11. and Fig.12) began to speak in the 4th month by mastering 1 program and 1 activity but then disappeared until the 10th month. In the 11th month, subject E mastered 1 program and 1 activity again. Furthermore, the ability of subject E began

to increase in the 11th month and continued to increase, both in the number of programs and activities. Until the 31st-month, subject E was able to 6 programs and 105 activities.

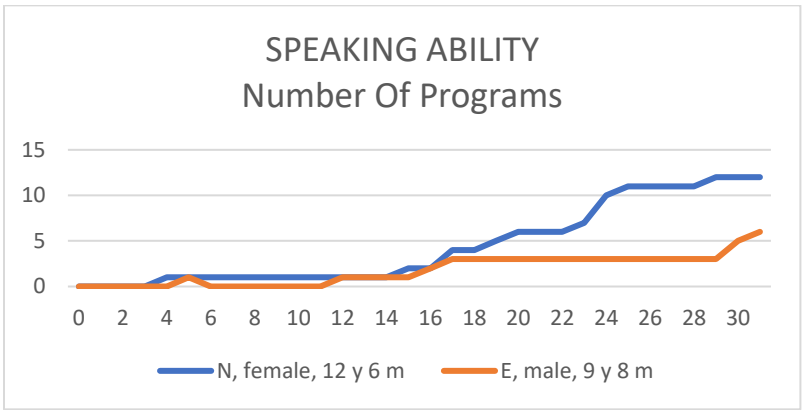

Figure 13. Comparison on Speaking Ability between subjects N and E; Number of programs

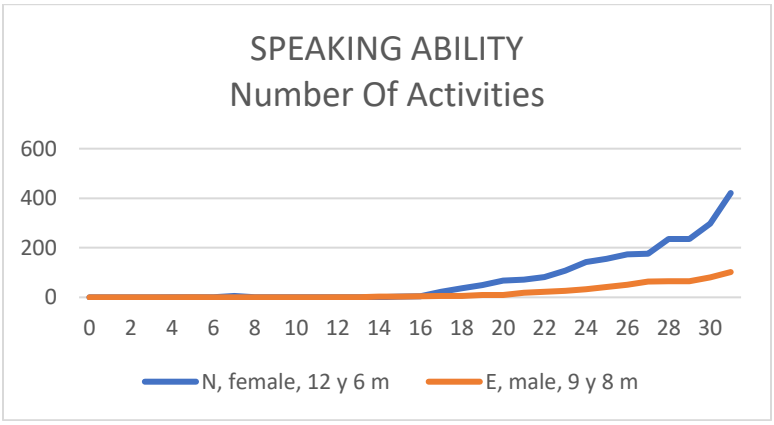

Figure 14. Comparison on Speaking Ability between subjects N and E; Number of activities

As illustrated in Fig.13 and Fig.14, subject N is once again superior at programs and activities in speaking ability. Subject N was successfully able to speak earlier than subject E. Subject N began to speak in the 3rd month, then the ability increased in the 6th month of therapy and mastering 5 activities, but then his ability decreased in the 7th month of therapy to only 1 activity. But in the 14th month, the ability increased again, both in the number of programs and activities and finally, in the 31st-month subject, N mastered 14 programs with 538 activities. Subject E began to speak in the 4th month of therapy but then disappeared and reappeared in the 11th month; after that continued to increase until he mastered 6 programs with 105 activities in the 31st month.

4.4 Ability to read

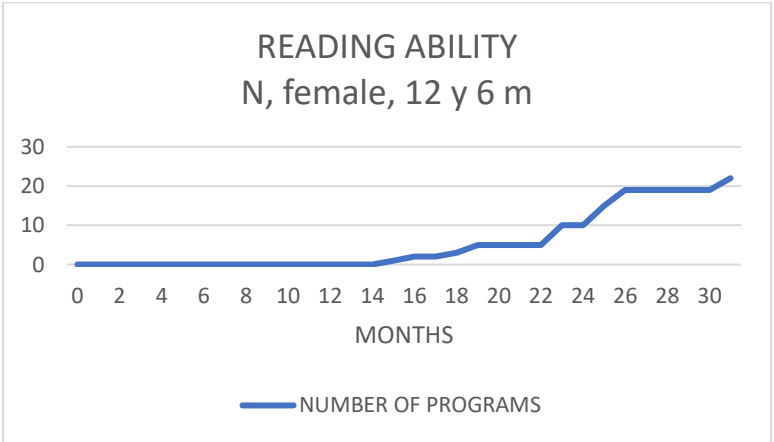

Figure 15. Reading Ability; Subject N; Number of programs

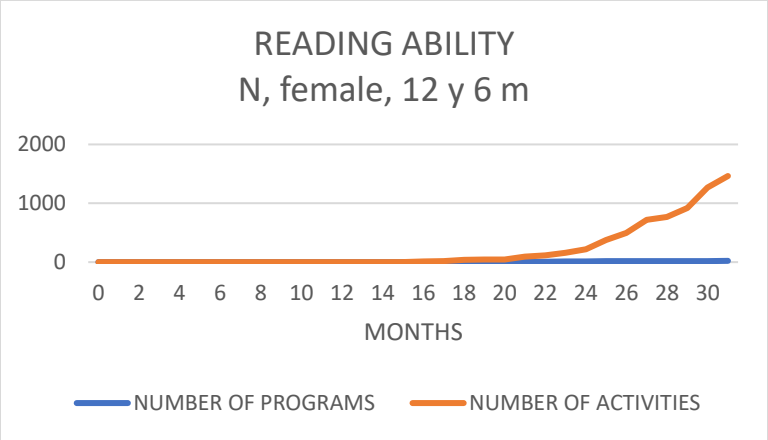

Figure 16. Reading Ability; Subject N; Number of programs and activities

Subject N (Fig.15. and Fig.16) took a long time to acquire the ability to read because the ability to read is actually only taught/trained to the subject after the prerequisites for reading are met, namely after the child had mastered the ability to imitate verbal programs, as well as sound imitation, syllables, words, and sentences. Subject N began to master one program and one activity during the fifteenth month of therapy. And then continued to increase rapidly in the program and its activities until finally able to master 22 programs and 1,463 activities in the 31st month.

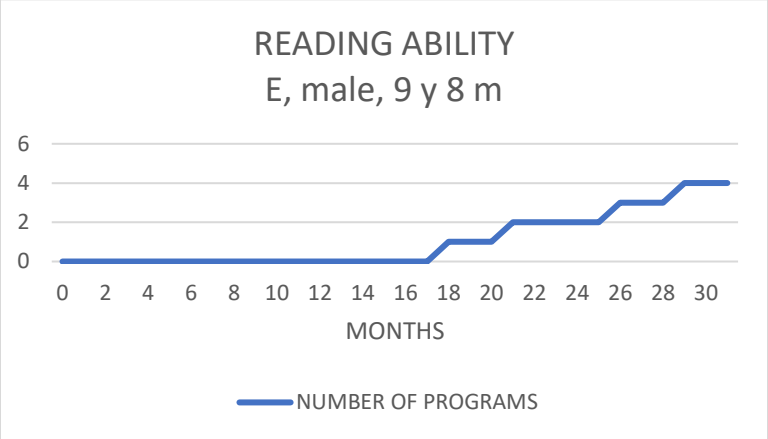

Figure 17. Reading Ability; Subject E; Number of programs

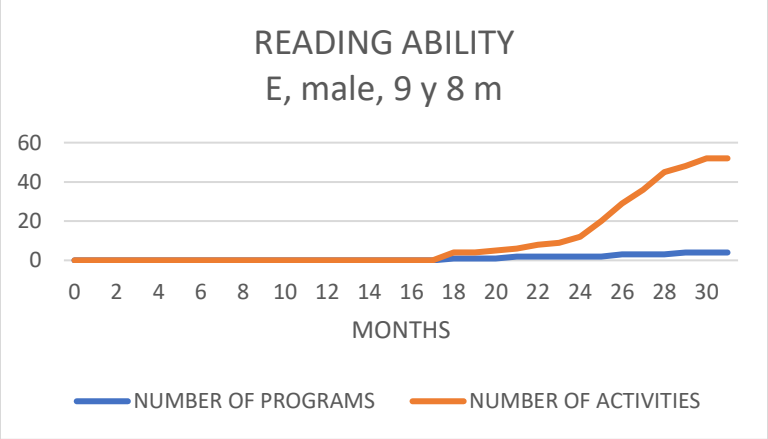

Figure 18. Reading Ability; Subject E; Number of programs and activities

Subject E (Fig.17. and Fig.18.), like subject N, took a long time to master reading ability because the ability to read is actually only taught/trained to the subject after the prerequisites for reading are met, namely after the child had mastered the ability to imitate

sounds, syllables, words, and sentences. After the 18th month of therapy, subject E only mastered 1 program with 4 activities. Then, the number of programs and activities increased significantly, to four programs and 52 activities.

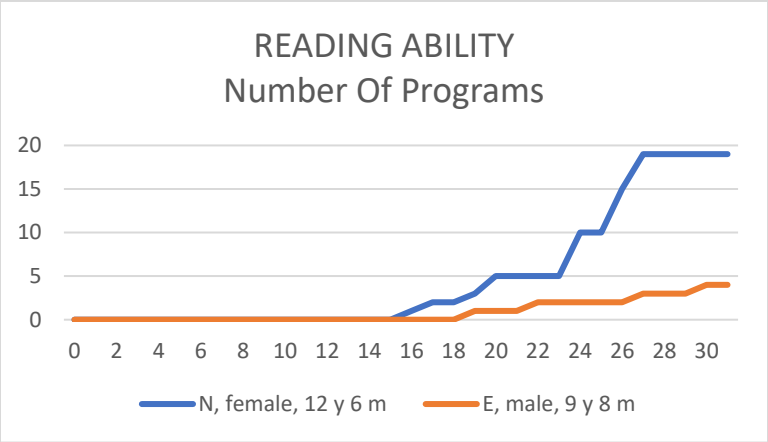

Figure 19. Comparison of Reading Ability between subjects N and E; Number of programs

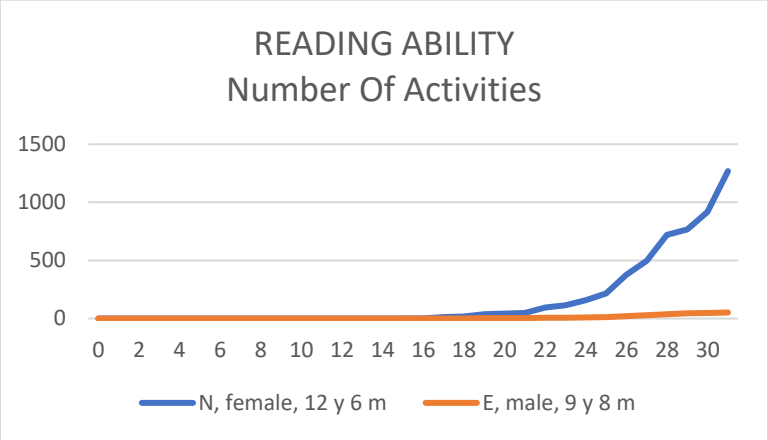

Figure 20. Comparison on Reading Ability between subjects N and E; Number of activities

Fig.19. and Fig. 20. Demonstrates that subject N was superior in reading ability compared to subject E. Subject N was able to read faster in programs and activities. Additionally, subject N also mastered more activities than subject E. Subject N began reading in the 16th-month therapy with 1 program and 1 activity, whereas subject E began reading during the 19th month of therapy with 1 program and 4 activities. At the end of the 31st month, subject N was able to read with 19 programs and 1,269 activities. While the subject E reading ability only reached 4 programs and 52 activities only.

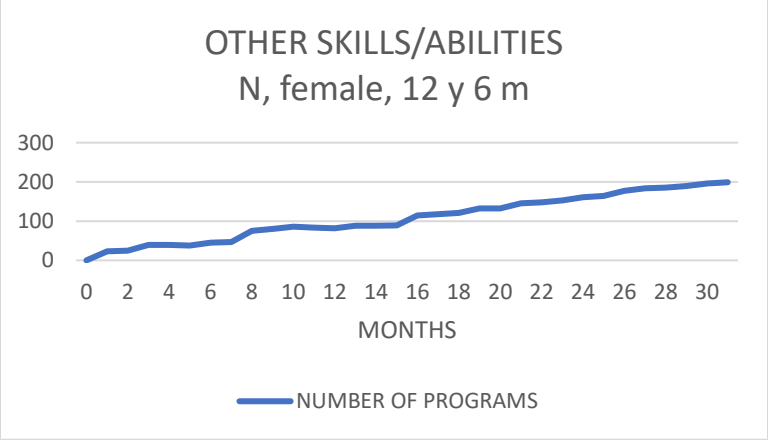

Figure 21. Other Skills/Abilities; Subject N; Number of programs

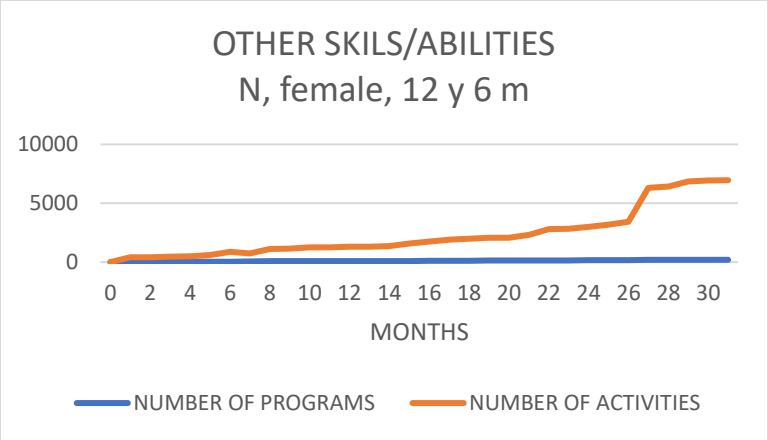

Figure 22. Other Skills/Abilities; Subject N; Number of programs and activities

As illustrated in Fig.21. And Fig.22. The ability of subject N, beyond the ability of learning readiness, imitation (Pre-Speech), speaking, and reading, developed significantly from time to time, eventually reaching 199 programs and 6,959 activities in the 31st month of therapy. Even in the 27th month of therapy, there was a very significant improvement in her ability in various activities.

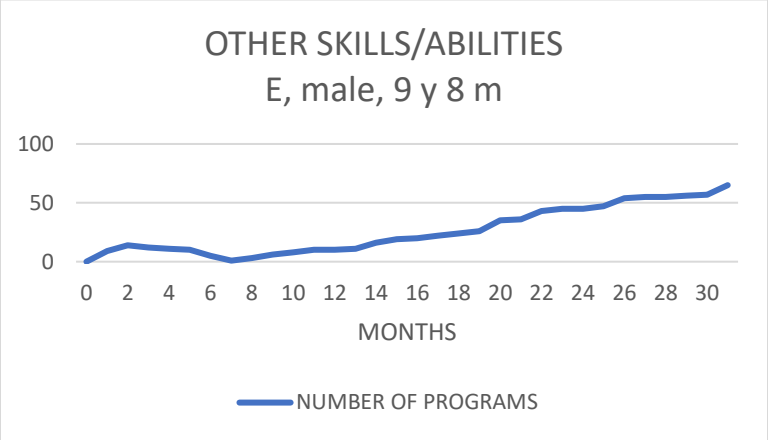

Figure 23. Other Skills/Abilities; Subject E; Number of programs

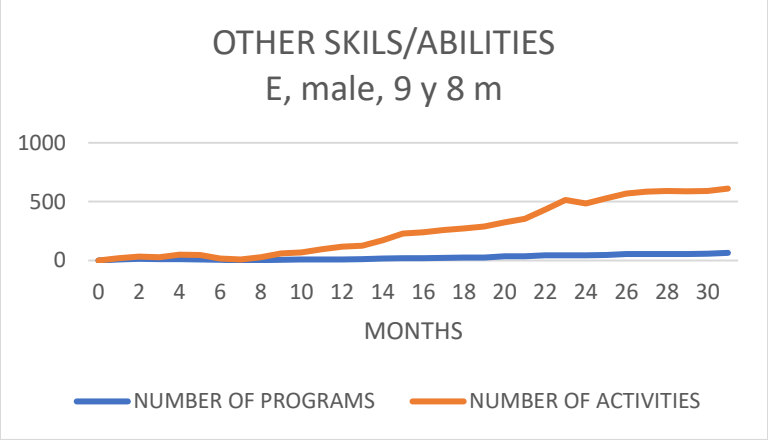

Figure 24. Other Skills/Abilities; Subject E; Number of programs and activities

In Fig.23. And Fig.24, it can be seen that the ability of subject E, beyond the ability of learning readiness, imitation (Pre-Speech), speaking, and reading, increased up to the 2nd month and reached 14 programs with 32 activities. But then there was a decrease until the 7th month when only 1 program with 8 activities remained. This occurred concurrently with the onset of epilepsy in subject E, which was somewhat difficult to control with anti-epileptic drugs, so the neurologist had to add the type of drug and

increase the dose gradually over time. Then in the 8th month, there was an improvement in the child's abilities and finally reached 65 programs with 611 activities in the 31st month.

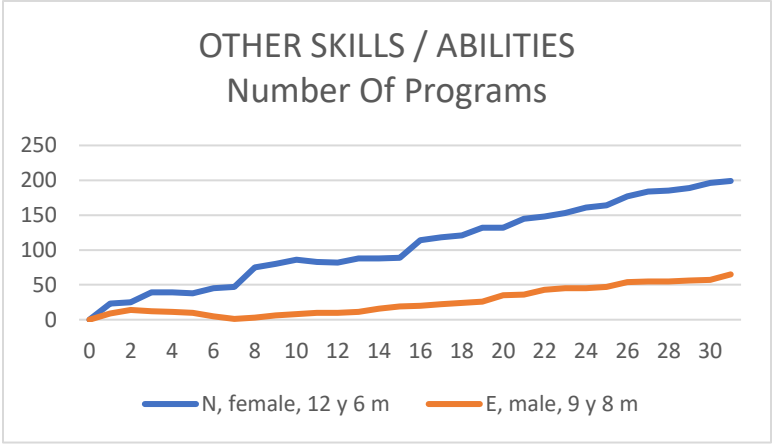

Figure 25. Comparison on Other Skills/Abilities between subjects N and E; Number of programs

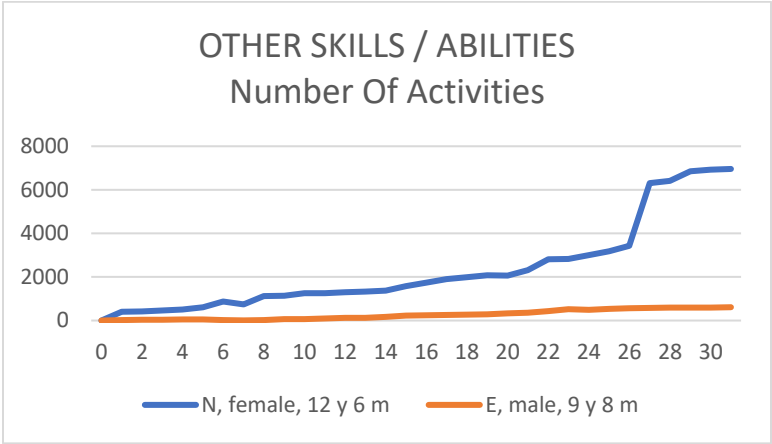

Figure 26. Comparison on Other Skills/Abilities between subjects N and E; Number of activities

The comparison of ability improvements between subjects N and E (Fig.25. and Fig.26), beyond the ability of learning readiness, imitation (Pre-Speech), speaking, and reading, it can be seen that subject N achieved 3 times more than E, which was 119: 65 programs in the 31st month. In the number of activities, subject N reached about 11 times more than subject E, which was 6,959: 611.

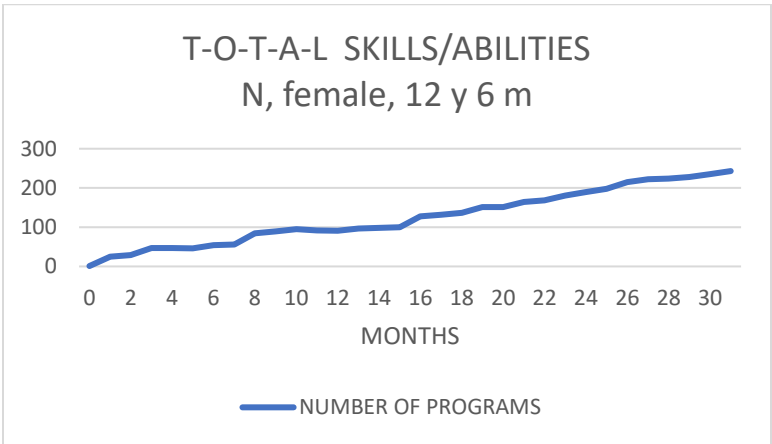

Figure 27. Total Skills/Abilities; Subject N; Number of programs

In Fig.27. It can be observed that over 31 months of therapy, subject N mastered almost all of the abilities that had been determined as the purpose of the therapy. Significant increases were seen between months 6 to 8 and months 14 to 16. In the last month of therapy, N mastered 243 programs with 9,001 activities.

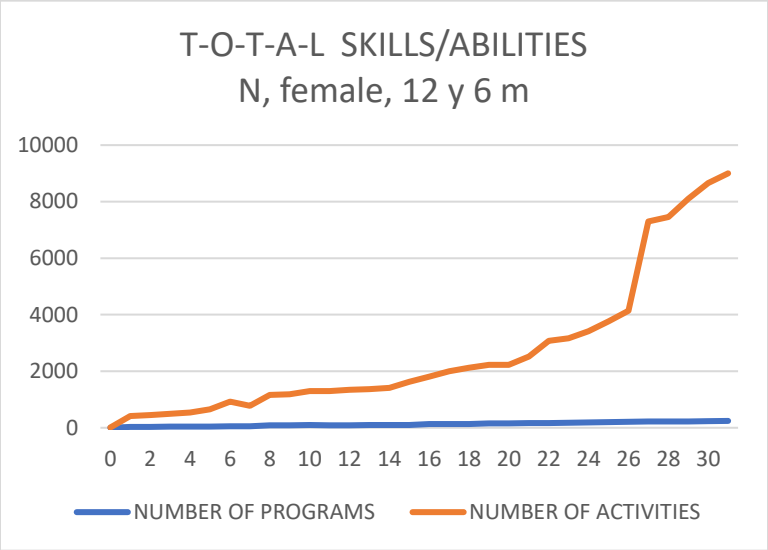

Figure 28. Total Skills/Abilities; Subject N; Number of activities

In Fig.28. Subject N's overall ability improved during the 31-month duration of therapy. N mastered almost all abilities that are necessary for mastering communication skills/abilities. Improvements occurred in programs and activities. Subject N in the program had increased and decreased. As in the 5th month of the decrease, in the 6th month, an increase occurred, in the 12th month, a decrease occurred, and in the 13th month, an increase occurred again. Similarly, the number of activities also fluctuated.

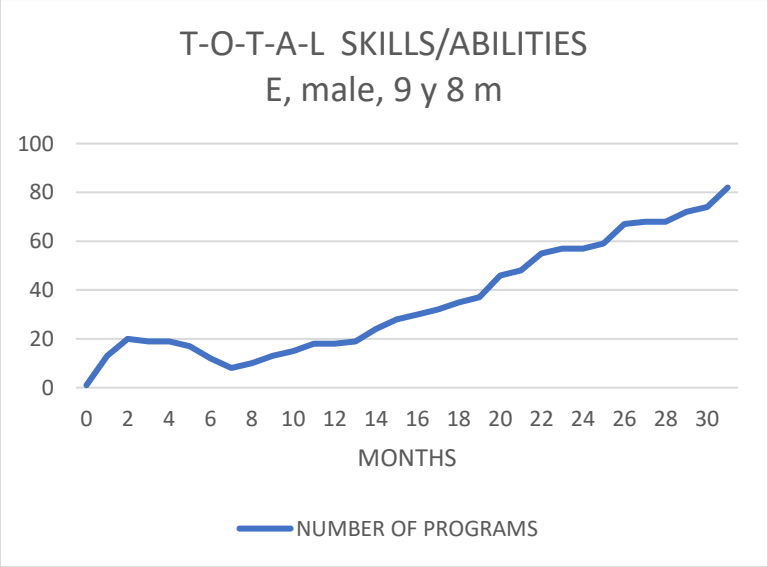

Figure 29. Total Skills/Abilities; Subject E; Number of programs

Based on Fig.29. it can be observed that during 31 months of therapy, subject E experienced an increase in the 2nd month but decreased in the 3rd month and continued to decrease until just 1 program remained in the 7th month. After that, subject E improved significantly in the 11th month and continued to improve until the end of therapy, totaling 82 programs with 801 activities.

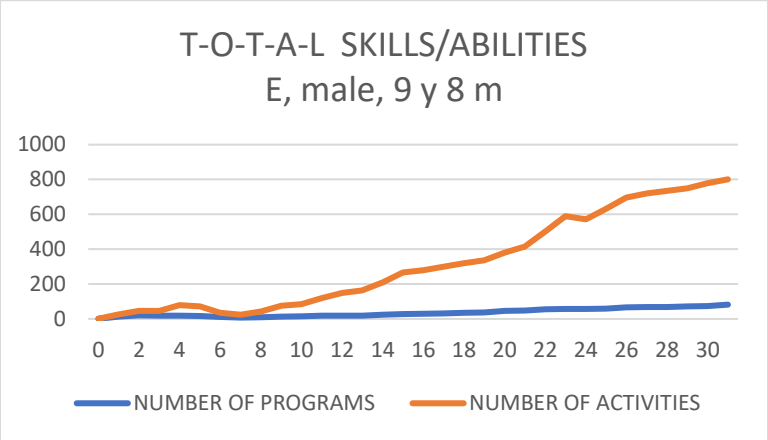

Figure 30. Total Skills/Abilities; Subject E; Number of programs and activities

According to Fig. 30, over 31 months of therapy, it is evident that both programs and activities underwent improvement and decline, which continued until the therapy was completed. Although the program stabilized in the 12th month, activity remained unstable until the end.

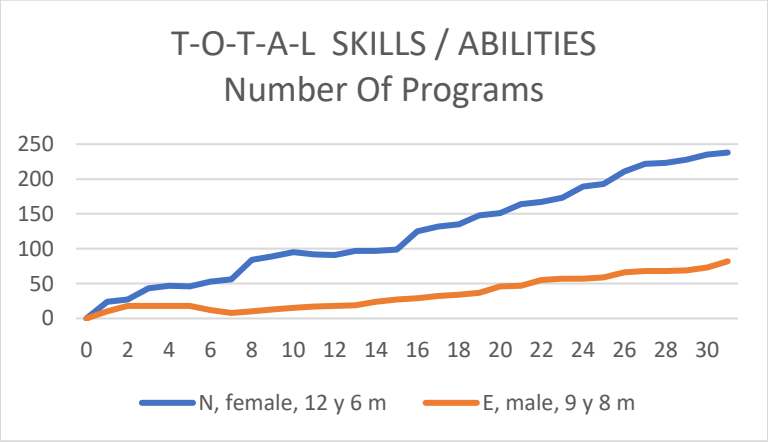

Figure 31. Comparison on Total Skills/Abilities between subjects N and E; Number of programs

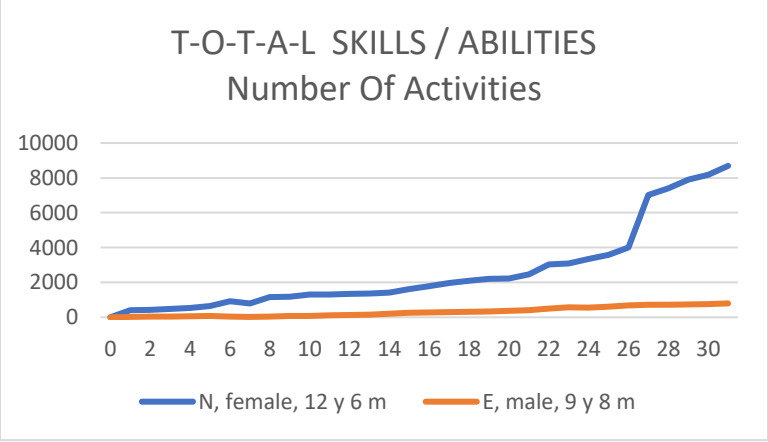

Figure 32. Comparison on Total Skills/Abilities between subjects N and E; Number of activities

The overall achievement (total) of abilities, both in the number of programs and the number of activities, subject N, is far above the subject E. In the 31st month of therapy, subject N's achievement of abilities across the entire program is almost 3 times that of subject E's across the entire program, which is 238: 82. While subject N mastered more than 12 times the total number of activities mastered by subject E, which is 8,690: 798.

5. Conclusion

From the above explanation, the results showed that therapy using the Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method) could produce verbal abilities in both subjects who were initially declared as non-verbal autism and should not be expected to speak. Subject N began to undergo Smart Applied Behavior Analysis (Rudy Sutadi's Method) therapy at the age of 12 years 6 months, whereas subject E began at the age of 9 years 8 months. Subject N had vocal sound imitation ability in the 3rd month of therapy, while subject E in the 9th month of therapy. Verbal and non-verbal abilities continue to develop despite a few declines in a few abilities, which eventually recovered, and then both subjects became verbal. In general, subject N is superior to subject E in all abilities. Subject N was able to master programs and activities first and rapidly increased, although, in the learning readiness, subject E is superior, both in the number of programs and activities mastered. Subject E also began to increase his ability in the number of programs and activities between the 7th month to the 31st month of therapy. Overall, subject N's results are much better than the results achieved by subject E. Whereas, at the beginning of therapy, the age of subject N was about 3 years older than subject E, who was 12 years and 6 months old. Additionally, subject E was previously diagnosed with mild (!) autism. Indeed, you should be careful when using mild terminology in autism, as there have been no studies linking this mild-moderate-severe criterion in autism with autism therapy, neither in the selection of method, nor fewer hours of therapy nor the quality of therapists, for example, may be just substandard. Actually, both subjects had been diagnosed at an early age, i.e. at the age of 2 years, so the hope of recovery at that time was highly expected because they were still in their golden age. But because the therapy was not appropriate, it did not produce meaningful progress. Subject N had previously been treated with SI (Sensory Integration), OT (Occupational Therapy), and ST (Speech Therapy), all of the three were not developed for autism. SI (Sensory Integration), the experts' panel of the NYSDOH (New York State Department of Health, 2017), stated that there is no evidence to support the use of SI (Sensory Integration) for autism. They also concluded that ABA is the only therapy recommended for autism. OT (Occupational Therapy) should also not be considered an autism therapy because almost all ASD children do not have occupational problems. And speech therapy itself was also not developed for autism but to overcome speech problems associated with cleft lip, deafness, post-cochlear implant, post-stroke, and so on. Surprisingly, subject E had been treated since the age of 2 years, which was said to use ABA, but there was no improvement, as well as when subject E was 5 years old after being taken to San Diego, USA, which was said to use ABA also. At the same age, when both subjects were 8 years old, they were declared as non-verbal autism and should not be expected to speak. It is advisable to be extra cautious about making such a statement before being treated with the appropriate and quality method, as well as before optimal and maximal treatment is given. In fact, both subjects became verbal after being treated using The Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method). Even so, both subjects managed to start verbally in a relatively short period of time, specifically when 3 months after therapy with Smart ABA on subject N and when 4 months on subject E after the start of therapy with Smart ABA. While at the beginning of therapy using Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method), both subjects were already 12 years 6 months old and 9 years 8 months old. This means that subject N had previously been treated for more than 10 years, whereas subject E had previously been treated for almost 8 years. Up to 3 months (treated with Smart ABA) compared to 10 years (treated with SI, OT, ST, PECS / COMPIC), and 4 months (treated with Smart ABA) compared to 8 years (treated with ABA that was not Smart ABA), as well as the age comparison of starting Smart ABA therapy on subject N 12 years 6 months old versus 2 years old, as well as subject E 9 years 8 months old versus 2 years old, is certainly a very far from balanced comparison, which is very visible advantages of Smart ABA (Applied Behavior Analysis Rudy Sutadi's Method). In a final conclusion, it can be concluded that in the above cases, Smart ABA (Applied Behavior Analysis Method Rudy Sutadi) is superior to the ABA used by both clinics in Indonesia and the USA, and even more to SI (Sensory Integration), OT (Occupational Therapy), and ST (Speech Therapy) therapy that was not developed for autism therapy.

6. Limitation and Further Research

This study used only two children with non-verbal Autism Spectrum Disorder as subjects, using Indonesian with the Smart ABA (Applied Behavior Analysis Rudy Sutadi's method) for autism that has been developed from the Applied Behavior Analysis Lovaas Method. This method requires multi-center experimental research with large samples of various ages and languages to further enhance their validity and reliability.

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Conflicts of Interest: The authors declare no conflict of interest.

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