

# A Major Breakthrough in Autism

Tongpil Min<sup>1</sup>, Gavin B. Min<sup>1,2</sup>

<sup>1</sup>PonderEd Education, <sup>2</sup>Simon Fraser University  
Burnaby, Canada

## Abstract

*Autism spectrum disorder (ASD) is known to be related to brain development. It affects social and language development, behaviours, and many more. Since brain development is tied to social and language development, most educational strategies focus on building socializing and language. However, there are people with autism who show high levels of brain performance, even with reduced social skills. This type of brain performance comes from logical thinking processes, and autistic people can acquire logical thinking processes. This was proved by previously published papers [1][2]. The papers discussed systematic approaches for a child with autism to develop logical thinking processes. However, the strategies were applied to the child who could communicate at some level. The missing part was the educational strategies for younger and non-communicable children. For the first time in human history, this paper will show systematic approaches for children with autism to simultaneously develop language and logical thinking processes. It is a reverse process from social skill-based language and logical thinking process development. This is a major breakthrough in autism and the most effective way to connect people with autism to the world.*

## 1. Introduction

People with autism can also think logically. Dr. Temple Grandin, a biologist who invented a revolutionary farming device, is a well-known example [3]. However, most families struggle with autistic children since their brain development is delayed. This is due to a lack of systematic educational methods to tackle the brain development of people with autism.

Even with enormous effort, education has not been able to cope with the brain development of autistic people. The reason is that the brain functions have not been separated. The human brain has multiple functions. For example, the brain function responsible for social skills differs from logical thinking. In neurotypical people, the brain functions for language and logical thinking are connected with brain function for social skills. In other words, social skills are the sparks and the fuel of language and logical thinking development. The brain function for social skills for people with autism is suppressed.

Since the foundation of language and logical thinking is not active, overall brain development is hindered. This is why people with autism struggle. Without social skills, the development of language and logical thinking is challenging.

Autism is a condition characterized by reduced social skills. It affects language development, which in turn inhibits the development of logical thinking processes. Autism is also responsible for unexpected behaviours. The reason for the reduced brain function for socializing is still unclear. The only known explanation is genetics [4][5]. The genetic factors are the result of evolution. Thus, autism is an evolutionary result.

The co-development of interpersonal and linguistic skills and logical thinking processes is a result of brain evolution. It is natural for neurotypical people. Language development relies heavily on social skills. As social interaction becomes complicated, language advances. So do logical thinking processes. However, the development of the logical thinking process has reached a plateau these days. Most people have average brain functions, and people with extraordinary creative brain functions are rare. This means a gap exists between ordinary and exceptional creative brain functions.

Autism seems to emerge to bridge these two different brain functions. To be creative, picture thinking is an asset. As Dr. Grandin described the thinking processes of an innovative farming device [4], simulation in pictures has the advantage. The problem is that the activation of the brain function of picture thinking somehow deactivates the brain function for social skills. This is the dilemma. Even with reduced social skills, there are people with autism who provoke both brain functions for language and logical thinking, while many others do not. This implies that there should be another way to develop language and logical thinking. Since brain function for visual thinking is not a promotion factor for language development, we had to look another way.

To develop new educational strategies for people with autism, the connections among brain functions have been compared. 1. Social skill-based language and logical thinking development. 2. Picture thinking-based language and logical thinking development. The 1<sup>st</sup> connection is for neurotypical people and is not practical for people with autism.

The 2<sup>nd</sup> is for people with autism, but the picture thinking is not connected to the language. Among these two connections, the common factors are language and logical thinking. Since language is strongly linked to social skills, it is excluded from primary targets. The only option left is logical thinking. Thus, the orders change. First, focus on developing logical thinking, then connect to language. Finally, social skills and picture thinking. This is a reversal process from the brain evolution. The brain evolution was social skill-based. However, newly developed strategies are logical thinking-based language and social skill development.

The methods to develop logical thinking processes have been discussed in published booklets [5][6][7]. The strategies have also been successfully applied to a child with autism [1][2]. The methods discussed in the papers and booklets were for individuals to develop logical thinking processes. Since the target is young children with behavioural issues and delayed language development, they must be modified.

Children with autism have difficulty socializing with people outside their families. Therefore, family members are the best people to apply the newly developed strategies. Through online coaching sessions, family members were trained on the new approaches to apply to their autistic children. As a result, children with autism in the program have shown changes in their behaviours, improved language skills and understanding of concepts. This paper will focus on changes in a child with severe autism and intellectual disability, along with step-by-step strategies for about six months.

## 2. Step-by-step strategies using repetitive life

The step-by-step strategies are based on the child's progress, and the developed strategies had to be adjusted to fit the child's progress. The strategies were delivered to the parents so that the parents could apply them to the child. The sessions were provided online since the family is located in South Korea. The strategies also had to be modified often to fit the child's case as the child progressed.

### 2.1. Changes in behaviours

The parents' biggest challenge was the child's behaviour. Since brain development can only be expected with changes in behaviour, behaviour was the primary goal.

**2.1.1. Cases.** The child had behaviour issues. When in a restaurant, he grabbed food from another table without warning, jumped out of the car, ran into trees in a garden, pulled fruits to smash, and more.

**2.1.2. Background.** Unexpected behaviour happens when logical thinking processes do not control it. Neurotypical children can learn to behave by observing others. Children with autism lack social skills. They do not observe to learn, so they do not know what to do in a given situation. The brain lacks ideas about what to do. Thus, planning their actions beforehand could change the child's behaviour.

**2.1.3. Strategies.** The parents were guided to plan the child's behaviour before any activities. For the behaviour of pulling fruits out of trees in a garden after jumping out of the car, the parents were asked to question the child what he would do step by step. This behaviour happened constantly when they were on the way to the kindergarten. The parents were instructed to ask the following questions on the way every time.

*What will you do when we park the car?*

*Where will you go?*

*Which tree will you go for the fruit?*

*How many fruits will you pick from the tree?*

*What will you do with the fruits you picked?*

**2.1.4. Results and analysis.** The questions were asked each time on the way to kindergarten, and possible answers were provided to the child. For example, 'How many fruits will you pick?' was followed by 'Three? Four?'. The child started responding after about a week. As he answered the questions, he began to behave as he replied. By applying the same strategies in different situations, the child's unpredictable behaviours were reduced significantly in a short period.

One of the most important parts of planning is that the child should make decisions. The parent's job is to ask questions and provide examples.

Letting the child make the decision is critical in this stage. The questions must focus on forcing the child to decide rather than telling the child what to do. Telling the child what to do works for neurotypical children. Following instructions is natural, as they can learn by observing or listening to others. However, children with autism lack social skills. Rather than providing instructions to follow, asking the child to make the decision is an essential factor in changing behaviours. In addition, making decisions is the first step in developing logical thinking processes since they learn from experiences.

### 2.2. Using the child's desire for language development and concept building

The child's behaviours were changed by planning. Planning is the process through which the child controls and achieves what he wants. This can

be expanded to everyday life, such as food, places to go, etc. When a child wants chocolate for a snack, parents might fight through the situation with health concerns. As parents would try not to provide it, there will be a conflict. The child insists and wins, but the parents are unhappy. If the parents win, the child will be angry.

Instead of causing conflict, the strategy was to turn the child's desire into a tool for developing logical thinking and language. The first step to developing logical thinking is building concepts [6]. The process of building concepts requires language. Thus, concept building and language are being developed together, like the co-development of social and language skills. In addition, the impact of conflict on communication and brain development was explained.

**2.2.1. Cases.** The child wants chocolate for a snack almost every day. There was a specific snack the child wished for. However, the child was not able to say the request in a sentence. He expressed what he wanted by using the word 'snack' and by presenting a dish for a snack.

**2.2.2. Background.** A child's desire could be the best opportunity for logical thinking and language progression at this stage. Since it is what the child wants, the child is naturally ready to listen and describe what he/she wants. Since this is the beginning stage of brain development, it was suggested that the parents start with questions that lead to simple answers, such as the name of the snack and the number of pieces.

The parents were asked to set up conditions before applying this strategy. The conditions were: 1. Preparing different types of snacks, including the child's favourite, and 2. If possible, prepare individually countable snacks inside the package. These conditions are for the child to select the exact snack and the number of snacks using names and numbers. Suggested questions.

*(By showing snacks) We have A, B, C, and D snacks at home. What kind of snack do you want?*

*Do you want a D snack? There are many pieces in the bag. How many do you want?*

**2.2.3. Results and analysis.** The parents were surprised to find that the child could respond with the actual name of the snack and its number. The number of the snack was not exactly what the child wanted, but the child accepted it since it was his choice. However, gradually, the child started to develop a concept of numbers as he requested a higher number of snacks. The child also begun to understand the word "more" and the idea of summation.

The child had the potential to speak, but due to a

lack of social skills, he could not express what he wanted. The questions without social skills allow the child to respond in language.

## 2.3. Expanding language development and concept building

The child started to express exactly what he wanted, and the number of snacks increased as a similar situation was repeated. The questions were modified to force the child to use two or more words to expand language skills and concept building by forcing the child to answer with more than one word.

**2.3.1. Cases.** The child asked for snacks as usual. This time, the parents were instructed to apply strategies to help the child develop language further and learn fundamental concepts required in everyday life, such as patience, subtraction, addition, etc.

**2.3.2. Background and strategies.** Building concepts in this stage is based on expectations and experiences. As discussed earlier, children with autism require visual tracking to understand concepts. For example, the word "play" in "play with the door." is social skill-based and challenging for children with autism to track visually. On the other hand, the word "close" in "close the door." is figurative and trackable. The concepts related to time are the same. Simply saying "later" will confuse children with autism. To deliver clear concepts of time, expressions like "after 20 min" with a time-trackable clock should be used. Thus, the strategies were to design questions for the child to build concepts required in daily life.

Before applying the strategies, the parents were advised to set up the conditions. Since snack time has a pattern, the parents were instructed to set up a different situation. For example, doing dishes around snack time or removing the snacks so the child was forced to expand in building concepts and language skills. The suggested questions for adaptation and modification are as follows:

*(When the child asks for a snack) I am doing the dishes now. It will take about 20 min from now. The current time is 2 PM. Do you see the longer arm in the clock? It is at the number 12. I can give you the snack when it points to the number 4 on the clock. Can you wait until then?*

*We are out of the snack you are looking for. But we can go to a mart to buy some. Can we go to the mart together to buy them? You can choose what you want there.*

**2.3.3. Results and analysis.** The child could build patience. He waited until the parents finished the dishes. When the parents asked the child to go to a mart together, the child followed. However, new

challenges also arose. When the parents took him to his favourite playdough place, the place was closed. The parents asked if he could wait until tomorrow, and he agreed. The problem was the following day. The child demanded to go to the place as soon as he woke up.

## 2.4. Building concepts to adapt to the world

Stores have time to open and close. People's life has patterns. Children with autism have difficulties in understanding social skill-based patterns. "Next day" could mean any time during the next business day. Neurotypical children can quickly catch the meaning. This is because social skills allow them to find variables in words from observation. However, children with autism cannot do this easily. For them, the words "next day" mean literally "next day." Similar behaviours happened in different situations. When he was told that his father would bring pizza on the way home, the child did not think about the timeline for his dad to come home with pizza. So, he asked for pizza as he heard pizza for dinner. These behaviours made people with autism look like they had some issues with their brain functions. Once again, lacking social skills does not affect their logical brain function. The concept-building method is to develop logical thinking rather than social skills. By having children with autism build concepts of time, days, and months, they would understand the timeline and patterns. This is a starting point for children with autism to connect to the world.

**2.4.1. Cases.** The child demanded what was promised. 1. He was promised to be taken to his favourite place the next day. 2. He was told that he could get pizza for dinner. But those promises did not happen as he expected.

**2.4.2. Background and strategies.** Neurotypical people use social skill-based language without any problems. They can find hidden or missing words to fill the gap. They can figure out the nuance or hidden meaning in language. For autistic people, this is a high-level challenge. The description must be detailed for them to understand. So, the following descriptions and questions were suggested to the parent to implant in the child's education:

*The store is closed today. We can go there tomorrow. When you get up, you can have breakfast, wash up, brush your teeth, and put clothes on. Then, we can go to the store. Will this be OK with you? Can you wait until tomorrow morning?*

*Dad just got off work. He will order pizza and pick it up on the way home. It will take him about one hour to get home. It is 5 p.m. now, and we can have pizza around 6 p.m. Can you wait until then?*

**2.4.3. Results and analysis.** The child showed adaptation in a given situation by these approaches. However, there was another unexpected problem. The child got ready to go out and did everything quickly, all by himself. He requested breakfast as soon as he woke up, ate it, washed himself, brushed his teeth, dressed fast, and then waited at the door, demanding to go. This unexpected behaviour could be changed by expanding the concept of time further. One of the most important parts is that the child begins to listen to others. It is the beginning of meaningful communication. In the beginning stage, the descriptions and questions were for the child to decide. However, the child started to listen to his parents and understand. This was a big step for the family.

The family could not go to restaurants or travel because the child's behaviour was unpredictable. However, from this stage, the child managed his behaviours in restaurants, airplanes, and hotels, allowing the family to travel for the first time.

## 3. Curiosity; connection to the world

Adapting to everyday life is the beginning of making a connection to the world for children with autism. However, the adaptation is not enough to explore the unknown world. To explore the world, curiosity is the critical factor. People with autism have curiosity. The only difference between neurotypical and autistic people is that they do not express their curiosity through language. Children, in general, show their curiosity by asking questions. Children with autism do not. They act on their interest and curiosity. For example, the child discussed in this paper showed curiosity by breaking crayons. His parents bought him crayons to draw with. However, the child broke them into pieces. And this behaviour continued at kindergarten. Initially, this was considered problematic at home as well as in the kindergarten. However, by designing and applying new strategies based on a curiosity perspective, the child has changed. The strategy was as simple as letting the child explore the world of curiosity by breaking the crayons. The parents even took him to a stationary store so the child could choose.

This strategy might sound the opposite of dealing with problematic behaviours. In general, problematic behaviours must be corrected by teaching "what is not to do." Letting them do what they want to do is different. The reasoning behind this was curiosity. Since children with autism cannot translate their curiosity into questions, they act. Breaking crayons was one of the signs. To fulfill the child's curiosity, the parents were suggested to add educational factors while breaking crayons together. The factor was the relativity in physical force for breaking crayons. One of the key points in teaching was not to deliver

knowledge. Delivering knowledge, for example, “longer crayon is easy to be broken” is not practical for children with autism to build concepts. This approach could face their resistance. The teaching must be focused on the child to build concepts. This involves describing factors to teach and asking reasoning questions, which are part of curiosity questions. The following question was a template for the parents to adapt and modify:

*Long crayons are easy to break, but short ones are difficult. Although they are the same crayons, their different lengths make the difference. Why?*

This is to stimulate the child’s brain to explore the unknown. Curiosity questions are open-ended questions. Their function is to prepare the brain to explore the unknown. Curiosity questions make brains connect to the world and work for both autistic and neurotypical children. However, not all curiosity and curiosity questions favour brain development. There are curiosity and questions that work against brain development. In fact, this type of curiosity and curiosity questions could degenerate the brain, as discussed in a recently published book (written in Korean) [8].

In summary, curiosity and curiosity questions to find answers from others such as parents, teachers, or any knowledgeable people will enslave the brain of the person who asks questions to those who are knowledgeable. They are named “knowledge-seeking curiosity and curiosity questions.” This curiosity and curiosity questions will force the brain to be passive, and the brain function stops as soon as the questions are answered since there is no reason to use brains.

On the other hand, curiosity can be translated into open-ended questions that promote brain development. The problem is that no systematic methods had been known to generate open-ended questions and thinking processes to find answers until the book was published [8].

As discussed earlier, children with autism can behave unexpectedly. These behaviours can be controlled by planning. However, the behaviour from curiosity cannot be managed using this approach. The children must explore to get the concepts to reduce these behaviours. In other words, if a child with autism were forced to stop those behaviours, the behaviours would not be fixed, and brain development would be affected as well. Trying to stop behaviours from curiosity is one factor that traps brain development.

For the child discussed in this paper, it took a few boxes of crayons to stop. Once explored enough, the child did not break the crayons anymore.

Curiosity works even in challenging situations like doctors’ or dental offices. The child resisted hard in these places. Many adults, including the parents,

had to hold him down for medical exams, and the dental care was a nightmare. The fear could be removed by showing the step-by-step processes in advance. For example, the parents consulted the dentist for information about tools and procedures and explained them to the child in detail. Videos and pictures were used to enhance the child’s understanding. The parents worked for about two weeks with the child before the dental care. The effort paid off. The child overcame the procedures and exams with courage. However, the fear did not go away completely. To reduce the fear further, the parents used photos of him bravely sitting or lying in the chairs. It worked on some level. But this could not remove the fear altogether.

The parents were suggested to stimulate his curiosity to bring out the courage to overcome the fear by asking questions. The example question is:

*The dentist uses a hissing sound tool that removes water from the mouth. How would it feel to close your mouth when the tool is sucking the water out?*

The medical exams go without any issues and become the norm.

## 4. Discussion

Autism has been known to be related to brain development and research papers on identification and pedagogy [9][10][11][12]. There have yet to be systematic approaches to tackle brain development directly. The reason is that the multiple functions of the human brain were not clearly understood. People with autism have weak brain function for social skills. Instead, they have a different brain function activated. That is picture thinking. Picture thinking is well-known in Dr. Temple Grandin’s TED talk and books [4][13][14]. In addition to picture thinking, there might be different thinking processes still unknown because Albert Einstein mentioned that he often thought in music [15].

As proven by a few people with autism, their brain function for logical thinking is not affected by autism. However, many autistic people are still left behind in terms of brain development. Their social skills are difficult to develop, their development of linguistic skills is slow, and their behaviours differ. However, as the world of autism becomes disclosed, it is possible for people with autism also to develop logical thinking processes by tackling logical thinking processes in connection with language development. One of the authors in this paper has autism. He is in a university studying biology. The reasons for behavioural differences and delayed language skills were analyzed by exploring his thinking processes.

Considering the picture thinking only, images and animations pop into their brains without control.

One example is when he saw a person fall from a bike and got injured, a cartoon character riding and falling from a bicycle was pictured in his brain simultaneously. And he laughed. The laughter was not about the real person who got hurt but about the cartoon character in his brain. A similar behaviour happens when he talks to his friends over the phone. This is another reason for unexpected behaviour, such as sudden laughter without apparent reason for others. Also, this can be an explanation for children with autism staring at one object or phenomenon for a longer time. For example, staring at fish in an aquarium can provoke fish as cartoon characters interacting with each other in their brains. Troubling to change interests from one to another might also be a result of this. As their brains play a fun animation, they would not want to be disturbed.

The coauthor also explained the sudden response to sound or light. When he hears a loud, sharp, sparking sound, his brain is filled with powerful lightning, and it hurts. So, he runs away from those sounds. Each child might react differently to various sources. However, they all seem to cause neurological reactions to their brains and hurt literally.

People with autism also have a memory of pictures. Specific images can be remembered quickly, but sometimes, they must match the image in their brains to the actual objects to modify for accuracy. This might be compared to memorizing unfamiliar terminologies for neurotypical people. Students read terminologies repeatedly to memorize them. Once the image is clear, they can project it on the canvas without looking at the objects. This could be another reason children with autism stare longer at one object or phenomenon. They are drawing it in their brains.

Evolution is a tradeoff, and the brain constantly evolves. Gaining one means losing another. However, it is not clearly understood why picture thinking had to be traded off for social skills. Some people rarely have both functions. Having both functions can be compared with ambidextrous. But for many, brain function is biased toward either one. Depending on which side is more active, the outcomes change.

People with autism have weak social skills but are strong in picture thinking or other types of thinking. Neurotypical brain development is based on social skills. Without this, language development cannot be expected. This is why people with autism have problems. Since social skills are suppressed at the brain level, they cannot cope with language spontaneously. Slower language development, in turn, hinders brain development.

The strategies discussed in this paper are based on logical thinking processes for brain development. People with autism have brain functions that allow them to think logically. This paper is the first to

discuss systematic approaches to develop the logical thinking processes of people with autism. The strategies discussed in this paper did not include social factors. They were built by connecting language and logical thinking processes.

Social interaction is not spontaneously developed in people with autism. They must conceptualize each social skill through logical thinking, which is very challenging.

This paper discusses the co-development of language and logical thinking processes by bypassing social skills. This was the first attempt in human history. The methods worked for children in the program, including the child with severe autism and intellectual disability. This is the beginning of a new chapter on autism. By further research and development, the lives of people with autism and their families will be changed completely.

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