Unveiling the Autistic Mind: Thinking, Emotions, and Behaviours

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Abstract

The thinking processes of autistic people are different from those of neurotypical people. They tend to think in pictures. The differences in emotions and behaviours are tied to picture thinking. Neurotypical people's emotions are from real world observations. However, the emotions of autistic people are strongly connected to the images that appear in their minds. In other words, if an autistic individual witnesses an accident, the brain generates an image or a video clip related to the observation. Then emotions linked to the image or the video clip arise. The unexpected behaviours are due to these emotions. If the image or the clip is funny, they will laugh regardless of the real situation. In this paper, we report, for the first time, differences in autism thinking and their relations to emotional and behavioural differences. In short, there are two different types of picture thinking: controlled and uncontrolled. The controlled images can be used for simulation, as Dr. Grandin described [1][2]. On the other hand, uncontrolled picture thinking is the source of emotional and behavioural differences.

1. Introduction

Signs of autism spectrum disorder (ASD) are known to be a lack of social interactions, difficulties with communication, fixation on a few things, and repetition of certain behaviours [3]. The reason behind all these distinctive characteristics had not been clearly understood. Thus, the differences were treated as problematic issues that needed to be addressed, especially the behaviours that look abnormal. The approaches to correct problematic behaviours are not very successful since the issues are still persistent for many people with autism. This indicates that the problem might not lie in social skills.

The results of brain functions are emotions and behaviours. Depending on how the brain processes a sensory input, emotions and behaviours are determined. Since social skills are part of brain function, educational approaches for autistic people have usually focused on social skill development [4][5][6]. However, the success rate is not high enough. Thus, understanding emotion-based behaviours from a different perspective is needed.

The problem in interpreting autistic emotions and behaviours from different viewpoints is that there were no autistic individuals to explain how their brains process input signals clearly before this paper. If the thought process of autistic people is understood, new approaches can be developed, and the stress of family members with autistic children can be reduced significantly.

To understand the thought processes of autistic people regarding emotions and behaviours, several factors must be considered. First, there should be a person with autism who can describe what happens in their brain. Second, moments of unexpected emotions and behaviours must be caught. Third, questions to identify what happened in their brain should be asked immediately after their behaviour is observed.

Since the corresponding author of this paper has autism, we have collected cases of emotions and behaviours that are not suited to real situations. Then, each case was explored to identify the cause of emotions and behaviours. Over five years of exploration, autism thinking is now being understood, and approaches to control these emotions and behaviours are also being discovered.

2. Two different ways of picture thinking

In neurotypical people, thinking processes are different from person to person. The same principle applies to autistic people. There are different ways of thinking in pictures. It could be like movies, virtual reality, cartoons, and/or animations. For example, in movie-like thinking, a picture of a fish, such as a Pacific salmon, appears to swim around in the brain, as if in a fish tank. Sometimes, specific body parts of the fish are drawn in the brain rather than the whole fish itself. One important factor to understand is that it is not seeing a fish in a real aquarium. It is a realistic image of a fish drawn in the brain, and the environment inside the aquarium is often added around it.

In addition to the characteristics of picture thinking, individuals have different thinking styles. As Dr. Grandin described in TED talk [1], some could think in patterns, some do not (the corresponding authors of this paper). However, one thing is common. They tend to think in pictures in various ways.

The picture thinking is further divided into two categories. One is controlled, and the other is uncontrolled. Controllable images, whether they are cartoons or realistic, are like simulations. The images can be moved and rotated as intended. On the other

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hand, uncontrollable images are triggered by sensory inputs and are random and unexpected. These two different types of images seem to be determined by the initial stage of thinking. The images were controllable when it is initiated from the beginning. If the images are from sensory inputs, they might not be controllable. The images that affect emotions and behaviours appear randomly and are uncontrollable.

2.1. Uncontrollable picture thinking and its impact on emotions and behaviours

Emotional and behavioural issues of autistic people are linked to uncontrollable and random images. It could be any type of sensory inputs that trigger the images. The most common initiation factors are sights and sounds. In neurotypical people, sensory inputs are directly connected to emotions and behaviours in most cases. For example, smelling food stimulates hunger and the desire to eat. However, autistic people have an additional process between sensory inputs and emotions. That is, random pictures generated by the sensory input, as shown in Figure 1.

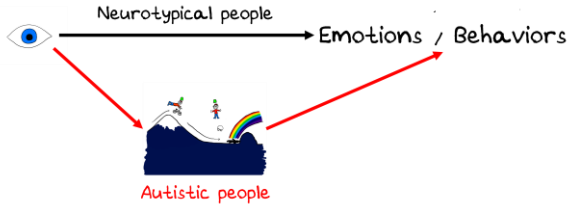

Figure 1. Different ways of processing sensory inputs between neurotypical and autistic people

When images appear from any sensory input, emotions and behaviours are responses to the images. If the images generated are humorous, they provoke sudden laughter. If the images are frightening, they will evoke fear. One problem is that the images are somewhat related to the real observation, but could reflect completely different situations. Sometimes it could be exactly the opposite. For example, they could laugh over serious situations.

2.1.1. Images that trigger the emotion of fear. Autistic children often show fear even when there is nothing that causes it. These behaviours were not well understood [7]. Thus, they were considered to originate from sensitivities. However, in many cases, the actual cause of fear is the images in the brain. For example, sounds from a fly zapper caused fear due to images of a person being electrocuted generated in the brain, as shown in Figure 2.

Another example is the fear of darkness. When the lights are turned off, the dark environment triggers a scary image of being eaten alive by a deep-sea anglerfish, like in the movie "Finding Nemo". A deep-sea anglerfish lives in the dark and uses a bioluminescent lure to hunt. Exposure to such a creature prompts the generation of an image in a similar environment.

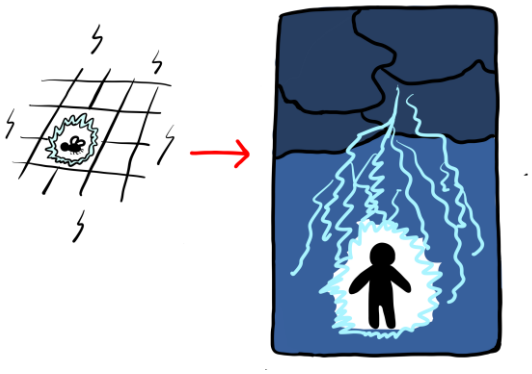

Figure 2. A randomly appearing image of electrocution caused by the sounds of sparks of a fly zapper. The images could be cartoons or realistic, depending on the case. The figure on the right is as the image appears in the corresponding author's brain when he hears the sparks from a fly zapper

It seems there are different types of fears in autistic children. One is persistent and hard to overcome, and the other has gradually disappeared. The first example is electrocution by spark sounds. Since the sound is not visible, pictures from the sound cannot be easily removed. However, the deep-sea anglerfish case is different. The fish and its habitat are observable. Once the creature's actual size, habitat, and food web are conceptualized, fear is reduced.

The differences between persistent and gradually disappearing fear might lie in the visibility. The angler fish is observable and understandable, while sounds are not easily visualized. When it is difficult to picture, overcoming fear is not easy.

2.1.2. Images that cause different emotions and behaviours from others. Neurotypical people might have difficulties understanding why autistic people feel fear from nothing unusual. Autistic people can feel fear when getting a haircut due to the cutting sound or show fears of even candles on a birthday cake. All these emotions and behaviours could be due to uncontrollable images in the brain triggered by the observation. Even if the fear is not understandable and other people are not involved, the emotions and behaviours could be treated as a personal issue and might not cause any conflict in social environments. When a similar thing happens in a social environment, it could cause some serious issues. Figure 3 shows a still image that was generated after observing a bicycle accident. The actual images were cartoon-like movie clips.

Observing a bicycle accident in which the rider fell into a ditch prompted animated movie clips. In the

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clips, a male mountain biker with a funny face and a long helmet flew off a mountain, landed on a rock, and got injured. However, instead of blood, a rainbow leaked out of his body. The clips then stimulated humour, and laughter broke out. The laughter at this moment is not from the actual accident. It was from the fun images in the brain. The most important matter to understand is that emotions are not from the actual scene. They were from the images in the brain.

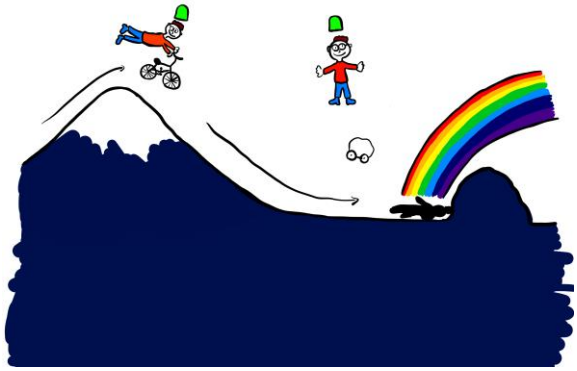

Figure 3. A still image that represents cartoon-like movie clips drawn in the brain after seeing a cyclist fall into a ditch and get hurt

The discrepancy in emotions and behaviours could lead to serious misunderstandings. Since people with autism often laugh over a serious situation, neurotypical people might interpret the behaviour as a different personality. In fact, autistic people could understand the seriousness of the given situation and make an emergency call for help. The differences are due to emotions and behaviours triggered by the images in the brain.

2.2. Picture thinking in social environments

The emotional and behavioural differences from uncontrollable images not only affect an individual's daily life. It also affects social interactions.

2.2.1 Difficulties in communicating with other people. Uncontrollable picture thinking, which is strongly linked to desire, could affect social interactions, especially in young age. With less experience, the uncontrollable picture thinking of autistic children could be governed mostly by desires. This phenomenon could cause issues in the social environment.

Autistic children might insist on what they want. For example, if a child desires a cup of hot chocolate, the desire prompts an image of hot chocolate. Once the image is drawn in the brain, the child would either constantly repeat the word 'hot chocolate' or gesture the demand. It is inevitable since the brain is fixated on the picture. This behaviour is different from that of neurotypical children. Neurotypical children also demand what they want by behaviours. The difference comes from picture thinking and language thinking. Language-thinking children are easier to calm down by persuasion. However, the pictures in the brain are difficult for others to understand and handle unless they are connected to the language.

The same picture thinking also affects communication. When an autistic individual learns something new and is interested in it, they will only talk about the knowledge they have obtained, regardless of others. In that process, the individual would repeat the same words or context. The reason for this behaviour is the desire to share knowledge when given the chance. This means that autistic people also want to interact with others, but in different ways.

2.2.2. Learning by imitation? Neurotypical children learn by imitating others. One of the driving forces of this learning process is social skills. When they want ice cream, they simply demand it at the beginning. However, as parents deny, they use tactics learnt from other children or adults. Neurotypical children can learn various skills and knowledge in this way.

Autistic children also imitate others in different ways. They could imitate conversations, accents, voices, and animal sounds. The imitation of conversations, accents, and voices occurs after building language skills. Prior to developing language skills, imitation is mostly limited to animal sounds. Like the fixated images of desires, their thoughts could be fixed on animal sounds. This is due to the images of an animal making the sounds in the brain. Basically, autistic people could think in pictures and sounds at the same time. When this happens, the children might reluctantly repeat the sound.

3. Controllable images

Uncontrollable images and sounds in the brain cause the emotional and behavioural differences in autistic people. It seems that the uncontrollable images are strongly related to desires and interests. Since desires and interests are part of basic instincts, which are difficult to control, the uncontrollable picture thinking is understandable. As neurotypical individuals can control basic instincts while logical thinking is developing, autistic people can also control picture thinking as they develop logical thinking. Then, behavioural issues stemming from basic instincts could be reduced. The question is how to develop logical thinking to control the uncontrollable images that appear in the brain.

3.1. Reduction of emotional and behavioural issues

There are sights and sounds that are difficult to

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avoid in daily life. For example, darkness or the sound of a vacuum cleaner is sometimes unavoidable. Also, these are not fear factors for neurotypical people. The sound of a spark is also common in daily life. However, the sound of a fly zapper could trigger images of a person being electrocuted. This is a frightening image, and not easy to control. These types of sounds are related to safety. So, these images might not be easy to control. However, unrealistic fears can be under control by having the brain explore the real world. For example, the fear of an anglerfish was reduced by exploring their habitat, body shape, and behaviours. The same strategy could be expanded to other marine animals. This indicates that picture thinking can be controlled as the number of real-life experiences increases. In other words, as logical thinking develops, emotions and behaviours could be reduced.

Real-life experiences and the development of logical thinking seem to play pivotal roles in emotional and behavioural issues. The only problem is that autistic people are not proactively involved in experiencing the world. Thus, guiding them to develop logical thinking systematically is essential. The only known methods for autistic individuals to develop logical thinking are through conceptualization and concept connection education [8], [9], [10], [11], [12].

3.2. Controllable images and academic performance

Building concepts and connecting concepts allow the brain to actively draw and control images. For example, in science classes, cellular functions and interactions between organic compounds during reactions can be simulated using realistic 3D images drawn in the brain. This is similar to what Dr. Grandin described in her TED talk [2].

The thinking process of simulation does not come spontaneously. An individual might be able to provoke this process on their own, either directly or indirectly. Experiences seem to enable the intentional visualization of the topic of interest. The reason that visual supports are effective in autism education lies in this. Even though visual supports are effective, they still have limitations. The individuals must be interested in the topics. If they are not interested in the topic, intentional picture drawing and simulation cannot be expected. This is why there are many autistic people who seem to be isolated in their own world.

4. Discussion

Deficits in social skills are characteristics of autism. This impacts language and brain development. Neurotypical children's language and brains develop through observation of others. They learn by mimicking others. The key player in this learning process is social skills. However, the lack of social skills, on the other hand, prohibits learning by observation. The only possible learning process of autistic children is limited to interests and desires. This limitation isolates them in their own thinking. A lack of social skills might be explained by genetics. However, the mechanisms underlying it are not fully understood.

Based on the descriptions by Dr. Grandin and the corresponding author of this paper, it is now clear that autistic people's thought processes are very different. It seems that losing social skills activates picture thinking. Losing one function to gain another has been explained by evolution [13]. Thus, autism might result from evolutionary tradeoffs in the human brain. The increase in the number of neurodivergent people could also be explained by this evolutionary perspective.

Picture thinking explains the differences in emotions and behaviours of autistic children. Neurotypical children show their interests by observing others. They watch cartoons and movies and listen to music. These behaviours are social skills. Being interested in others is the basis of learning knowledge and skills. Without social skills, they would not be able to learn by observation. In autism, picture thinking is enabled. This means they are watching cartoons and movies in their brains rather than observing others. As experiences increase, the picture thinking feature becomes more active. From this moment, autistic children might not need to interact with the real world.

Picture thinking is not all a disadvantage. When the images generated are controlled in advance, this thought process could be used for simulations. Simulations are beneficial for daily activities, including academic performance. However, images cannot be controlled naturally. The concept-building and connections [7], [8], [9], [10], [11], which are tools for developing language and the brain, enforce the control of picture thinking.

We have established and published methods for systematic brain development [14], [15]. By the time these methods were being developed, the thinking process of autistic individuals was not clear. Since more details about picture thinking have been unveiled, the methods can be adjusted accordingly. Thus, a manuscript with updated educational strategies is submitted to the *International Journal of Technology and Inclusive Education* alongside this paper [16]. The paper provides step-by-step methods for developing language and brain function in autistic children. The strategies are based on the processes of brain development. The processes of brain development were not well understood before, even for neurotypical people. Thus, conventional education for developing language skills and thinking processes was ineffective. However, neurotypical people can

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foster the development of language skills and thinking processes since they have social skills. Autistic people do not have social skills. Because of this, the education is even more difficult. There was no clear direction to follow. By combining autistic thinking, emotions, and behaviours with novel methods for brain development, it is possible to systematically educate autistic people in language skills and thinking processes.

5. Conclusion

The researchers have put enormous efforts to develop new strategies and methodologies. The results were not satisfactory, given the effort and time invested. The reason was a lack of understanding of the brain developmental processes. The only brain developmental process known to date is through social skills. Without developing social skills, there was no other way to turn. This is why there were challenges in educating autistic children. As discussed in this paper, people with autism think in very different ways. Their emotions and behaviours are also different from those of others. The education must be able to handle people with these differences. Common sense from social skills does not apply to autistic people in many cases. They have their own scenes to observe in their brains, rather than interacting with others. Still, they do want to interact with others. However, the approaches that they take are not accepted by neurotypical people in most cases.

Education is about helping neurodivergent people learn through their unique characteristics rather than discriminating against them. When education cripples, conflicts and discrimination increase. These were the lives of autistic people and their family members. It is now the time to change the world. By applying the new strategies, educators can include people with different thinking processes in society and the world. Neurodivergent people, including autism, might be different in the beginning. Soon, they will change the world.

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