

Communicating with those who cannot communicate: the alternative methods of communication for people with autism

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MA Design Products

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Word Count: 12690

October 2015

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INTRODUCTION

Considering communications, people believe ‘with whom’ is more important than ‘how’. Infinitely expanding SNS (Social Networks Services) delude us that connections may spontaneously generate wherever there is people and content. Self-expressions diffuse through the whole worldwide web in a second, and they construct new social connections with millions of ‘likes’. It seems that everyone is connected and is able to communicate with each other.

But people suffering with severe autism are excluded from this network, since they are unable to communicate with others. Autistic people use different social grammar and expressions; people usually don’t even recognize that they have their own thoughts and emotions. People suffering autism are like isolated islands, accessible only after a bridge is constructed. This paper is a guideline to build those bridges. I aim to find effective ways that enable people to understand autism patients, and for these patients to reach out to other people.

Whether they are able to make a conversation or not decides life qualities of autistic people. Among patients, those with communication ability can have a job and live a normal life. Those without it may live in a world lacking of understanding and where even closest people distort their intentions. They hardly obtain what they are in need of, and cannot deliver even the simplest intentions, like yes or no. This extreme situation is the main reason why many autism patients are in so much anger; their suffocation that comes from the communication gap is often expressed by pure rage. People often think autistic people make strange sounds and do unpredictable actions just because they have autism. However, it is anger in their mind that makes them do so.

This rage calls a vicious circle that most autistic people are caught in since they are children. Not knowing why autistic children do so, parents and protectors just blame them for their strange behavior. Children’s rage deepen because they cannot fulfill their desire. Strange behaviors become more severe. Then, exhausted parents and protectors just give up on their children and gradually abandon providing education for them. Although autistic children have enough intellectual capacity to be educated and have their own clear thoughts, their talents and ability gradually become pushed out of their parents’ mind. Consequently, autistic children lose the chance of learning basic manners that are required to live as independent individuals.

This is how they are imprisoned inside the house. My brother is at present 25 years old and has autism. Our family believed that we did the best for him, but in fact, we may have been imprisoning him in a glass box for all these years. Until the age of 10, my brother was very aggressive and was angry all the time. One day, he turned very calm like a lamb, which made us very happy. When he was 20, we suddenly found out that he could read, do maths, and even know quite a bit about history. We realized this as we found out coincidentally that he could use a computer keyboard. The shocking realization at that time is still clear to us. We realized then that Min-jun had a lot to say in his mind and was extremely angry with others for not being able to understand him. It was devastating to realise that he had given up trying to communicate his feelings to others. I felt that this shouldn’t happen to other people with an autistic mem-

ber in their family. I feel passionate that an appropriate way to help people with autism to communicate with others should be developed.

Then what are the situations in which autistic people require aids for communication? I acknowledged three different kinds of core communication channels that autistic people need. First, autistic people need to express their genuine feelings to their nearest people. In this case, listeners are also desperate to understand autistic people. Therefore, aids should be provided to help autistic people express even their deepest emotions. Second, autistic people need to express their intentions quickly and precisely to unfamiliar people in public places. Listeners are not familiar with autistic people, and often fear about what autistic people are doing in this case. Thus, help should be provided to make autistic people express simple opinions immediately. Lastly, autistic people need education that permanently solves their communication problem. Although patients have enough intellectual ability to be educated to communicate, many are excluded from this.

There are already existing products and methods that are designed to solve the problems mentioned above. (This part will be written after researches are done)

The rest of the article is organized as follows. Section 2 defines the three channels to help communication of autistic people and analyze current ways through case studies. Section 3 finds alternative methods that improve the current ways. Section 4 concludes the article.

CHAPTER 1 –Introduction to a special kind of people

One in 68¹ people are born with a certain disability. Like everyone else they wish to be happy, but are often met with disapproval and rejection by others. Their disability is muteness. Although they are unable to communicate with others, they have their own language inside. Their physical bodies are not in their control, and they often make silly noises and uncontrolled movements. However, their thoughts are at their utmost freedom. Memories for them are not a continuous line but a series of dots, so they are often mesmerised by the beauty of the moment. Because of their oddities, they are commonly misunderstood by others, but they too are also aware of this. Their view of the world is slightly different to ours.



fig1. Green Bamboo, colored pencil on paper, 64x48(cm), 2015, Donghyeok Yu

Everyone has a world of his or her own, as such, a right opinion may not exist. The world is full of individuality and paradox, so whoever is different from me is just another person. However, there are rules of society, like communication bridges between distant islands, such as manners, promises, order, regulation, and exchanges. Communication could be the only way to gain an insight into the world of others. For this reason, many people fear and stigmatise those who cannot communicate.

Society has named this world 'Ja-pye(自閉)' in Korean. Ja-pye is autism in Korean and it means being caged inside. Their world is treated as a prison simply because of their different communication method in their special world.

¹ <http://www.cdc.gov/ncbddd/autism/data.html> (accessed 15 July 2015)

Their liberal thoughts are thought to be incomprehensible. People are not interested in autistic people who cannot communicate. They are often ignored by people or met with startled faces and fleeting eye contact in public areas.

Whenever my younger brother was met with this attitude by complete strangers, I always wondered; why did he have to be ignored when he is just one of millions of autistic people in the world? Why do people not wonder about autism or try to understand about it? After settling my discontent, I felt ashamed of myself, wondering if I know my brother truly. Do I understand what he is trying to say? It was this self-reflection and regret that motivated me to write this thesis. Further, I wish to increase the interest and understanding of autism in the wider public through this thesis.

1.1. The medical causes and symptoms of autism

Autism was first medically defined in the 1940s, but its diverse range of symptoms and prognosis has only been recently identified. At present, it is the norm to diagnose patients with autism spectrum disorder (ASD) when they have very mild symptoms. By the age of three, infants with symptoms of ASD show at least one of the following symptoms; anti-social behaviour, communication problems, restrictive and repetitive behaviour.

Previous research has identified three different causes of autism, an environmental factor, a physiological factor, or a combination of both. The environmental cause described by Bettelheim (1967) and Szureck (1973) is from the effect of the mother's behaviour towards the child during an important phase of its development². On the other hand the physiological cause was hypothesised in the late 1990s, which describe that problems with the neurological function or the brain structure may cause autism. Many scientists argue that the poor connection of the central nervous system causes the inadequate functioning of the physical sensitivity and cognitive function. Conversely, the hypothesis that combines both the environmental and physiological factors describes the interaction between the mother's behaviour and the physiological state, i.e. the disconnection of the central nervous system, as the cause of autism.

As such, existing scientific evidence suggests that autistic children from a young age show persistent damages in the ability to socially communicate and interact, and show a limited range of behavioural pattern, interests and activities. In Table 1³, the symptoms of autism are divided into four different domains; defective interaction, cognitive impairment, repetitive behaviour and faulty exercise abilities.

² Park, Kyung Sook, The Effects of the Sensory Integrative Function Development Program for Autistic Children, Ewha Womens University, 1987, 4-7

³ Park, Sun Eui, An Effect of a Developmental Therapy Education Program for the Total Development of Young Autism Children, Teagu University, 2001,6-8

Interaction	Problems of interpersonal relationships exist. They are excessively attached to their parents or friends and have problems with emphasizing with others. Therefore, they often do not express appropriate feelings in certain situations. Further, they fail to imitate external stimuli including those from parents, so cannot develop perceptive senses and exercise ability properly.
Behavioural characteristics	Autistic children cannot control their bodily movements, and they are often seen with strange facial expressions, bodily positions, hand movements and walking on toes. They are also obsessed with unity. Their devotion to unity persists even if a certain behaviour is very strange or inappropriate. Also, they can become very obsessed with particular objects. Such characteristics make autistic children very fearful and anxious of meeting new people and encountering new objects, so cannot learn to the rule of social interaction. This is reflected in their behaviour and speech, which are often repetitive in nature. At times, they show very aggressive behaviour, such as self-infliction of injuries.
Cognition	There are problems of cognitive development. Autistic people simply do not have low cognition, but have difficulty developing it. Furthermore, they experience insensitivity or hypersensitivity to external stimulation. For example, they may block their ears due to oversensitivity to sound, refuse touching their parents due to hypersensitive to touch, or have difficulty wearing clothes with different texture. All in all, these are important factors which inhibit the proper development of perception.
Communication	Autistics children do not have deformity in their oral structure or organ, but have a deficiency in the linguistic ability to express themselves. Further, as difficult it is for them to express their thoughts, people cannot understand them. So, even if autistic children learn with great difficulty to use the appropriate language, they have difficulty in maintaining conversation with others. Furthermore, they cannot express the appropriate emotion at the correct situation. For example, they may laugh uncontrollably in situation where everyone is solemn.

Table 1. Characteristics of autism

1.2. Education over treatment

At the time when awareness of gender equality was increasing, the book by John Gray, *Men Are from Mars, Women Are from Venus*, was the long-time bestseller. It was a book which described by men and women cannot sometimes understand each other, illustrated with entertaining examples and explanations. The most interesting part was the illustration that the language system of Mars and Venus are similar, but at the same time totally different. For example, when a woman asks “what are you doing?”, a man interprets it literally as what he is doing right now, whereas a woman is actually demanding physical and/or mental attention. The author writes that men and women are different in numerous ways, and thus require constant communication between the two.

I sometimes think that autistic people are from Saturn, because the two are very much alike. Like the fact that autistic people cannot divert their eyes from beautiful objects, Saturn has the most beautiful ring in the solar system. Autistic people adore objects that rotate, and often have the urge to spin things. Similarly, the rotation cycle of Saturn is twice that of Earth, at around 11 hours.

The physical body of autistic people require treatment. However, like the difference between men and women, they do not have mental illness but are simply different to the rest of us. Firstly, they are not restricted by the concept of time, so are not bound by past memories and are captivated by the present beauty. Although they cannot grasp the full picture of what they are seeing, they can see details which are not perceived by the normal eye. When normal people simply recall memories, they are able to relive the moment and feel every emotion.

Similar to how men in the past treated women as ‘somewhat lacking’, people today may be wrongly treating autistic people. People often refer to treating autism. However, there is discrimination in the word treatment with regards to the dichotomy of being normal or abnormal. Autistic people do not require treatment, but heartfelt communication with others. What is more, they need to learn how to communicate with others, which is like learning a new language. The definition of education is to bring out the abilities of the educatee, to allow them to live a better life, increase knowledge and absorb new skills, and contribute to the advancement of society. Through education, autistic people can learn how to live like people of Earth, and we in turn can learn a new way of thinking from the people of Saturn.

The statement that we can learn a new attitude from autistic people may be abstract. To expand, the special characteristics of autistic people may be divided into 4 categories. In table 2⁴, we can see that autistic people possess thoughts and abilities unique to autism. Although their full capabilities have not been revealed, table 2 shows that what we can learn from them is sufficient.

Then what is the correct way to education people to communicate with autistic people? What must be first emphasized is the proper understanding of being ‘different’ by parents. Many parents believe that their autistic child is somehow mentally deficient, and are patients who require hospital treatment. However, this sort of attitude may actually scar children and further isolate them from the world. In particular, when parents over-emphasise the ‘difference’ as an autistic child, the child may no longer perceive this ‘difference’. In their parents eyes, the individual characteristics

⁴ Naoki Higashida, *The Reason I Jump: one boy's voice from the silence of autism*, United Kingdom: Hodder & Stoughton, 2014

and the identity of their child are overshadowed by their autism.

A completely new experience which happens in front of their eyes cause autistic people turn towards what they already know. Autistic people often exhibit strange, incomprehensible behaviours, such as suddenly screaming in the middle of the road. The sad fact is that even though they are screaming on the outside, they may be crying on the inside. Like tears during a sad movie, this occurs uncontrollably. However, parents often do not understand and reprimand their child for this behaviour. Like the fact that people choose to go for walks on a warm autumn day for different reasons, autistic people may have their own, individual reasons for their behaviour.

As such, the way by which autistic children can come out of their world is to understand the ‘difference’, but at the same time communicate with them in a non-discriminate way. The reason why parents are able to give appropriate education to non-autistic children is that they have the same cognitive system and way of thinking as the parent. Parents should perceive that autistic people indeed live in a different world, a different method of communication is required through technical translation. However, their world is not inferior to ours, and we must respect each and every person for their unique being.

Perception of objects	<p>They look at the detail first, and then the whole object.</p> <p>They are visually captured by vivid colours and interesting shapes, and show extreme concentration.</p> <p>They are truly joyed by the beauty of objects.</p> <p>They perceive nature and objects as their friends.</p> <p>They like order and tables. E.g. calendars, train schedules</p> <p>They are able to easily memorise things they are fascinated by. E.g. train schedules</p>
Concept of time	<p>They cannot understand the concept of time.</p> <p>For them, a second may be long and a day may be an instant. (There is no difference between a second and a day).</p> <p>They can remember what happened years ago like yesterday.</p> <p>They cannot remember recent events.</p> <p>The flow of time is like a series of dots instead of a line.</p>
Behaviour and sensual perception	<p>They cannot stop obsessive behaviour.</p> <p>They are comforted by repetitive behaviour and sounds.</p> <p>They create their own world by making unique noises.</p> <p>Making noises is like breathing, so they cannot stop.</p> <p>Their sensual perception is affected by their temperament.</p> <p>They watch other people’s voices without looking into their eyes.</p> <p>They use sensual organs to listen to other people.</p>
Emotional expression	<p>They may suddenly explode with laughter when they recall a funny experience.</p> <p>They relive the emotional experience of a memory, by instantly picturing various events of the past.</p> <p>They cannot contain their extreme joy when they feel happy.</p> <p>They crumble with shock when they experience failure.</p>

Table 2. Autism: a different world

CHAPTER 2 -The Pre-requisites of Communication and its Design

The alternative method of education may connote various options. In particular, we could focus on education given by parents at home after school-hours which does not require the help of professionals. First of all, it would be essential that the autistic child feels at home in an environment that they feel secure in. The senses of an autistic child is much more sensitive. For this reason, they are able to concentrate less on their parents' or their teachers' words. For a more stabilised conversation and education, a secure environment which is preferred by the child is necessary.

Secondly consistent promotion of the basic physical attributes is required. The development of the physical organs in autistic children is slower than that of other people. If they are provided with exercise tools which help to continually stimulate those under-developed areas, these stimulations could translate to the development of their cognitive, communicative, and exercise abilities, therefore live more comfortable lives as a result.

Thirdly, a special tool of communication would be required in order to communicate with autistic children for their education. If an appropriate tool is used with the child, a conversation albeit slow may be possible, which in turn allows for their education. This would definitely enhance the quality of their lives compared to when they cannot communicate.

Fourthly, infinite and unrequitable love, as well as empathy, for the child is necessary. This would give psychological stability to the child, which would in turn increase the uptake of education, allowing them to progress into beautiful individuals. Such an education is certainly different to what infants normally receive, but this is just a personalised education for those with somewhat different propensities. If they able to receive such education, they would be able to achieve happier and healthier lives even in adulthood. Further, they may even be able to return their gifted abilities back into society, a new kind of charity that is not seen at present.

2-1 A Design which gives Psychological Stability: Education and space at home

Autism may be described overall as a developmental disability which restricts social interaction and communication. The typical characteristic of autism is that communication is out of the control of autistic people. Therefore, the usual pattern of conversation with an autistic person is that they end up making incomprehensible bodily actions or noises and make it impossible to continue conversing. Often, the other person is left to start off a conversation and lead it too.

Current research describes the diverse linguistic communication deficits of the autistic person as follows. So-Hyun Lee (1995) argues that it is not the problem in the ability to absorb and use words, but the inability to express their own opinions and understand the feelings of others which makes communication difficult. Even if they want to express something, it is expressing this in a socially acceptable way that is problematic. Yonclas and Brya (1989), discovered that autistic children use more non-verbal methods of communications like body movements than normal infants⁵. Kiernan (1983) explains that because of the developmental link between non-verbal communication and exercise of visual perception, communicating via movement comes more naturally for these children with cognitive deficit⁶.

Normally, children naturally learn to communicate by constantly practicing new words by conversing with their parents. However, autistic children are born with a disability which blocks them from carrying out this natural feedback. Therefore, they will be unable to incorporate new words and grammar into everyday conversation even if they are taught them. Autistic children are unable to naturally learn the methods of communication. If this problem of communication is neglected during the critical years of infancy, development of the child will be severely delayed and cause limitations in their later daily lives. Therefore, early intervention is key for communicative development.

Results of early educational intervention for autistic children is being reported by many studies. The educational outcomes when interventions were carried out before the age of three is more positive than when it is done older (Hoyson, 1988)⁷. Furthermore, there is evidence of a long-term effect of early education on the cognitive, educative, social, psychological and behavioural aspects of an autistic person (McEachin, Smith and Lovaas, 1993)⁸. The case for an early diagnosis of autism and early education can be argued for by the following reasons. Firstly, early education must be achieved before the development of abnormal communication methods characteristic of autism. This would allow for a relatively more normal way of communication. Next, behaviours which are inhibitive of a normal life may be prevented through early education. Examples of such anti-social behaviour are self-injury, sudden aggression, and excessive obsession. Lastly, parents can be accurately informed of the autistic tendencies of their child, and be aware of

⁵ Kim Min Young, Lee so Hyun, The Effects of Enchanced Muliu Teaching on the Spontaneity of Functional Communication Behavior for Children with Autism, Special Education Research, 2006, 32

⁶ Kim Min Young, Lee so Hyun, The Effects of Enchanced Muliu Teaching on the Spontaneity of Functional Communication Behavior for Children with Autism, Special Education Research, 2006, 32

⁷ Lee, So Hyun, Early Intervention in Autism: Best Practices Based on the Analysis of Model Program Components, The Korean Journal of Special Education, 2002,370

⁸ Lee, So Hyun, Early Intervention in Autism: Best Practices Based on the Analysis of Model Program Components, The Korean Journal of Special Education, 2002, 370

the alternative education that is required by them. In this way, the child would be able to receive appropriate education in the environment in which he or she spends the most time in, which will contribute to a speedier and greater development for the child.

The major examples of types of education which have been carried out recently include behavioural therapy, play-based therapy, language therapy, sensory integrative therapy, special physical/psychological exercise, and musical/artistic therapy. The current project has identified a way to divide these methods of treatment into two broad categories. First is whether the treatment or education requires intervention by a medical professional, and second is whether it requires the use of a special product of tool. These categories are described in Table 3 in greater detail.

	Medical professional required	Medical professional required occasionally	Medical professional not required
Tool required	Picture Exchange Communication System (PECS treatment) Psychological training / special physical activity	Artistic/musical therapy Sensory integrative therapy	Sensory integrative therapy Artistic/musical therapy Provision of a stable home environment
Tool not required	Applied behaviour analysis (ABA) Play-based therapy	N/A	N/A

Table 3. Types of therapy organised on the basis of the need of medical professionals and/or tools.

At present, the education of the communicative ability of autistic children is often carried out in specialist schools or organisations in which professionals are present. However, the opening hours of these facilities are often during the day-time only. Autistic children spend their time with their families thereafter, and receive a much less effective education during these hours. However, education at home, which involves interaction with family, gives stability to the child and it is an educational method as important as the one provided by professionals. Therefore, bearing in mind this method of classification based on the two factors, the current study attempts to identify how family members can provide education to their autistic child, which does not require the help of medical professionals.

From looking at the table, we can see that there are various ways of treatment. In particular, I will focus on sensory integrative therapy, artistic and musical treatment, and the stable family environment. Of these three, the foundations of any treatment must be the provision of a stable family environment. From observing my brother's routine, I realized that the family life and environment is as important as the professional education received in specialist institutions for the education and stability of my brother. During term time, my brother would be home after six, and during the holidays he would depend on a specialist institution where he spent 4-5 hours day. The rest of the time would be spent at

home. My brother suffered from staying at home after school hours and always wanted to stay outdoors. He would also refuse to make conversations with family members and did not communicate. His time at home composed of pinching me, misbehaving, following around family members, and being lethargic and stare at the ceiling whilst lying on the bed. We could do very little for him at home. Whilst we attempted to converse, 'hello' was simply a meaningless and repetitive word. He was always sensitive and unstable. We thought that this is how autistic children behave usually, and believed that we as a family could do very little to help.

However, treatment for autism is much more developed in this present day, and my family realized how wrongly we tried to address my brother. We wonder if we had not wasted so much of the time my brother spent at home, whether he may be living a fuller life. Whilst my family loved and tried our best to help our brother, we did not provide him with the optimal treatment at home. We did not provide a platform for communication or a suitable environment for an autistic child. My family's biggest mistake was trying to understand my brother in our point of view. Not being understood, and having people unable to comprehend him, has cause repetitive stress which ended up with my brother an autistic person who cannot communicate. Sadly, what my brother shows is the importance of education at home, even more so than professional help, in treating autism.

Even today, many parents of autistic children are undergoing the same stress and making the same mistakes as our family. By the time parents realise that their child is autistic, they are mentally overwhelmed and mindlessly seek professional help at various well-known institutions. In fairness, trying to seek the best and diverse education for their child. However, providing a stable environment and a calming space at home is of utmost importance, more than any professional therapy. Professional help will be hampered if the children are not cared for appropriately at home for their sensitive and irritable behaviour.

Autistic people have very sensitive senses, so they may become very irritable in environments which they are not fond of. Parents often decorate rooms for young children, and for a normal child this is usually not an issue for them to spend time in the room because the child and parent have similar brain structures. For an autistic child, although the decoration was done according to what the parents think is best for their child, he or she is likely to feel uncomfortable. What an autistic child prefers in terms of space, product, and orientation is beyond the comprehension of normal people, but these must be satisfied for a stable psychology, which will in turn allow children to make eye contact, make conversation, and have a mental capacity to uptake education. What then is the best environment for an autistic child?

Autistic people have very different preferences for various objects, and is as diverse as how we all have different preferences. Their preferences of a stable environment is as follows:

- a. Use of indirect lighting and the avoidance of noise or other distractions, (blind cords, exposed pipes or dominant views out), need to be considered⁹.
- b. The need to provide simple and reduced detailing¹⁰
- c. The requirement to provide a mix of large and small spaces¹¹
- d. The need to balance security and independence¹²
- e. A space (using both floor and wall space) on which movement is possible so that the senses are stimulated.
- f. A space which sound proofs noise coming from the outside, and at the same time that allows effective transmission of noise from within. The provision of headphones and microphones to allow concentration when listening to sounds.
- g. To increase visual effects, the colour of the wall in the therapeutic environment must also be considered. Use of lighting which may be adjusted, images and pictures of various shapes, a glass ball which reflects light in all directions, a highly fluorescent Line-light, mirrors, and sunlight is recommended.
- h. Exploration of a range of smells and tastes is also recommended, for which perfume and scents can be used to stimulate the smell.

Factors 1-4 is an effective way to produce a stable environment for autistic people. Factors 5-8 can stimulate their sensory organs, giving them both stability and joy at the same time. An environment which encompasses several of these factors have also been named snoezelen.

⁹ Designing learning spaces for children on autism spectrum/ Published in partnership with The University of Birmingham autism. west midlands and Autism Cymru.36 / BB 77: DfEE, 2005 Section 2.3.2, 37

¹⁰ Designing learning spaces for children on autism spectrum/ Published in partnership with The University of Birmingham autism. west midlands and Autism Cymru.36 / BB 77: DfEE, 2005 Section 2.3.2, 37

¹¹ Designing learning spaces for children on autism spectrum/ Published in partnership with The University of Birmingham autism. west midlands and Autism Cymru.36 / BB 77: DfEE, 2005 Section 2.3.2,38

¹² Designing learning spaces for children on autism spectrum/ Published in partnership with The University of Birmingham autism. west midlands and Autism Cymru.36 / BB 77: DfEE, 2005 Section 2.3.2,38



fig2, snoezelen space

It is important to have knowledge and understanding of how they experience the environment and the people and objects within it. Both Bogdashina (2003) and Hinder (2004) describe very well the potential sensory differences in perception, processing and responses. It is also important to know that not all children are affected in the same way or to the same extent. Whilst many children are capable of learning within mainstream environments, some children require a more bespoke and tailored setting.¹³

As mentioned in Table 1., sensory integrative therapy, musical/artistic therapy and psychological exercise/special physical activity are the major methods through which the communicative ability of autistic children may be enhanced without the need of a medical professional and which can be achieved in a personal space.

¹³ Designing learning spaces for children on autism spectrum/ Published in partnership with The University of Birmingham autism. west mid-lands and Autism Cymru.36 / BB 77: DfEE, 2005 Section 2.3.2, 38

2-2 A Design which develops the physical function of autistic children: sensory integrative therapy

Rosenzweig (1976) carried out a test in 2 populations of mice. In the first population, he gave a very rich environment which composed of ladders onto which the mice could run across, a windmill wheel, a cross-rope, a maze, and so forth which all continuously stimulated the exercise reflexes of the mice. In the other population, he gave a very sedentary environment. Afterwards, Rosenzweig dissected the brains of these mice and found that the neural mass of the mice in the richer environment was heavier than that of the mice in the other environment. They also had more of the chemicals which preserved the health of the brain, as well as chemicals in the neural synapses which allow for neural connectivity. As a result, the mice living in richer environments had greater ability to use special information and exhibit quicker reflexes. Therefore, they were also able to carry out more tasks than their sedentary counterparts. In particular, the effects were greater in younger mice¹⁴.

The cause of autism has not been perfectly elucidated yet, but the function of the brain and the structural deficit, i.e. the brain's limbic system, had been identified as a possible cause since the 1900s. The limbic system of the brain allows for the registration of and response towards an external stimuli, and instigates an appropriate physical reaction. Furthermore, it decides what to do with the information and makes doing new activities possible. On the whole, people with autism have difficulty making appropriate use of their sensory integrative function..

Sensory integration occurs across a total of four stages, as described in Figure 2. Such successive stages occur naturally in normal people. However, this natural integration is difficult for autistic people who are born with a deficit in brain function.

As the four stages co-ordinate, the basic abilities of humans come into being, namely intellectual ability, and motor control, thus allowing all of the parts of the brain to exhibit their function. This allows for self-satisfaction, to experience the joy of learning, and to slowly grow self-esteem. However, for those with autism, sensory integration is difficult because they are with this congenital deficit in brain function.

In Figure 4., we can see that the first stage includes the basic functions of hearing, vestibular sense, proprioception, touch, and sight. In the second stage, the integration of vestibular senses and proprioception causes the movement of the eyes and is connected with balance. The sense of touch also develops which is connected to sucking at objects, eating and feel for soft objects. Thirdly, hearing and sight functions integrate with the functions at stage 2, which adds to visual perception and the co-ordination of the hands and eyes, allowing purposeful action. At the fourth and final stage, each of the stages co-ordinate, which allows for the formation of the basic abilities including intellectual ability and motor function. By using all parts of your brain, you are able to feel self-satisfaction and experience the joy of

¹⁴ Park, Kyung Sook, The Effects of the Sensory Integrative Function Development Program for Autistic Children, Ewha Womens University, 1987, 26

learning, slowing developing self-esteem. Such normal progression of stages occur naturally for most people, but this integration is difficult in autistic people who have inborn functional deficit in their brains. to visual perception and the co-ordination of the hands and eyes, allowing purposeful action.

According to Aryes (1979), it is the limbic system which does not function properly in most autistic people, which in turn exhibits a variety of poor co-ordination of and response to external stimuli. Of these, there are three most common symptoms. Firstly, the sensory information is not taken in accurately by the infant's brain. Secondly, this sensory information is not appropriately processed by the proprioceptive or the sensory organs. Thirdly, the brain has a problem performed new actions¹⁵.

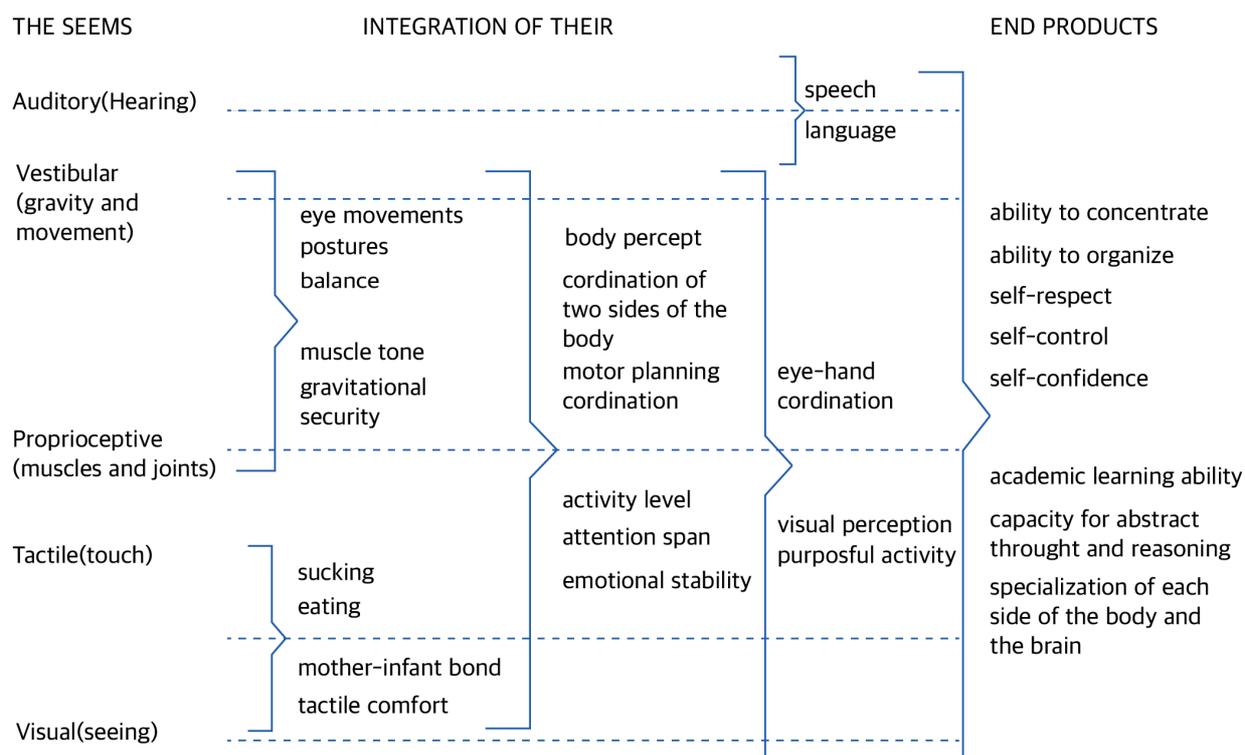


Table 4, Park, Kyung Sook, The Effects of the Sensory Integrative Function Development Program for Autistic Children, Ewha Womens University, 1987, 16

¹⁵ Park, Kyung Sook, The Effects of the Sensory Integrative Function Development Program for Autistic Children, Ewha Womens University, 1987, 15

Whilst most people do not have a problem, failure to take in sensory information is common for autistic people. In particular, uptake of auditory and visual information is difficult. For hearing, autistic infants might register some noises excessively and not register other noises enough. For example, children may often not register obvious sounds like bell chimes or people's voices, but excessively concentrate on seemingly repetitive and meaningless sounds.

The failure of controlling the sensory input makes many autistic children anxious with regards to their vestibular sense, i.e. of their sense of touch or of the relationship between gravity and space. If they cannot control or adjust to the input of vestibular senses, it causes extreme surprise when the children are placed in an unfamiliar location or position, for example when placed in a high area or lifted upside down. When the children cannot adjust to the input of tactile senses, they are only able to register very strong sensations, and show very defensive reactions against these senses, resulting in the failure of sensory input.

The failure to register sensory information, as well as lack of control of this sensory input, causes the failure of sensory integration. This loss of sensory integration may cause speech disorders and failure to develop physical awareness for persons with autism. With regards to speech disorders, the ineffective hearing capacity ultimately limits the formation of language perception. Similarly, the reason for a restrictive physical perception lies in the lack of normal registration of sensory information by the skin muscle joint vestibular sensory organ. This inhibits the development of an accurate physical perception. As a result, autistic people are unable to sense their own bodies or their current actions, which make motor co-ordination impossible. Thus, restriction of this basic physical development causes a harmful influence on the development of self-esteem.

For a person who has autism, the problem with their limbic system in the brain is that the system which is in charge of voluntary action does not function properly. This does not mean that the autistic child is unable to function at all, but that it cannot function purposively or constructively on his or her own. For example, a child may resist simple task like putting socks as if he or she has never learnt or tried it before. This behaviour is however, not defiance, but is the voluntary system that is not responding properly. What is more is that this system can be quite temperamental, so children may sometimes wear their socks easily.

Due to the unstable nature of their sensory processing, the motor co-ordination ability of people with autism is often hindered. However, our daily lives requires a functioning physical exercise ability in order to carry even the basic of tasks. For this reason, it is of utmost interest to provide education for the stability and development of the basic physical conditions of an autistic person from their infancy. Only after these fundamental physical conditions are in place, can other requirements be gradually filled.

People with autism suffer from extreme problems with the function in their sensory integration. This is why they cannot learn to use their bodies to its full ability and experience developmental deficit in the four basic aspects which are tactile development, vestibular-bilateral integration, motor planning coordination and visual perception and auditory function.

The under-developed function in either of the four aspects is usually resolved in a normal person naturally as they grow. Therefore, although education regarding this matter may be unfamiliar and difficult, it is the most important

education required by autistic infants. This education is not learning a language, walking or learning to eat with a spoon, but education of the fundamental physical condition which will be used to do the preceding tasks. Since early education is most effective for this, the home is as important as any special educational institution. An educational environment must be built at homes which suits this purpose. A somewhat different set of objects needs to be decorated for a child who has autism. Instead of toy mobiles, building blocks, toys, books and alphabet magnets, an autistic child requires a room filled with a wide range of objects that not only educates, but helps with the functioning and recovery of the sensory integration process.

People with autism tend to react negatively to tactile sensations and tend to over-react to tactile sensations than other people. Their sense of touch is associated with negative feelings because of the confusion in their nervous system as an infant. However, their defensive reaction to a slight touch is just an automatic rejection that hides a deep want for contact. Even if there may be rejection initially, a constant stimulation of the sensation will allow children to become used to it, and even begin to enjoy the touch sensation that they once refused.

In order to develop the tactile sensation of autistic people, a diverse design of tools is needed. The design must be an everyday object that integrate tools which aim to develop the sense of touch, for example, a clothing which inserts pressure onto the body, a range of toys made of diverse materials, and a chair which gives the impression that you are being hugged when you sit on it, Such continuous and direct skin contact can gradually diminish the negative response towards tactile sensation, and educate the body to embrace it. What is more, contact which involves inserting deep pressure into the body provides sufficient proprioceptive input that helps give a calming effect. However, one word of caution would be not to enforce such objects onto the child. The products should be everyday objects which will be naturally used by the child. This will allow the gradual improvement of the basic physical function, which will make introduction to tactile sensation comfortable.



fig3, Pressure vest



fig4, Tactile dominoes/bars/turn and match

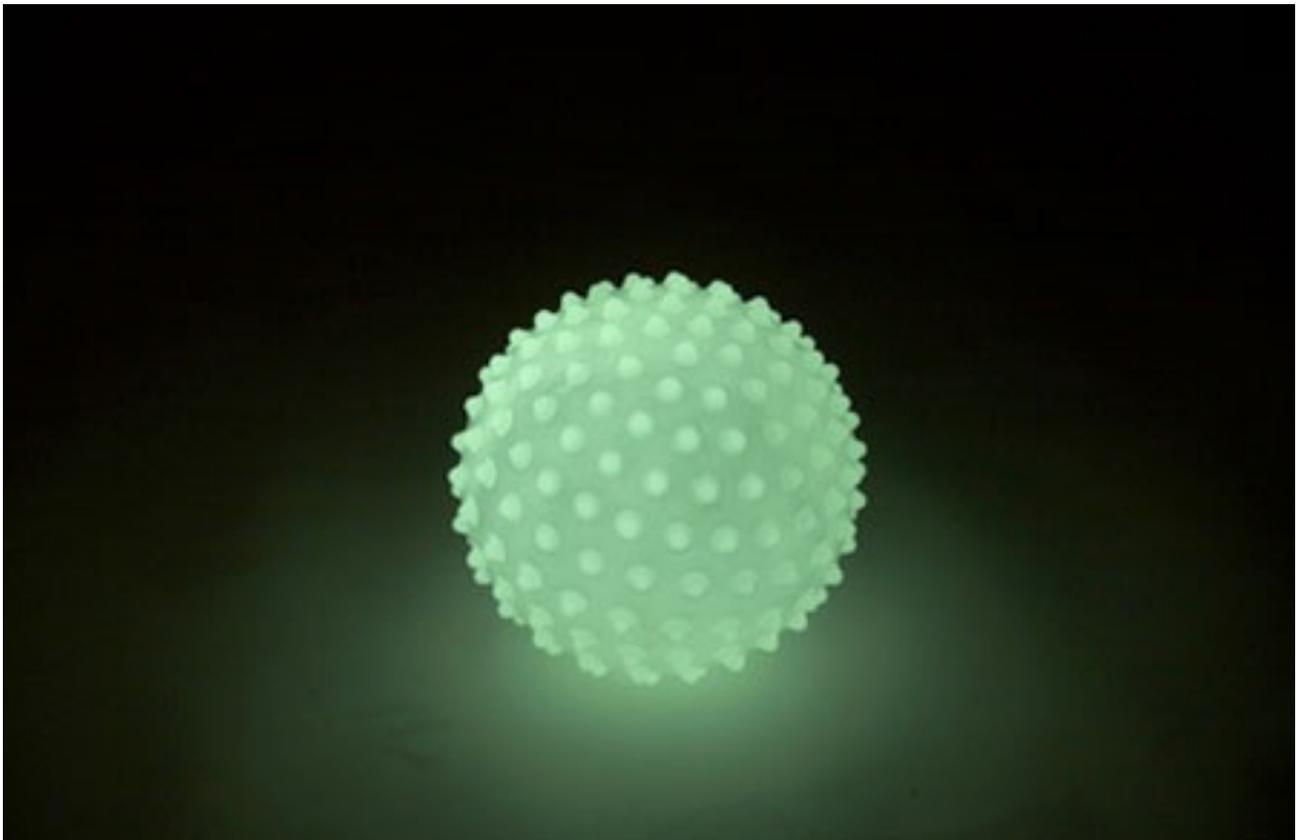


fig5, Sensory ball



fig6, Sensory chair

The vestibular senses of autistic people do not function naturally. This is reflected by the over- and under-sensitivity of the vestibular senses. Under-sensitivity of the vestibular senses causes faulty integration of the nervous tissue function, which is why autistic people cannot control their posture as they please and their visual perception does not react properly. They also have learning difficulty and find coordinating both hands challenging. Over-sensitivity of the vestibular senses cause rotational anxiety and gravitational anxiety, which causes discomfort during normal life when their rotational or gravitational senses are stimulated even just a little.

The vestibular senses of autistic people may be stimulated by using certain tools and objects, which can form the basis upon which other senses may act on. This foundation allows for the control of muscle tone upon which posture is based on, the control of head position, and the stable movement of eyes. Further, it aids with the coordination of multiple senses which allows for complicated movements and decreases the anxiety from gravitational and rotational stimulation. However, parents must be aware that the children may not engage in activities which require much movement or changes in bodily posture until they feel confident and comfortable with their vestibular senses. Once they become accustomed to the stimulus of their vestibular senses, they will experience satisfaction and happiness which will help with mental development and motivate them to carry out other activities.

For stimulating the vestibular senses, a wide range of toys is required. In particular, toys which give a stimulating experience, such as a scooter which gives quick changes in speed and the opportunity to co-ordinate both hands, a swing which gives rotational stimulation, and a balance beam which allows the opportunity to practice balance and improve anxiety from gravitational stimuli. If an autistic child is provided with such stimulating toys instead of the average swing, slide or car toys, they may be continually stimulated even on their own. They will also be able to develop step by step as they are able to experience coordinating a wide range of sensory organs.



fig7, Scooter board



fig8, Riding scooter board



fig9, Swing



fig10, Balanced beam



fig11, Balanced pad

People with autism require education with respect to the function of their motor co-ordination. Often, the accuracy of their hand muscle movement falls, and are unable to appropriately co-ordinate the functions of the necessary organs for exercise. For this, the proprioceptive function is indispensable. This sense is the communication channel between the brain and all the muscle joints of the body. However, for children with autism, their sense of proprioception is faulty and rife with problems. This is why autistic children have difficulty gauging the concept of space when exercising, of self-awareness, of physical co-ordination or of the relationship between self and the external space and how this combines. Furthermore, children with faulty motor co-ordination are characterized with quick and distracted movements, and find slow movements hard to perform.

Using various objects, an autistic person may be able to experience new activities with respect to the special functions of the object. Through this, their tactile and proprioceptive sense may be activated. If proprioceptive senses do not function properly, autistic people must perceive each and every structural muscles which are required for movement when carrying out even the simplest of activities. In this case, the autistic person may feel a constant sense of failure, as their body organs cannot co-ordinate to learn very trivial things. If this experience builds up, a feeling of lethargy will dominate and the person may end up not wanting to do anything. This is why autistic people must be given as much opportunity to exercise and activate their proprioception in order to be able to naturally carry out activities in their daily lives.

In order for communication between the brain and the rest of the body, including the muscles and joint to be fluent, a sense of order, the ability to manage time, autonomy and purposeful exercise is important. Examples of activities which require these are jaekichagi, a Korean traditional game, double dutch and hopscotch. Additionally, in order to directly stimulate the proprioceptive sense, autistic children should be exposed to novel experiences which involve the whole body, such as playing with and wrapping themselves in a large blanket, wearing wrist weights or using a weighted blanket during everyday life. Such methods stimulate a sense of touch upon muscles, which will in turn activate proprioceptive senses.



fig12, Hopscotch



fig13, Weighted blanket



fig14, Wrist weights

Education for the visual perception and auditory function is critical for autistic people, but the integration of the vestibular, proprioceptive and tactile senses, which are beneath the cortex, is first necessary for proper sight. Autistic children who are not as accustomed to using their hands score lower in tests for tactile perception and visual perception than compared to their normal counterparts. As with hearing, sight cannot function properly if it is not integrated appropriately with other functions, which means the cerebral cortex cannot carry out its job. For instance, at a loud noise, the head must move towards the direction of the sound and at the same time maintain a balance, which requires integration between the sense of balance and sight. Therefore, in order for education of sight and hearing to proceed, the above education must first be carried out.

2-3 Artistic/musical treatment – a design which promotes social interaction

Although it may appear that therapy through artistic activities have no direct impact on an autistic child, it may indirectly help them by giving them the power to communicate¹⁶. A child with autism finds it very difficult to express oneself with language. In fact, a child with autism said that “words did not come out of my mouth. Shouting was the only way I could communicate.” If such a thing repeats on a daily basis, an unbelievable amount of repressed emotion is likely to be present on the inside. Art and musical activities would be a way through which these repressed emotions can be expressed, and for autistic people to become mature by this empowerment. For children with autism who can rarely experience a sense of accomplishment or satisfaction. Art and music gives confidence and provides a means to grow their sense of self-worth.



fig15, David Barth, Autistic artist, 'Beasts & Bugs', October 2009

Art activity for autism must be separated from the usual art activities. It is not to improve the formative senses, or to enhance technical expression or painting skills, but to give the opportunity to experience self-awareness and gain an insight into an autistic person's mind. An autistic child can express his or her inner emotion through the symbolic language of an artistic activity, and an outside looking at the painting may be able to communicate indirectly. In particular, with respect to families, parents may even have an indirect conversation without words or direct contact by looking at the painting drawn by the child. This can even develop the relationship within a family. Paintings and drawings by autistic people are in fact quite widely available. Through their drawings, we are able to experience their world, which have different assumptions to ours. We can detect what it is that they are intrigued by, and that they view this in a different light to ours. In this way, we are able to begin to understand each other, and autistic people will be able to

¹⁶ Chang, Sung Keum, Case study on Art therapy for Early Stage of Adolescent's Autism, Yonsei University, 2004, 23

deliver a part of their opinions, which they have so difficulty doing so with words. Additionally, autistic people very much enjoy the process of creating artwork like paintings or clay work, and are able to experience a great sense of accomplishment and self-pride with the end product.



fig16, Iris Grace, Autistic Artist, 2013



fig17, Flower(Sound of music), acrylic on cambus, 119 x 91(cm), 2013, Dongmin Shin

My brother particularly enjoys clay work. (Fig. 18) Due to his lack of fine motor skills, he prefers shaping clays rather than drawing detailed pictures. He finds pleasure and a sense of accomplishment when shaping clays. I can always assume his state of mind when I see the pottery that he created. Although other people may feel something different, having known him for 27 years, I can feel that he is expressing his mind through pottery. I believe he expresses via nonverbal communication. However, our family did not know how to communicate with him even until recently, and it was only through his artwork that we caught a glimpse of his thoughts and feelings. Although not an active conversation, I could tell through his work that he too has a mind as complicated as mine. Even now, I cannot say for sure the exact emotion he is feeling, but I have personally felt connected to him when looking at his pottery work. I could feel his worries and woes, which is why I began to try to understand his needs.



fig18, My brother's art work_Minjun Kim,2008

An autistic child has difficulty having a conversation with words. However, language is the primary method of communication, and it is something which requires order and sequence. On the other hand, the arts encompass dimensionality, so are not bound by language rules like grammar and order, during expression. At the same time, you are able to express your mind externally and experience your mind internally. Since the resulting artwork is also something concrete, like a drawing or object, it represents a bridge between the autistic person and the outside world. What is more, the autistic person may also look at their work, feel emotions, and be able to identify with their own self.

Music is a method of communication that human beings experience throughout their entire life, from infancy to senescence. Zoller (1991) said that singing a song comes as natural as breathing to a child. Language and music have similar application methods and share many characteristics. They are both expressive and a communication system. To music, an autistic child may show surprising concentration and sensitivity¹⁷.

Many studies have shown that musical ability and interest is universal in children with autism. Thus, musical activity may be used as a positive accelerator to improve the communicative skill of autistic children, after which we might even expect improved social life and interpersonal relationships.

For autistic children, a recorder is an excellent tool for practicing their vocal organs, as well as practicing their hand-eye co-ordination. In addition, it is a tool by which they can express themselves freely and enjoy the musical rhythm.



fig19, Recorder

¹⁷ Han, Sung Eun(2006). A case study on the development of language of children with autism, through singing activity focused on social context, Ewha Womens University, 2006, 6



fig20, sychrony music therapy

Accordingly, there have recently been developments of musical instruments specifically for autistic people, which work by the pressurization of or by the movement of fingers on the surface of the instrument.

Musical activity is not only able to give psychological enjoyment to autistic children, but provide a means to learn a language in a non-forcible way. What is more, it helps with the physical development of respiratory function, sound dynamics, intonation, pronunciation and so forth. Such musical stimuli also has the ability to develop overall skills of social interaction and communication, as well as empathy for another person through music.

However, there is a limited variety of educational tools which autistic people can use. Furthermore, of these existing tools, only a few are affordable and accessible enough for people to use. This is why parents tend to depend on professional educational institutions rather than educating their children directly. I believe that autistic people should have the right and opportunity to choose tools which are most suited to themselves. In this way, they would be able to actively participate in receiving a proper education, and further on live a more stable a comfortable life. As we are able to choose clothes and other items according to our preference, these rights of choice ought to be guaranteed for people with autism. I am convinced that such a change would be a dramatic win for the autistic community. This is why I am determined to design and make a wide range of tools for people with autism.

Chapter 3. Design for an autistic's communication

Using voice and letters to deliver thoughts and feelings through language is one of the privileges of being humans, it defines us. Human beings use language as a mediating method for communicating with others, building relationships, and to control one's environment. As a consequence, those with problems communicating, such as autistic children, have a relatively lowered quality of life. Even if these children possess individual talents and unique ideas, they are often unable to express their intentions properly to the closest of people like their parents. They become caged within themselves, and are without opportunity to express their special talents. If this condition persists, they are rejected the fundamental need to communicate and have a harder life.

An autistic child has a different communication method as to that of a normal child. Their way of expression include less linguistic methods like spoken and vocal language, but more non-verbal methods like movements and gestures¹⁸. Kiernan (1983) explain that a nonverbal system which is dependent on a visual perception system is more comfortable for an autistic child than a language system and verbal development process which is dependent on hearing and speaking. This is why specific focus must be given to children with autism, taking in to account their different nature and create a different way of communication suited to them¹⁹.

The form of communication for autistic children should not focus simply on the acquisition of spoken language. Instead, an alternative means of communications should be given at infancy, as oppose to trying to teach spoken language or obsessing with vocalization, which is difficult to grasp or learn quickly by autistic children. According to Kiernan (1983), providing an alternative means of communication for a non-verbal autistic child who cannot use spoken language, not only provides a method of communication but it may help with the development of communication later on²⁰. In the future, alternative methods of communication will allow a more fluent communication method and supply a vital element in the life of an autistic child who will be able to press their emotions. In turn, they will be able to acquire what they need and give what others want, creating a sense of understanding and sympathy for each other.

There are many kinds of alternative communication methods. For example, the Picture Exchange Communication System (PECS), Sign Language(ASL,ESL), Augmented and Alternative Communication(AAC), and humanoid robots (NAO robot) which helps with communication. PECS and Sign Language (ASL, ESL) are appropriate means for relatively simple communication. On the other hand, AAC is a medium which helps with the expression of more complicated sentences or of emotions. In the past, the communication methods PECS, sign language and ACC, had all been used manually, but have now become methods which can be used with digital devices. NAO is a recently developed high-tech smart media. Children with autism find it easier to converse with digital devices than with other humans,

¹⁸ Wetherby,A.M.,Yonclas,D.,& Bryan,A, Communicative profiles in preschool children with handicaps : Im plications for early identification. *Journal of Speech and Hearing Disorders*,54,148-158, 1989

¹⁹ Kim Min Young, Lee so Hyun, The Effects of Enchanced Muliu Teaching on the Spontaneity of Functional Communication Behavior for Children with Autism, *Special Education Research*, 2006, 32

²⁰Kim Min Young, Lee so Hyun, The Effects of Enchanced Muliu Teaching on the Spontaneity of Functional Communication Behavior for Children with Autism, *Special Education Research*, 2006, 33

because in the stance of an autistic child, he or she does not need to decipher the unpredictable and wide range of facial expressions or intonations of humans. A robot is static and without emotion, so conversation with them is much easier. For this reason, using a digital device as a communication method can help autistic children more effectively. I believe such methods are a combination of design and technology. When design and technology are appropriately mixed, I believe it provides the optimal method of communication for autistic children which improves their communication skills and increases their quality of life.

3-1 Communication in public places: proper signals for their emotions

Many people do not speak a lot in public places. There may be some conversation, such as ordering from a menu at a restaurant, buying a ticket for the public transport, and paying for your groceries at the counter. However, conversation in public places are actually quite limited and rather simple. However, for people with autism, even such simple conversation is difficult. First, autistic people are slow to convert their thoughts into words, so are at a disadvantage in public where fast communication is required. Also, having a conversation with complete strangers itself is a very daunting experience. Present methods which help to alleviate this are sign language and speech apps on mobile phones.

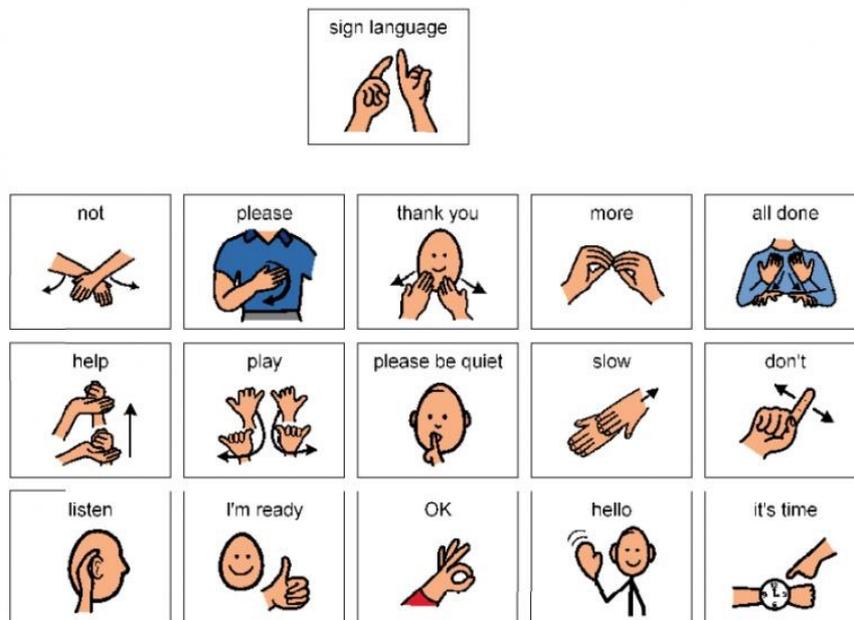


fig21, Sign language for autism

Sign language is an alternative method of communication which uses hand signals and gestures. However, many autistic people cannot move their bodies freely which makes learning sign language difficult. This is why sign language is not a method easily taken up by autistic infants. What is more, even if they are able to learn sign language, other people may not be able to understand their hand signals and gestures. However, an advantage of this method is that it does not require the help of devices, and the infants can themselves lead the communication. If there is a way to help convert the sign language to a language which can be directly understood by people, it would help autistic infants to communicate people under their own lead. For instance, if we could connect the motion using sensors and the sound from words, we would be able to create a device which could help the sign language of the autistic children more effectively.

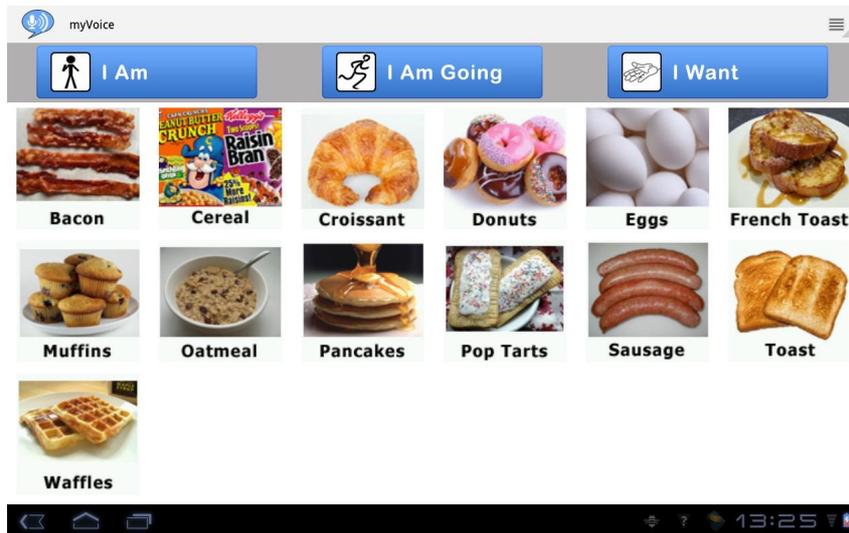


fig22,speech app_myVoiceCommunicator app

Speech apps are a method by which autistic children can express their needs to other people. For example, they can order food at a restaurant and buy snacks from the supermarket. In the past, they would have had to find the specific snack from a pack of picture cards, which made communication rather slow and cumbersome. However, the development of smart devices now allow much more efficient communication. However, having used these apps personally, I felt that its use by an infant has some limitations. For example, an autistic infant would not be able to find or upload all of the pictures in advance. It is only after a family member helps with this process that the autistic child was able to use it relatively easily.

An autistic child cannot always have a person to help them communicate. Their parents will age and their siblings will eventually have their own jobs. This is why it is so important to them to be able to express even just simple needs in public places. In that sense, the advance of smart devices has played an enormous role in the development of an alternative communication method for autistic children in their daily lives.



fig23, PECS APP

3-2 Communication in private places: fully understanding each other

Personal spaces are usually used for familiar people or those you have a specific relationship with. Communication and conversation with these people may be diverse, from basic conversation like enquiring after your day to your deep feelings or thoughts concerning a complicated issue. In most cases, a communion in personal spaces take place when you accept each other for who you are.

For those with autism, a private space is even more special. Unlike the people that they meet in other places, the people in their personal spaces already know the inconvenience that autistic people feel regarding communication. Furthermore, these are the people who are able to wait with patience, for the autistic people turn their thoughts into language. Accordingly, the personal spaces must contain a tool which helps autistic people to express their inner thoughts. Even if it takes some time, a way of communication which helps the expression of concrete emotions or feelings is needed.

The technology of today has a wide variety of methods which helps autistic people to communicate. Most representative of these methods are PECS, AAC, apps on ipads or iphones and NAO robots which help with communication.

The PECS method takes a relatively long time to use, and is not available for use in public areas. It is therefore separated as a private means of communication, but is difficult for complicated conversation because it involves communication by the exchange of photo cards, picture cards of objects, picture cards of three-dimensional objects, and vocabulary cards. However, autistic people have a character of being able to communicate more easily using sight stimuli rather than auditory stimuli, since it accepts and processes sight more effectively. This is why stimuli such as visual letters and pictures last longer than words which are only noticed instantaneously. Therefore, using visual aids may be accepted and absorbed more easily by autistic children, making it a more effect method of communication²¹.

The AAC method is defined as the combinations of symbols, development aids, strategies and techniques which together promote communication. This emphasizes the fact that a range of components of a wide variety of modality is used for communication. AAC systems can be defined as any device, system, or a method that improves the ability of a user with communication impairment to communicate effectively. This AAC is defined as a substitution of the natural speaking capability using aided or unaided symbols. The AAC may include from No Tech, Low Tech, Light Tech and High Tech devices²². The AAC improves the ability of a use-stance, it allows the use of subject, verb and objects to express oneself with a sentence, and to choose from pictures, photos or images that symbolizes something. (Fig 24, 25) Such a method provides the opportunity to express a wide range of feelings, such as expressing a simple daily choice between eating cereal or bacon for breakfast, to the opportunity to have a conversation on why a child might be

²¹ Kim, Ji Eun, Acquisition of the Picture Exchange communication System for Autistic Children, Dankook University, 2001, 8

²²A Design and Implementation of Smartphone-Based AAC System.1896

feeling upset after school. This allows an intimate conversation between an autistic person with a familiar person in their personal space, thus increasing their quality of life.

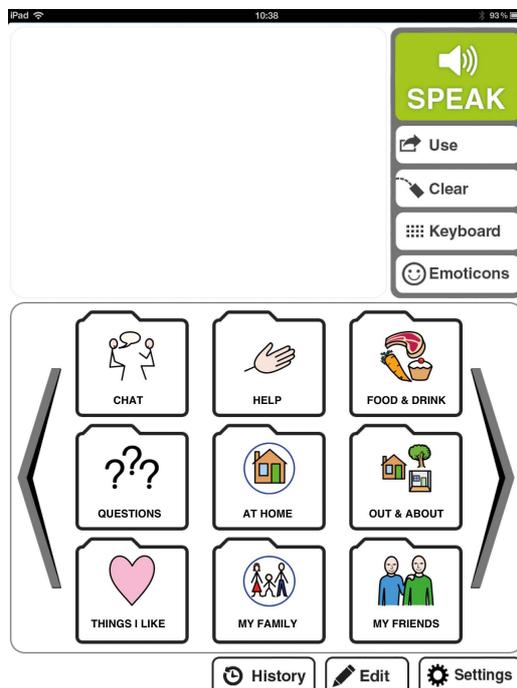


fig24, AAC APP

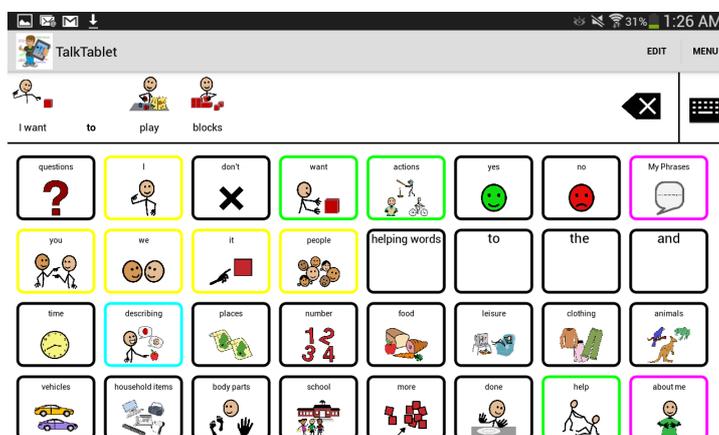


fig25, Sentence maker app

The NAO method is a communication method that uses a smart medium. A particular research found that a mediation medium with a robot configuration was found to be more effective in improving the communication ability than one which uses a standard computer. A robot can promote communication skills in a fun way and stimulate the tactile

curiosity²³ (Robins, Dautenhahn, & Dickerson, 2009), as well as creating a social interaction with the child²⁴(Michaud & Thberge-Turmel, 2002). In particular, many autistic children have problems of interpreting most of the non-verbal social information during interpersonal interaction. These problems disappear with a robot which is simple and predictable, so infants with ASD find a psychological sense of stability and comfort in the robot's behaviour. This would be a positive influence on the child's social interaction (Dautenhahn, Billard, 2002)²⁵. Through the robot's communication mediation program, the autistic child is able to express their emotions more plentifully, which may be reflected by an increased vocabulary²⁶.(Figure 4) The children are able to improve their vocabulary as they learn a wide range of communicative expressions and words when they converse with robots versus using other smart media. If they are able to learn a new method of expressing their emotions, they may be able to communicate with other better and other people will be able to have a more deeper understanding and acquire a true interest in them.

Emotional category	Language
Happiness (18 words)	glad, satisfied, to be moved, refreshed, heartwarming, pleasure, kindness, thankful, relief, glorious, cheerful, commendable, delighted, happiness, proud, welcome, excited, joyful
Sadness (12 words)	mournful, regret, whimper, miserable, sadness, pathetic, sorry, sorrowful, ruthfulness, apologetic, distress, upset
Surprise (5 words)	surprised, amazed, shocked, wonderful, marvelous
Anger (7 words)	Boiling mad, disgraced, mad, dissatisfied, complain, outrage, furious
Fight (4 words)	be scared of, be fearful of, be afraid of, to cower
Other	worry, envy, shameful, be disappointed, greed, hate, be embarrassed

Table 5. Emotion vocabulary

²³ Robins, B., Dautenhahn, K., & Dickerson, P, From Isolation to Communication: A Case Study Evaluation of Robot Assisted Play for Children with Autism with a Minimally Expressive Humanoid Robot, In Proceedings of the Second International Conferences on Advances in Computer-Human Interactions, ACHI 09, Cancun, Mexico, IEEE Computer Society Press, 205-211, 2009

²⁴ Michaud, F., & Thberge-Turmel, C, Mobile robotic toys and autism socially intelligent agents -creating relationships with computers and robots. Kluwer Academic Publishers, 125-132, 2002

²⁵ Jeong, Min Kyeong, Lexical representation of emotions for High function autism via story program intervention using smart media(humanoid robot vs. PC), Ewha Womens University, 2015,15

²⁶ Jeong, Min Kyeong, Lexical representation of emotions for High function autism via story program intervention using smart media(humanoid robot vs. PC), Ewha Womens University, 2015,45

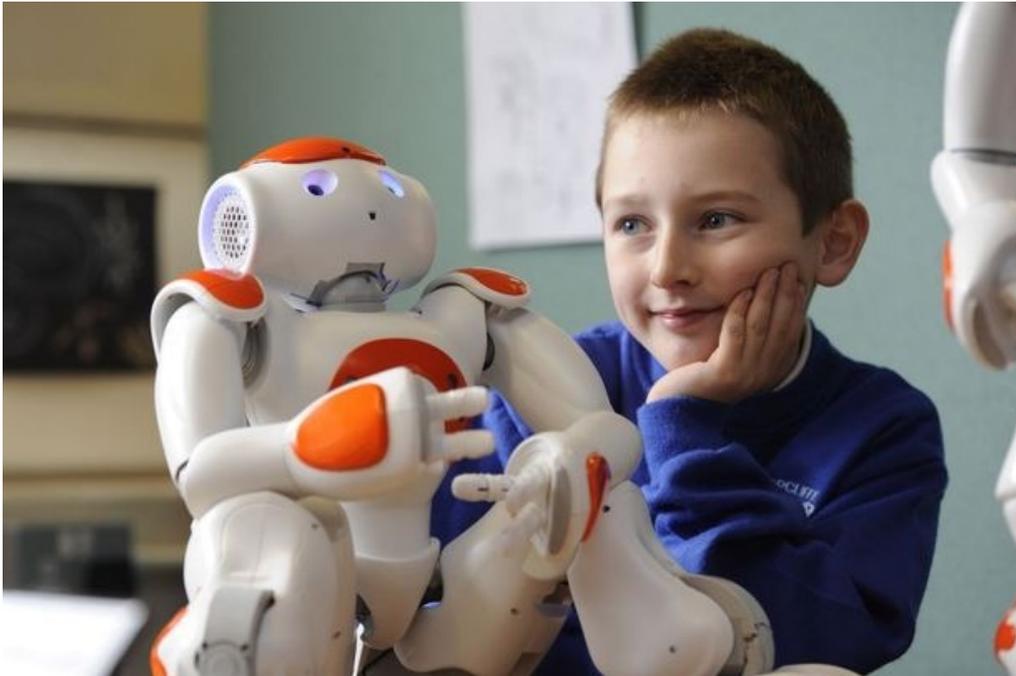


fig26, Communication with NAO Robot

The reason we are able to receive education is due to the constant communication between people. Most people naturally acquire this ability as they are born, but this does not happen so easily for people with autism and must learn to communicate. Many methods must be mobilized in order for them to be able to interact with others comfortably.

The current AAC machine or PEC has some limitations with regards to efficiency and convenience. Although these may be used in personal spaces, they are with many limitations. Their use in public spaces is near impossible. However, portable computers, such as tablet PCs and smartphones with many applications allow autistic people to express their intentions, not only in their homes but in many other settings. Accordingly, many apps which use the theoretical foundations of AAC and PEC are starting to be used and developed. Additionally, more designs are being invented which take into account that the users will be autistic people. When the development of smart medium is simply the diffusion between the off-line and the on-line world for a normal person, it is the diffusion between the public and private space in terms of communication for an autistic person. However, nonverbal autistic infants who cannot use these applications are yet to benefit from this development. For these people, a passive but accessible design must be investigated.

Conclusion

A person with autism senses things differently compared to a normal person, but we are all the same people. However, because of the false and negative perception from people around them, many experience difficulty finding their role in society and are socially isolated. Because people with autism have difficulties with everyday social interaction, autistic people often have trouble expressing their thoughts properly.

The development of the world always comes from diversity; humanity, society, plants and animals, nature and the laws of nature is no exception. Meeting between the same genes causes a genetic defect in the offspring; a society with like minds may carry peace indefinitely but never progress. If there is only one element in the universe, there would not have existed a beautiful night sky as it is now. Hegel's thesis-antithesis-synthesis are the most simple and yet powerful metaphor for this cosmic law.

The Author Naoki Higashida said autism could be nature's warning for the people who's life are getting further away from nature. Perhaps in autistic people's eyes closer to the 'nature' may seem that others are acting strangely²⁷. I believe if our society may be able to develop a better way through thesis-antithesis-synthesis, we can get better to interact smoothly with autism people.

People with autism today suggest us a new perspective through the method of art. As we can see from the works, they see the world differently to others, and this presents us with a new synesthesia sensory perception. With their emotional sensitive perception, they take in and observe the grains of things in the world that today's people carelessly pass by.

I have always been unfamiliar in expressing emotions and I would like to give another example in expressing emotions that need to be learned by people with autism. Contemporary people are familiar with pressing down the emotions rising from deep down and have cynical attitude in expressing the dazzling beauty that's around us. With numerous social norms and hierarchies make us feel rebelled against society when we try to be honest with ourselves and behave naturally; rather people give you strange looks and that tells us our society is sick. However people with autism are better in expressing their needs and emotions; they laugh out loud and scream when they feel delighted; with anger they express through quick physical action. An ancient Chinese philosopher Lao-tzu seen this as a good behavior being natural and transparent following the way of nature.

In fact when writing the thesis it was a concern on how to refer autistic people, as when people use the term autism, it is referred to as 'self-trapped' patient; and I did not wanted to use this expression. Yet, using the word 'they' would be also representation of people with autism, meaning 'others', differentiating with us; so in the end I was compelled to use the word.

²⁷ Naoki Higashida ,The Reason I Jump: one boy's voice from the silence of autism, United Kingdom: Hodder & Stoughton,2014,17

Earlier, I mentioned several ways about how people with autism can contribute to society. In fact, if they can overcome the problem of communication skills in society, our society will be able to develop in many areas.

This content emphasises on the part how we need to make an effort improving their education in communication skills. In order to provide better education system, firstly there is the need for a deeper theoretical understanding of autistic tendencies and would like to advise meeting with them in person and gradually spend time and get to know them better. Although it will proceed slowly compare to others, nevertheless if they are educated and accustomed to social interaction and networks, they will be able to become members of the society and run side by side with others in the race of life.

My recent design work is concerned with the communication between the five senses of humans and nature. Whereas my current work is concerned of the communication between the visual sense and the auditory senses. This was a work which visualised the depth of emotion in a person's voice as the waves of a water. My dissertation reflects upon a more personal aspect of my life that informs my view of products and their design. My autistic brother has trouble communicating his emotions and this dissertation aims to consider this idea, leading me to generate new designs of products. The purpose of the new designs and the ultimate product that I will create in my final year are to find an innovative way to help the needs of autistic people.

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