

Engineering Car for Autistic Children

Hongze Lu

Avon Old Farms School, Avon, Connecticut, US

lhzaof@gmail.com

Abstract. Through the opportunity of some public welfare activities, this study gradually has a deeper and deeper understanding of autism, and this study really want to help them improve their disease as much as possible. Through some adjustments, study found that the best time to improve children's autism is around the age of 2. Therefore, this study wants to design toys through research and inspection, and try to improve the condition of children with autism. Therefore, this study designed a toy that can stimulate all aspects of the senses of young children to try.

Keywords: Autism, Young Children, Toy Design.

1. Introduction

It is understood that autism is a disorder with a certain degree of difficulty in social interaction and communication. Atypical patterns of activity and behavior, such as difficulty transitioning from one activity to another, attention to detail, and unusual reactions to sensations are also present [1]. People with autism have a wide range of skills and requirements, which might evolve over time. Despite the fact that some autistic individuals may live independently, others have severe difficulties and need ongoing care and assistance. The condition is very difficult to detect, and people usually notice the characteristics of a child with this disorder at an early age, but it takes a long time to identify autism [2]. In order to allow those children with autism characteristics to get timely intervention, the author designed a toy through research and field trips.

Through research the author found that while there is no cure for autism spectrum disorder, there is no universal cure. However, there are still treatments available to ease the symptoms of autism spectrum disease and assist a child's growth and learning to the fullest extent possible. Preschool-aged children can benefit from early intervention by learning crucial social, communication, practical, and behavioral skills. [3].

From these interventions, the author believes that stimulation through toys is the most effective for children around 2 years old, because at that time they do not have enough communication skills to chat with strangers, and they do not have the motor skills to play outdoors. Then the author started related toy research.

2. Related works

After reading some literature and visiting relevant schools, named Green Apple, the author learned the toys like Sensory Mats; Chew Toys; Sand, Slime, or Putty; Rainmaker Toys; Fidget Spinners; Electric Dog Pet are great for young children with autism. And found that these toys all have one thing in common: they are all sensory toys. Sensory toys are designed to stimulate children's five senses: sight, hearing, touch, smell, and taste [4]. They could have components like loud, contrasting colors, noises, or various textures. Autism-related youngsters are increasingly helped with sensory toys, according to research. Autism sensory toys come in a wide variety of forms that engage one or more senses. A fun approach to engage your child's senses is through sensory toys. Sensory toys can help children with autism relax, focus, and calmly face a scene or event [5]. It helps them grasp objects, reduces costs and discomfort, and ultimately helps them play naturally. Additionally, sensory toys help develop social learning skills such as negotiation, planning, and sharing. In the school, teachers always ask and help children to play. For example:

1) Give the kids a partner to play the game with. Children with autism may initially be utterly inactive during activities like shooting a ball, skipping rope, and driving a toy vehicle together, but with enough repetition, the kids will be eager to join.

2) Eye contact training. Parents should make the effort to observe their kids. Children initially do not gaze at grownups. Children can be pursued by adults in order to be seen. If children start to look at their parents, parents should immediately praise and encourage them.

3) Call answering training. Parents say their child's name clearly and loudly, urge him or her to respond aloud, eventually allow him or her call their own, and help the youngster develop social skills. If there is even a small amount of improvement, the child's social abilities are developing.

4) Parent-child physical contact. Parents should set aside a certain amount of time every day to do this kind of training, let the child sit on the lap of an adult, or stand in front of the adult, and parents can let the child feel "love" by talking, touching, hugging, kissing and other cordial expressions of parent-child relationship.

5) When the children express their willingness to contact the host or the host's children, they should give praise and encouragement in time. Parents should never keep their children at home because they are afraid of contact with outsiders.

6) Take children to play skateboards, swings, balance beams and other games. This has a good effect on reducing behavioral barriers and increasing communication [6].

3. Methods and Materials

3.1. Benchmarking

Through the marketing research, the author found that there is small number of toys that can help children develop their tactile and visual abilities. Most toys focus on the development of balance and coordination with the child. The teacher will ask the children to stand up on the balance beam and do some throwing and catching movements to exercise their balance ability and multi-task ability. There are also some climbing walls in the classroom for the children to use to improve their athletic ability and coordination. But touch and sight are also very important parts of a child's development, which do not possess a large amount of toys to help children to practice that aspect. Among that, Figure 2 showed a case playing with the children in the green apple school.



Figure 1. Playing with the children in the Green Apple school

3.2. Description of Persona



Figure 2. Persona

Figure 3 showed a description of persona. The author's cousin always readily to play building blocks with his friends and other kids, because he wants to talk with others and befriends with others through this way.

3.3. Experiment in Interview Design

By looking into the families of the interviewees, the author learned that their children were eighteen years old. If someone can help or guide him on a single task, he can do it, but if he has to multitask, he can't. At the same time, due to the emotional instability caused by the epidemic and adolescence, they often lose their temper and do not dare to take their children out often. Even if these children are capable of doing some simple jobs in normal companies, they will still encounter a lot of problems. The main problem is the comments of others. In addition, autistic patients are not willing to communicate with others, which may cause some unnecessary mental illness and trouble.

Also, those with autism may have more than one condition, such as cerebral palsy, or a lack of oxygen at birth that leads to incomplete brain development.

Through the discussion with parents, we can understand that autistic people are closed in their own world and unwilling to communicate with others, which is equivalent to their own independent world and the outside world is another world. As a result, they cannot communicate with others and are disconnected from the society. The main reason for this phenomenon is that they have a genetic defect in communication in their brain, so they are reluctant to communicate with others and behave strangely [7].

Parents told me that at their current age, what they need most is a tool and way to vent, because homemaking staff are generally unable to understand the causes of children's emotional problems and solve the problems. Thus, it's best to have an outlet or a diversion. And through statistics, we know that most children have favorite toys or objects. When they lose their temper, they can adjust their emotions faster by letting them see what they like [8].

4. Results in Design Structure

4.1. Mind Map

The following figure 4 indicated mind map structure.



Figure 3. Mind map

4.2. Early Concept

4.2.1 Pull Toy

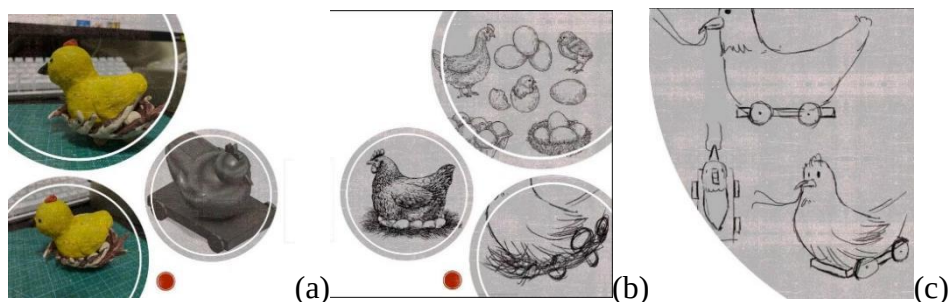


Figure 4. Pull toy design

Figure 5 is a pull toy design. Because chickens are very close to life and cute. The child will not feel strange and will easily adapt to the toy. At the same time when playing can also ensure children's sports, exercise a variety of abilities.

4.2.2 Car

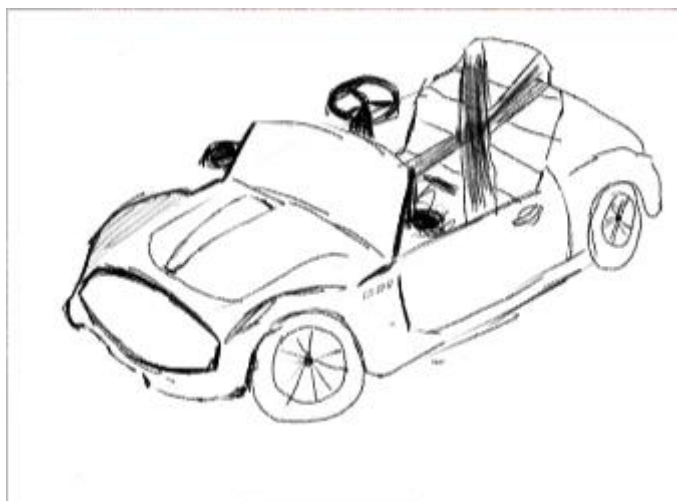


Figure 5. An outdoor toy car design (children can sit into it)

Figure 6 represented an outdoor toy car design (children can sit into it). At first, the author prospect to design a car that can motivate children to do exercise. By using plastic materials, children cannot be harmed. And boys at this age are very fond of vehicle toys, so this toy can also focus the children's attention.

4.3. Final Concept



Figure 6. Engineering car design

The author designed a detachable and simple car. The car can be assembled by snaps on the various parts, there will be a hole at the intersection of each part, and the children can pin it in place. At the

same time, the various parts of this toy car have different colors and feel, so as to stimulate children's vision and touch [9]. By assembling various parts, children can not only strengthen their hands-on ability, but also stimulate the development of the brain. And through the combination of different ways, different cars can be formed, so that they will not feel boring and monotonous. Children with autism use the form of visual observation as the main learning method, and children with autism have long been interested in a specific shape, the overall appearance needs to use relatively simple lines, and the toy shape will not be very complicated to show a variety of simple shapes, such as cylinder, cone, cube, cuboid, ball and other shapes, can bring them different feelings. Expert research shows that children with autism prefer cool colors to warm colors, preferring colors such as green, blue, red, and purple. Therefore, in the design of toys, cool colors should be used as the main color, supplemented by other colors, and rich colors should be used. And simple shapes induce autistic children to learn, so my car also paints different cool toned colors on each part. Select environmentally friendly materials and materials that are not easy to be damaged or deformed. In order to give children different tactile feelings, a variety of materials can be combined, which helps children with autism to develop their vision, touch, and hearing, and to develop their own imagination. The author will choose fabrics with soft texture and good wear resistance to increase the sense of intimacy of children with autism; and choose green wood, plastic or rubber with high corrosion resistance to give children a safe environment; choose durable and the slightly textured leather material can bring a good tactile experience and psychological feeling to children with autism. Therefore, plastics, wood materials, rubber and leather materials can be considered more in the design. Figure 7 showed an engineering car design process. In the structure of the toy, the structural parts are handled as simply as possible to avoid unnecessary dangers [10].

Finally, if conditions permit, the author would like to continue to develop a realistic construction site scene where children can play in the form of cooperation with partners, and they can learn about various equipment, tools, and vehicles on the construction site; You can learn about the various materials needed to build a house; you can also build a house they love together through cooperation. Because for autistic children, they are not good at communicating with others and are closed in their own world. Through the cooperation and communication between peers in the simulated world, they can promote their development and development in related aspects and improve their ability more effectively which can also play a decisive role in their better integration into society in the future. At the same time, in the process of playing, children are also learning new knowledge, new vocabulary, and exercising their ability to stimulate the development of the brain.

In life, autistic children will suddenly have some negative emotions that need to be vented. In this case, these toys are good venting tools. Because of the soft texture of the toys, children can thump them as much as they want, and it won't hurt to drop them. This not only gives children a good way to vent, but also gives parents a chance to rest without having to help children digest their emotions.

5. Conclusion

By doing investigation and field research, the author found that teaching autistic children how to communicate and corporate with other is a really important part of their education. Because autistic people keep themselves in their own world and are not willing to communicate with others, which is equivalent to their own independent world and the outside world is another world. As a result, they cannot communicate with others and are disconnected from the society. If we want to improve their condition, we should help them in these aspects.

The author believes that the toy designed by the author can allow those children who have been investigated for autism to carry out targeted training, such as visual training by recognizing the colors of different parts of the vehicle, and tactile training by touching different parts of the vehicle to feel different textures. As well as hands-on assembling vehicles to exercise their hand muscles and coordination.

References

- [1] Yang, J., & Cang, S. Research on Design of Toys to Enhance Autistic Children's Social Skills. Retrieved April 26, 2020, 1-16.
- [2] Yang, J., & Tong, S. Development on Design of intelligent toys to Enhance Autistic Children's Social Skills. Retrieved June 16, 2020, 1-8.
- [3] Helma van Rijn, Pieter Jan Stappers, (n.d). The Puzzling Life of Autistic Toddlers: Design Guidelines from the LINKX Project, 04 Sep 2008, 1-12.
- [4] Marguerite E. O'Haire, Samantha J. McKenzie, Alan M. Beck, Virginia (2013, February 27). Children with autism show increased positive social behaviors when animals are present. ScienceDaily. Retrieved September 4, 2022, 2-15.
- [5] I. Giannopulu, T. Watanabe, Give Children Toys Robots to Educate and/or NeuroReeducate: The Example of PEKOPPA, 13 November 2015, 2-11.
- [6] Claire R. Paterson, Lucius Arco, Using Video Modeling for Generalizing Toy Play in Children with Autism, September 1, 2007, 2-19.
- [7] F. Michaud, A. Duquette, I. Nadeau, Characteristics of mobile robotic toys for children with pervasive developmental disorders, 2003, 4-16.
- [8] Margaret H. Laurie, Andrew Manches, Sue Fletcher-Watson, International Journal of Child Computer Interaction, June 2022, 4-9.
- [9] Marti Patrizia, Moderini Claudio, Giusti Leonardo, Pollini Alessandro, A robotic toy for children with special needs: From requirements to design, 23-26 June 2009, 5-19.
- [10] Christopher Frauenberger, Julia Makhaeva, Katta Spiel, Blending Methods: Developing Participatory Design Sessions for Autistic Children, June 2017, 6-16.