Study on Children's Toy Design Based on Perceptual Evaluation

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Abstract. With the development of society, the demand of consumers shifts from material demand to emotional demand. The consumer - centered designer is asking for more. Perceptual technology, is a kind of "consumers' perceptual translated into product design elements of technology", which aims to explore some of the emotional reaction, for the product to convert these reactions to design products and consideration should be paid attention to by the conditions. Perceptual evaluation can help designers to grasp the emotional needs of consumers scientifically and accurately extract design elements. In view of the importance of children in family, it is particularly important to study the emotional needs of children's toy consumers. Methods by using the method of psychological measurement, semantic research for consumers, by interview or questionnaire to the respondents information such as language, actions, expressions, gestures were analyzed, and the master consumers emotional appeal for children's toys. Through the material image experiment, the perceptual evaluation of the material is studied, and the design language is acquired. Conclusion the emotional demand of children's toy consumers is analyzed, and the emotional tendency is quantified, and the excellent design language is extracted accurately. It provides scientific theoretical support for the product design of children's toys, and provides reference for the selection of color, material and processing technology of the products.

Keywords: Emotional evaluation · Children's toys · Emotional design · The semantic method

Preface: with the development of the society, the progress of science and technology, make people's material needs are met, people no longer just for survival, and gradually began to the pursuit of life, high level, high quality, enjoy life. This puts forward higher requirements for the designers who focus on users and consumers. The design of products no longer stops at the requirements of function and safety, but tends to satisfy people's emotional needs and enhance the added value of products. As the perceptual technology, is put forward by the Japanese city of Hiroshima university a "consumer's perceptual translated into product design elements of technology", which aims to explore some of the emotional reaction, for the product to convert these reactions to design products and consideration should be paid attention to by the conditions. Perceptual

design provide us with a product quality and functionality are going to promote the design method of the competitive advantage, at the same time also can make designer constantly in the design, pay more attention to the emotional needs of the people. Children, as the new force of human society and the hope of the future, are widely concerned, and the industry related to children is worth exploring and redesigning. Children's toys are of great significance to children's intelligence exploration and communication, which can arouse children's enthusiasm, enhance perceptual knowledge, and help children to think and imagine actively. For this reason, this article will research related to children's toys perceptual engineering theory and analysis in the design of children toy should be considered when the problem such as colour, material qualitative, craft, so as to provide new study idea for the design of children toy and practical way.

1   Current Research on Children's Toys

From the perspective of toy development, science and technology level, it can reflect the each stage of history can reflect different countries, different nationalities, different education concepts, customs, different religious beliefs, aesthetic temperament and interest. Like other civilizations, toys have evolved over time. Toys for children is more important, is not only indispensable to accompany them grow "mentor", at the same time also cultivate their intelligence and promote the healthy growth of children learning and intelligence auxiliary tool. As the children grew up, lu xun once said, "games are children's work, toys are the angels of children." "To pay attention to the growth of young children, we must pay attention to children's games"; Attention to children's game, it is necessary to focus on use of toys, children can see toys in developing plays an important role because of toy contain the social or the culture of The Times, customs and values, any toys are all in the broadest sense of the term "education"; And from a narrow point of view, the education function of some toys in the toy design, can promote children's learning a new skill or size, shape, color, position, type, number, classification, comparison and calculation, such as concept and training, etc. Can be seen that the toy in preschool children, especially the role of education should not be underestimated, need to be taken seriously, at present, although there are many different kinds of toys, toy market in our country the number of dazzling, but the author in writing this thesis, through the access network and literature, etc., found at home and abroad about scarcity, toy toy theoretical research is relatively weak. It can be seen that the role of toys in children, especially preschoolers, has not yet attracted enough attention. With the rapid development of China's economic construction, the family living standard is also improving. As a result, parents in today's society are more than happy to buy toys for their children, and the annual expenditure of toys also shows a clear trend of growth. But how do parents buy toys? What kind of toys? What are the effects of toys on children? And so on. [1, 2] For suppliers, sometimes too much emphasis on toys commercial, considering the manufacturer's profits and earnings, and neglect the function of the toy, therefore, the design and production of toys too much emphasis on entertainment functions.

At present, there are some scholars involved in the research of toy design in China. An early childhood educator, once put forward such a view on the design of toys. He believes that "manufacturing materials should be firm and not damaged"; "interesting shapes can stimulate children's interest"; "can wash without fading, modeling is not ugly, to meet the child's aesthetic needs"; "the structure of the toy needs to be changed, can be moved The children can play on their own and can open up; adapting to the child's ability. It can be seen that the toy designed by Mr. Chen is from the material, shape, color, structure and aesthetic requirements of the toy. The articles of the design principle of preschool children's toys, she puts forward five aspects of the design of toy design principles: Security, namely the toy design should consider when playing with toys by children, will not be any harm; The toy design should be concise and easy to use, which conforms to the operation mode and usage habits of children. Toy design should be interesting, because interesting toys can arouse children's attention and arouse their interest, and cultivate their exploration spirit, imagination, creativity and practical ability; Fourthly, it should be helpful to stimulate the brain development of children and promote the development of their thinking and cognitive abilities. 5. Interactivity, that is, when children play with toys, they can also play different roles to make their social and other aspects develop. Horse town Lin the articles of the four concepts into toy design, toy design puts forward four Suggestions: one, to highlight the theme, namely toy design should comply with the corresponding age children's physical and mental characteristics, toy design fits their needs; Ii. Functional integration, that is, toy design should consider having more functions, such as disassembling and assembling, etc.; Third, the innovation, that is, toy design should also keep pace with The Times, constantly add new elements of the society, let it give the flavor of The Times; Focus on serialization.

2   The Main Function of Children's Toys

Toys, as the name implies, are used to play. Therefore, any kind of toy, entertainment and games should be the most basic characteristics of toys. Apart from the characteristics of entertainment and games, the education effect of toys should not be overlooked. The world health organization (who) led the organization of children's growth and development cooperation center under 6 years old children's psychological development level and family situation, according to a survey of the toys to children's physical activity, language, cognitive and social development has a role in promoting. The author believes that the role of toys in preschool children is mainly reflected in the following aspects.

2.1   Help Children Learn

Our country some scholars pointed out that: good toys to children bring happiness, not only can they provide a rich perceptual experience stimulation and social culture, helping young children to understand and master the usage of some articles for daily use. It can be seen that toys can promote children's learning [1]. One of the early adopters of the learning process was the British thinker John Locke. He transformed the blocks into

building blocks that could help children learn the alphabet, and tried to use them at home to learn. Some toys are designed to promote children's learning of certain skills or concepts. If thimble plastic toys, not only in a variety of colors: red, yellow, blue, green, violet wait for color, common but also vary the shape of a ring: round, square, triangle, heart shape, rectangle, etc., children can combine at will assembling. In the process of playing, I not only learn to distinguish shapes and colors, but also learn to combine orders according to certain rules, from easy to difficult, and train children's logical thinking ability. Such as all kinds of makeup, also on every board with different Numbers, letters or animals, not only let the children of Numbers, letters, and learn the cognition to the animal, can also through different combination of simple addition and subtraction and learning of English words.

2.2 Help Children Get More Experience

Former Soviet educator sukhomlinski once said that the development of children's intelligence is reflected in the fingertips. Toys with there are bright colors, beautiful shapes, pleasant sounds, different materials, etc. [3] Toys can give children a variety of feelings. The excitement of an official children gain many different experiences by looking, listening, touching and sniffing toys. The development of ability has good promoting effect.

2.3 Help Children Learn to Explore

For preschoolers, to play with toys, they must first observe, study and play with toys. Some toys have some difficulty in playing, which requires children to use observation, imagination and memory at the same time. Psychology studies suggest that preschool children observation has no purpose, also is not very stable, easily affected by other things, to the training on preschool children in observation, will find a first can cause they observe the stimulation of interest. [1] Toys because of its beautiful shape, bright color is easy to attract the attention of young children, plus the artists also like hidden in the toy "mystery", children need to explore to find by my own observation, a variety of fun so that they, in their observation of persistent training there is a huge role in promoting. Such as various types of jigsaw puzzle toys, children by looking for patterns and characteristics of each first, and then put all of the puzzle together, together a complete picture of the children in the process of observation obtained the very good training [6]. For example, children play cars on the plane of different materials (wood, glass, cloth, etc.). By observing the different speeds of cars, they feel the existence of friction in the process of playing. In conclusion, the observation ability has been well developed in the process of playing with toys.

3   Explore Children's Toys in an Emotional Way

3.1   Color Image Experiment
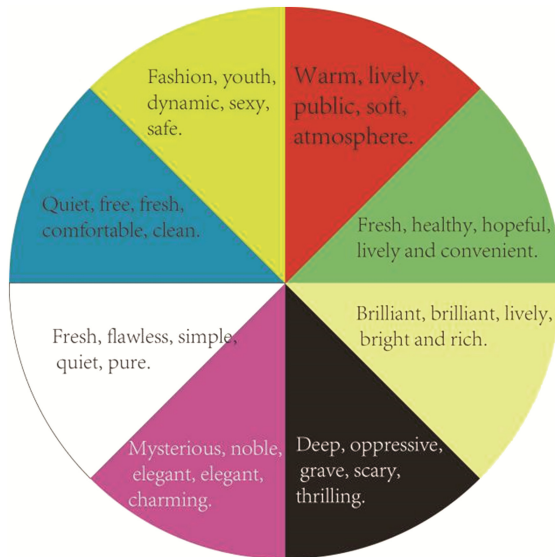
Select Research Cases
Network through on-the-spot investigation, collection, magazine refer to a variety of ways such as sample collection, preliminary get 100 samples of children's toys, considering visual characteristics, to all sorts of color classification analysis, selection of representative and able to related comprehensively covers product place to choose color, finally select 15 representative sample.

The Selection of Perceptual Vocabulary
Choose the seven colors commonly used in toys: red, orange, blue, green, purple and black. The steps are as follows:

(1) Collection of vocabulary: from product books, magazines, toy product introduction manuals, and Internet, 150 representative emotional imagery words related to children's toy materials were collected;
(2) Meaning analysis: the respondents were randomly selected 50 mass consumers, through which questionnaires were issued and according to the conclusion.
After selecting the representative sample images of children's toys, we selected 54 perceptual images that were in accordance with the criteria.

Table 1.   The sense of the color corresponds to the vocabulary

(3) The semantic object: random invited 30 mass consumer's perceptual image semantic clustering experiment, statistics based on the number of the same listed after the similarity matrix, after multiple scale method classification and cluster analysis by class, on the basis of the status of the material classification is divided into six groups, eventually take each group of center distance for the group of

representatives recently, the resulting in a group of representative perceptual image semantics, as shown in Table 1.

3.2 Data Sorting

The Participants
Before the investigation, the respondents were divided into designers with children's toy design experience and children's toys.

Use experienced consumer 2 groups.

Quantization of Semantics
The semantic differential component method is used to obtain the numerical value for statistical analysis, as shown in Fig. 1.
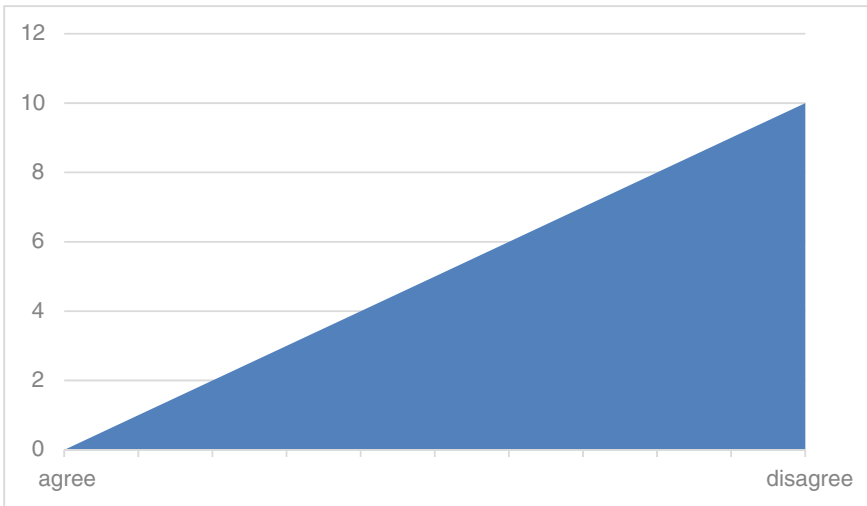
Fig. 1. Semantic quantization graph

Questionnaire Survey. After screening, finally determine the 6 groups of 18 adjectives, let consumers and designers get emotional information from children's toys on the material for each group of adjectives scores, thus build a perceptual image relation model between consumers and designers, as shown in Table 2. Selection of survey objects, one group of children toy for 15 are using consumer, and the other is a set of 15 have certain practical experience and a toy designer, to obtain the image evaluation of children's toys material, as shown in Figs. 2 and 3.

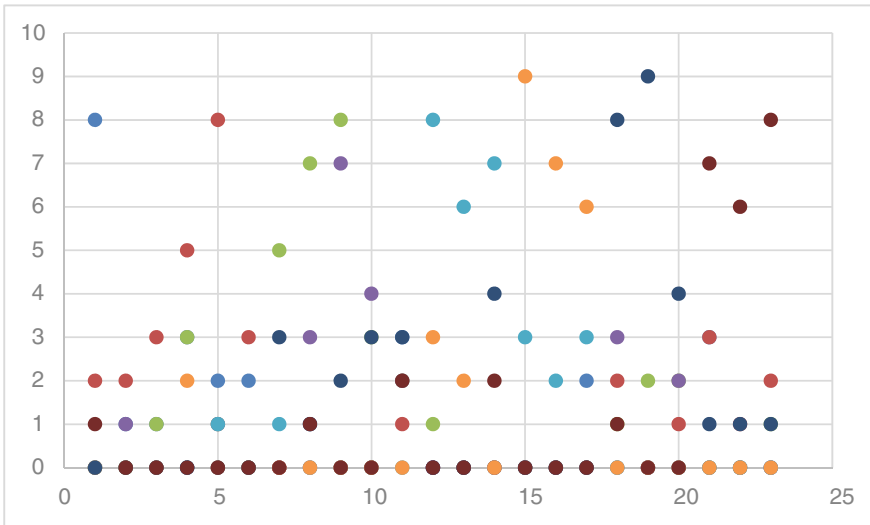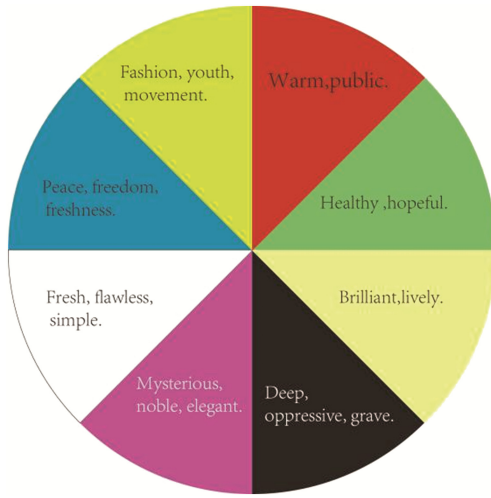**Table 2.** Group diagram of perceptual vocabulary.

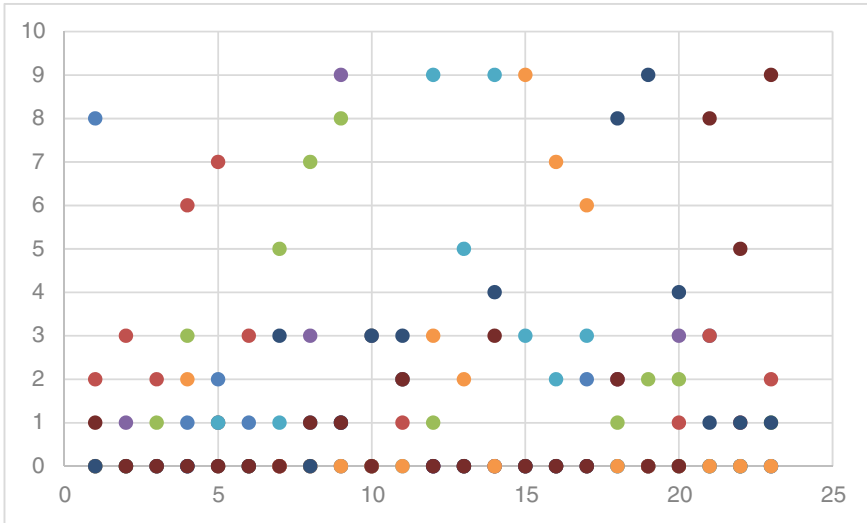**Fig. 2.** Consumer information graph (Color figure online)

Fig. 3. Designer information diagram (Color figure online)

3.3 Material Related Results

Above from the perspective of children's toys material application, analyzes the selection of key points, children's toys and combined with market research and questionnaire survey and mathematical statistics analysis method, a detailed analysis, establish a toy design by means of the quantitative evaluation model of the conclusion. [7] In terms of material classification, it is suitable for children's toy materials to design plastic, wood and leather. Metal, rattan bamboo and cloth art are not suitable for making children's toys.

3.4 The Influence of Color on Children

Due to age restrictions, children have some limitations on the awareness of the surrounding things. They do not have the ability to think independently. This special physiological condition should be taken seriously by the designer. For children, the colors of children's toys attract attention more than shape, text, and sound [5]. Colors are used in children's toys to enrich the use of toys, stimulate children with color, enhance children's memory of pictures, and attract their attention. But with the ever-increasing interaction design, the rich use of color is no longer a simple picture, the picture will affect the story requires the use of color rendering, so that color and children's feelings interact [8]. Color is one of the important design elements of children's toys and is a necessary manifestation of children's toys.

The colors of physiological and psychological feelings of different ages are different, so as a designer, in the design of children's toys, in addition to the application of color color design features, the physical and mental states of the application are divided into

different age groups. The festival will focus on analyzing the cognitive experience of children of different ages. Child psychologists divide children into three phases according to their physiological and psychological characteristics: Different ages and colors have different effects on people's psychology and emotions, especially children. Due to the particularity of children, we should also design them in the design of children's toys.

The development of newborn vision is the lowest of all sensory abilities. Newborns have a range of 1/10 to 1/30 of the average adult's vision, and by six months they have almost as much vision as adults [4]. Some researchers use conventional methods to study babies' visual abilities and discover the world's colors when they are born. The rapid development of the nerve center and sensory channel makes the children's color perception ability improve rapidly. 3 years old, due to its physiological development, the level of vision, hearing and language is limited. The response to color is only a conditioned reflex of the brain, a physiological response to color, not psychological. The famous professor of psychology at valentine to analyze this stage children of color perception and color preference, in kindergarten conducted an interesting experiment: the one hundred red bricks and one hundred blue bricks together, and let one hundred two to three years old children to choose their want to block, the results more than 90% of children chose the red color blocks, after obtaining blocks and was very happy. The results of this test confirm that children in this stage have a clear perception of color and can distinguish between red and blue colors. Children three years old have a special preference for red. They like to wear red clothes and red shoes. They also like red pens when they doodle. Young children are attracted by red color, red color is strong, can produce certain stimulation to the vision, help the growth and development of the baby brain. The deep color such as blue, black can make the child feel fear, adverse to their physical and mental development.

Therefore, as the designer, when designing children's toys for children's children, we can try to use bright colors to avoid the gray color.

Preschool age children in early childhood have certain thinking ability, they began to have their own ideas, also has made great progress in the language, you can say what they want, favorite things, and so on. This stage belongs to the color of a sensitive stage, by thought alone, they are not thinking of the feelings of color, when you see a certain color, will have a clear psychological reaction, and very direct through facial expressions, language, or physical behavior. "Child psychology research shows that four years of age had 98% of the children can correct to say "red", 94% of the children can correct a "black", 92% of children correctly say "green", 78% of children are able to correctly say "yellow". By the age of five, more than 70% of children can correctly name eight colors. By the age of six or so, more than 55% of children can correctly name 12 colors. This study proves that children in this stage have good visual foundation and color discrimination ability. They like the color of high purity such as red, yellow, blue and green. This color will give them a warm and cheerful color feeling. Preschool age children in addition to correctly identify part color, also to have certain color changes in temperature, light and heavy feeling, hard and soft feeling, and as the growth of the age, this kind of colour feeling more intense and accurate.

Children and preschool children's sense of color is more dependent on perceptual thinking, and has a certain preference for color purity and higher brightness. And 6 children as the growth of the age, also some changes have taken place in physical structure, visual and language expression ability has reached the level of adult, have own judgement ability, can the independent thinking ability. This age children are in elementary school, so different from infancy, preschool age children, environment changed from home to school such a large group, and parents communication, less interaction with peers became more frequent. Them for their favorite things have the initiative, want to wear what color clothes, what color back schoolbag have their own ideas, now the young parents will think of some way to try to meet to the requirement of the child. This stage children's understanding of color began to mature, no longer favor only in the colour of bright, excitant strong, gradually to the lightness and purity, low dark and cool color tones have interest. The color psychological effect also gradually reflected in them: they began to recognize the color symbolism, the color is rich in association, can feel the color of the cold, the sense of light. For example, see red in infancy and preschool age children, intuitive thought is a flower and the colour of the sun, and childhood is different, they can feel this is a happy color, also can produce sweet taste sense; Seeing black, they can feel the dark atmosphere that this color brings, still can have the psychological feeling such as hard feeling, weight, melancholy. Therefore, we should clarify the color psychological characteristics of children in this stage and start from their thinking logic.

In addition, "pre-school children have a certain gender difference in color perception". As is known to all, little girls' favorite color is pink, while boys are different, most of them like blue. Pink light tone, easy to remind them of the beautiful skirt, lenovo to the beautiful flowers in the garden; The boys, however, prefer a sedate tone that suits them better. Over time, in the people's inertia is considered strong warm girl's gender attributes, cool color to emphasize the boy's gender attributes, with color for girls and boys on the gender cues.

The Influence of Different Age or Gender on Toy Color. A questionnaire survey of toys for children of different ages and genders was conducted. Children with different age and age have different color preferences for toys. The color preference of children between 1 and 3 years old is not related to gender, the preference is blue and red, the boy of 7–10 years old is fond of blue, the girl likes red, yellow and orange are not very different. Blue and red are the most popular colors in different colors, followed by yellow and orange. Purple and green were the least favored by children (23.4%). As shown in Fig. 4.
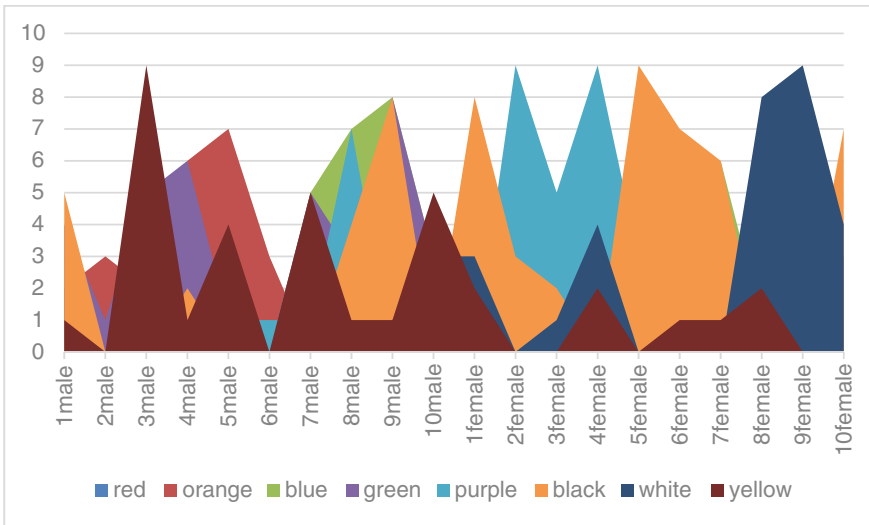
Fig. 4. Color of toys of different ages and sexes (Color figure online)

Through the above investigation, it can be found that children's toy color cognition is of age difference and gender difference. First of all, before the age of 3, children had no difference in color. Generally speaking, boys over four years old prefer cool colors, such as blue and green. Girls are more likely to enjoy warm colors, such as high purity yellow, red, pink, etc. Therefore, as the age increases, the children in this stage will be bored with the usual colors of red, yellow, blue and green, and do not like simple color combinations. Also is prominent, the color is lenovo at this stage in the children's consciousness, they will feel warm nervous, see red see yellow will feel warm, soothing, see will feel dark black, fear, and so on. Therefore, in children's toy color design, the first step is to strengthen the color complexity, from simple color to gradual change, with the brightness change, from concrete to abstract.

4   Conclusion

Children are the future of the country. Children's toys play a crucial role in the development and development of children. Currently, the design of children's toys is more entertaining and ignores the important education function. In the design of the toy, the consideration of perceptual engineering is deficient, and the related research is very weak. However, children's toys which are conducive to intellectual development and conform to the scientific basis of perceptual engineering are the urgent needs of children and parents. This study on the current children's toys design and research present situation has carried on the induction summary, emphasized the important role in children's toys, apply the scientific method of perceptual engineering and experiment of children's toys products material and colour is analyzed. Using the semantic difference component method to study and summarize the materials suitable for children's toys. Comparative

study (0–3 years old) early childhood; (3–6 years old); (6 to 12 years old) children childhood for physiological and psychological characteristics of color, children's toys of different age and gender love colour has carried on the questionnaire survey, found that children's toys color cognition has the age difference and gender difference. After clarifying the physical and psychological characteristics of children, the designer can obtain the use demand more accurately, so as to make more rational use of the design language for children's toy design. In a follow-up study, the author will from a broader investigation scope, increase the number of samples, for voice, process more dimensions of research, children's toys to realize more scientific, complete and system design.

References

1. Zhang, Y.: Research on the status of children's toys. Shanghai Normal University (2012)
2. Zheng, S.: "Childhood study" needs to introduce children's voices. Chinese Social Science News, 2010-06-01(005)
3. Jiang, M.: A brief analysis on the color design of children's toys. Sci. Technol. Inf. **33**: 340 + 338 (2009)
4. Wang, D.: Color study of children's toy design in China. Jilin Art Institute (2012)
5. Chun, L., Tian, F.: Development of children's toy design based on sensory experience. J. Packag. **4**(03), 83–87 (2012)
6. Chen, Q., Lei, Y., Hong, L.: Influence of color, shape and size similarity and variability on children's inductive reasoning. Psychol. Dev. Educ. **27**(01), 17–24 (2011)
7. Guo, J., Yuan, Z.: Analysis and research on Kansei engineering of children's furniture. Furnit. Inter. Decor. **11**, 100–103 (2015)
8. Wang, J.: Application of color in children interactive ebooks. Hubei University of Technology (2012)