Revista Argentina de Clínica Psicológica
2020, Vol. XXIX, N°1, 728-734
DOI: 10.24205/03276716.2020.98

PSYCHOLOGICAL FEATURES OF VISUALLY IMPAIRED CHILDREN AND THEIR NEEDS IN BOOK ART DESIGN

Qi Zhang[1,2], Tingzhao Wang[1]*

Abstract

Many books for visually impaired children do not conform to the cognitive rules or reading habit of these children. To solve the problem, this paper carries out a comparative analysis on the psychological features of visually impaired children, from the perspective of cognitive psychology. Besides, the authors discussed how to satisfy the psychological needs of these children in book design, in light of relevant theories on book art design. The results show that visually impaired children are more sensitive in auditory and tactile senses and better in short-term and permanent memory than ordinary children, but slower in perspective mode and the development of thinking; visually impaired children mainly rely on touching to "read" books. Finally, this paper puts forward the design principles, concepts and components of books for visually impaired children. This research offers a reference for the application of cognitive psychology in the book design for visually impaired children.

Key words: *Visually Impaired Children, Book Art, Book Design, Cognitive Psychology, Psychological Characteristics, Psychological Needs.*

Received: 14-02-19 | Accepted: 09-08-19

INTRODUCTION

Books are not general commodities, but a kind of culture and art, which is one of the most important tools for the knowledge dissemination of human beings. Book art, also known as book binding art, is a harmonious and beautiful overall art that combines material and craft, idea and art, appearance and content, part and whole in the production process of books and it includes design elements such as cover design, text design, page design and illustration design (Raisamo, PatomKi, Hasu et al., 2007). The art design of books should not only consider the aesthetic habit of people, but also meet the needs of readers. However, most of the books available for visually impaired children in the market are mainly based on Braille and it is difficult to meet the needs of visually impaired children without starting from their cognitive rule and reading habit.

From a global perspective, Japan attaches great significance to special education, and has various Braille books. Although foreign countries have solved the problem of information access for visually impaired people from the technical field, Braille books are still the major approach for visually impaired people to learn knowledge. Therefore, the innovative design of books for visually impaired people is particularly important. As a special group, visually impaired children have different physiological characteristics and psychological characteristics at different ages. Therefore, it is the requirement for the future design to design the books for visually impaired children from the perspective of cognitive psychology. Cognitive psychology is a science that studies the process and psychological mechanism of human cognitive activities and the research on cognitive psychology is relatively mature, among which

[1]School of Education, Shaanxi Normal University, Xi'an 710062, China. [2]School of Fine Arts, Inner Mongolia University for Nationalities, Tongliao 028043, China.
E-Mail: 15047169666@163.com

the "*cognitive characteristics and educational countermeasures of visually impaired children*" and "Progress of Psychological Research on Visually Impaired Children in China" studied the literature on the psychological research of visually impaired children in China's five core journals from 2008 to 2014 (Howard, Culley, & Dekoninck, 2008), which is of important reference value. In general, the design for visually impaired people at home and abroad mostly focus on using certain technique or media technology to help these people to obtain information, while the number of studies on the book design for visually impaired children is limited.

Based on the above analysis, this paper proceeds from cognitive psychology and mainly focuses on the aspect of perception, consciousness and memory from the perspective of cognitive psychology. It uses the comparative analysis method to analyze the psychological characteristics and psychological needs of visually impaired children and ordinary children in book design and summarizes the problems in the book design for visually impaired children in China. On the basis of relevant theories of book art design, this paper proposes the book design strategy for visually impaired children based on cognitive psychology in order to provide new design thinking for the book design of visually impaired children.

ANALYSIS OF PSYCHOLOGICAL CHARACTERISTICS AND PSYCHOLOGICAL NEEDS IN THE BOOK DESIGN FOR VISUALLY IMPAIRED CHILDREN BASED ON COGNITIVE PSYCHOLOGY

Cognitive Process Comparison between Visually Impaired Children and Ordinary Children

Comparison of sensory characteristics

Most visually impaired children are unable to perceive light and color, and mainly rely on hearing in their daily life. Therefore, their auditory sense is more sensitive than ordinary children. In addition, visually impaired children can also replace vision with touching.

Comparison of cognitive approach

Vision is an important way for humans to obtain information. For visually impaired children, they can only rely on the tactile sense, hearing and smell to compensate for their visual defects, among which the tactile sense is the main way for visually impaired children to understand the world. However, compared with ordinary children, they are slow in thinking and lack initiative. Moreover, the tactile sense requires a direct contact with the object. Therefore, visually impaired children can only rely on their imagination for objects in far distance or with fine structure, which limits their direct perception.

Cognitive Psychological Characteristics of Visually Impaired Children in the Reading Process

Characteristics of Perceptual development

Visually impaired children can use the sense of hearing to judge the distance and physique of people. This special ability of hearing is acquired in daily exercise and this phenomenon is called sensory compensation (Gratch & Marsella, 2005), which is also in line with Law of Use and Disuse. Therefore, the reason why some organs of visually impaired children are much more sensitive than others is to compensate the lack of vision. This is acquired in a special environment and it is this sensory compensation that improves the living ability of visually impaired children.

Characteristics of thinking and memory development

Due to lack of vision, the inferential capability of visually impaired children is less developed than ordinary children and they have insufficient logical ability, abstract thinking and classification and generalization ability so that there is no clear concept in the occurrence and development of thinking. The development of memory ability is mainly based on skin touch and sound and they have better short-term and permanent memory, but the physical representation is not clear and their memory is fragmented.

Perception mode in reading

Visual reading, auditory reading, and tactile reading are the primary means of reading for visually impaired children (Kucirkova, 2018), where visual reading refers to visually impaired children with low vision using a magnifying glass or other supplementary means for close reading (Schulz, Tompkins, Wood et al., 2006). Reading through sounds such as music and voice is called auditory reading and in recent years, with the development of technology, more and more

books are equipped with phonetic function. Tactile reading refers to the reading through Braille, which is the main reading approach for visually impaired children.

BOOK DESIGN STRATEGIES FOR VISUALLY IMPAIRED CHILDREN BASED ON COGNITIVE PSYCHOLOGY

Current Situation and Problems in the Book Design for Visually Impaired Children

Reading Braille books and listening to audio books are the two main reading forms for visually impaired children (Motoshima, Shinohara, Todo et al., 2014). Reading software and Braille books are the main reading materials provided for visually impaired children in major libraries in China. Since Braille is composed of six raised basic elements, (Figure 1 shows the comparison table of Braille initials) and all numbers, symbols, etc., must be translated through six-point Braille, the whole book is very heavy. Also, the book is covered with points, as shown in Figure 6, which looks very boring. At present, most of the existing Braille books are textbooks and medical books while the number of picture books and classics that can be read by visually impaired children are very limited. In addition, according to the definition of visual impairment, it can be divided into two categories: total blindness and low vision. (Cohen-Kreisberger, 2005). However, there is no clear classification in the design of Braille books in the current stage, so that people with acquired blindness and low vision are not satisfied with Braille and Braille books. In summary, the design of books for visually impaired children does not proceed from the cognitive psychological characteristics and needs of visually impaired children, and these books are single in form and lack interestingness and interactivity.

Figure 1. **Braille initial table**

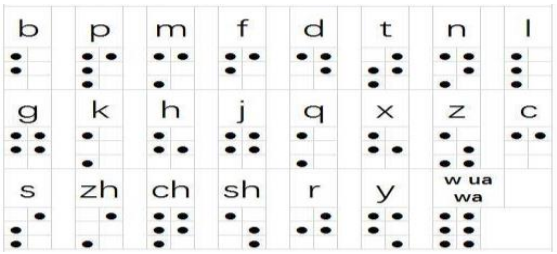
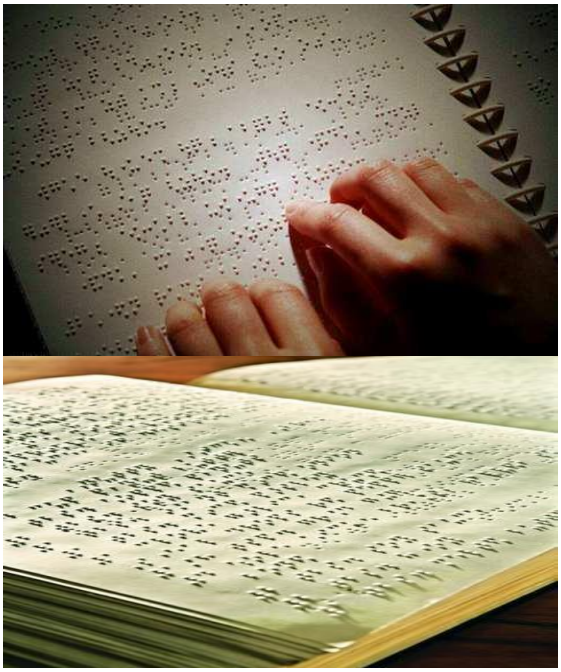


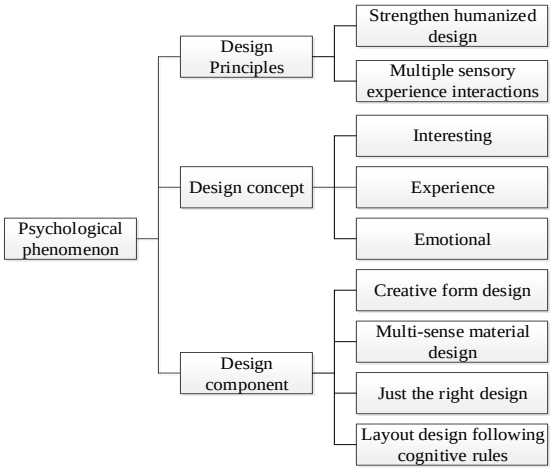
Figure 2. **Braille books**



Book Design Strategies for Visually Impaired Children Based on Cognitive Psychology

From the perspective of cognitive psychology, this paper proposes the book design strategy for visually impaired children from three aspects, namely book design principles, design concepts and design components, as shown in Figure 3.

Figure 3. **Visual design strategies for visually impaired children**



Design principles

(1) Strengthening humanized design

When designing books for visually impaired children, the cognitive rule of visually impaired children must be taken into consideration. Different from ordinary children who can read the content of books or see the overall shape of pictures easily, visually impaired children usually read the book through touching. Existing studies show that the top-down reading method is more intuitive and effective. Only by fully understanding the psychological characteristics and cognitive structure of visually impaired children can we design books that meet the needs of visually impaired children to help them have a clear understanding of the content. In addition, in order to avoid harm to visually impaired children, right angle and hard materials should be avoided when design those books. On the contrast, safety round corner design (as shown in Figure 4) or rubber and fabric materials should be adopted. To facilitate the reading of visually impaired children, the actual needs, such as the grasping ability of visually impaired children of different ages should be considered in the binding method.

Figure 4. **Rounded design visually impaired children's books**

(2) Various perceptual experience interaction

At present, there is a certain misunderstanding of visually impaired children. They include not only blind people in the traditional sense, but also children with low vision, which accounts about 90% (Landau, Sullivan, & Solomon, 2010). Therefore, when designing books for visually impaired children, bright colors should be used, which is more in line with the cognitive rule of visually impaired children. Figure 7 shows the picture book of a snake, which depicts a vivid fruit pattern with simple thick lines and vivid color contrasts.

Figure 5. **Picture book-a hungry little snake**

Auditory sense is the second only to the visual sense and it is also one of the important ways for visually impaired children to understand and communicate with the outside world in addition to tactile sense. Unlike ordinary children, visually impaired children can tell the direction through auditory sense. Therefore, auditory elements can be added in the design of books for visually impaired children so that paper books will bear auditory elements. The interestingness of reading for visually impaired children can be enhanced through a variety of senses and the learning efficiency of visually impaired children can be improved.

Design concept

(1) Interestingness

Interestingness is the motivation in life. It is likely for visually impaired children to lose their concentration and interest when facing the lengthy and monotonous Braille in the reading process. They are not easy to concentrate and lose interest. Therefore, it is necessary to integrate the element of interestingness that can be understood by visually impaired children. Methods such as the transformation of things into interesting art forms, the selection of appropriate graphic patterns to make touch graphics, the selection of different materials to make the book and the enrichment of the tactile experience of visually impaired children can stimulate their imagination and trigger their curiosity and arouse their thirst for future world.

(2) Experience

The expression of sensory design is the core in the book design experience of visually impaired children. Tactile, auditory and olfactory senses are the main senses that can be mobilized by visually impaired children when reading books. The use of special sounds, contrasting colors, and interesting three-dimensional shapes

in the design of books can mobilize various senses of visually impaired children, so that reading will be more interesting. Figure 6 shows the picture book of ancient Chinese mythology. The picture book transforms the story content into vivid and lifelike three-dimensional model, which greatly enhances the interactive effect of reading. However, it is worth emphasizing that some visually impaired children cannot see the effect of three-dimensional books and can only perceived by tactile sense. Therefore, design should be performed based on the cognitive rule of visually impaired children so that they can have an overall understanding of things through tactile sense.

Figure 6. **Three-dimensional book**

(3) Emotion

People's perception and feeling of things is called emotion, which is divided into instinct, behavior, and reflection level (Noy, 1979). The most direct reaction that people have when are in contact with things is called instinct emotion. In the interaction process, one of the physiological reactions produced in the participation is called behavioral emotion. The perception and understanding generated by the visually impaired children based on the previous two emotions are called the reflection level. The hole book shown in Figure 7 arouses the curiosity of visually impaired children and stimulate their reading interest because of its unique shape. Children are curious about what is behind these holes so that they will continue to read. Through touch reading and based on their perception and understanding, children finally understand the knowledge and content in the book. This process includes three stages of emotion. Therefore, the design of books for visually impaired children must be based on their cognitive psychology and focus on emotional design.

Figure 7. **Hole book**

Design components

(1) Creative design

It is found through investigation that books and picture books for ordinary children are rich in forms, such as hole books, folding books, and three-dimensional books while books for visually impaired children are mostly square. For visually impaired children, the first thing in reading is to touch the book. Therefore, on the one hand, the design of books for visually impaired children should consider the cognitive psychology of visually impaired children; on the other hand, it should also perform innovative design referring to the form of books for ordinary children so that the interest of visually impaired children will be aroused once they touch the book

(2) Material design with multiple senses

Tactile sense is an important means for visually impaired children to understand the world, and different materials can give people different feelings. In order to promote brain development and enhance the understanding of the book content, visually impaired children should be exposed to objects of different materials as soon as possible. Figure 8 shows the touch book for babies made from different artificial fur materials and fabric materials. Visually impaired children can perceive the fluffy feeling of bunnies through touching and perceive the touch of flowers, so that these children feel like they are in the real scenario place, and the reading will be more approachable. It also facilitates the memory of visually impaired children. Therefore, in order to provide high-quality books for visually impaired children, more appropriate and vivid materials should be selected in the design of books for visually impaired children.

Figure 8. **Touch book of different materials**

(3) Appropriate format design

The selection of format is based on the principle of facilitating the reading of visually impaired children. For preschool visually impaired children, the design should be square and longer format should be avoided. The main reason is that children at this age have poor coordination ability and they are likely to lose their concentration in the reading, so longer format is not conducive to their reading. When the increase of the age and cognitive level of visually impaired children, a slightly larger format can be used. Undoubtedly, the design of format should also consider the type and content of books.

(4) Layout design following the cognitive rule

Different layout designs bring different feelings to readers. Color contrast and matching, graphic and image modeling and Braille arrangement are all part of the layout design of books for visually impaired children. In addition to considering the layout of books, the interestingness and beauty of images should also be considered. It is necessary to consider the physical and psychological characteristics of visually impaired children and the law of touch reading so as to reduce the difficulty of understanding the content for visually impaired children.

CONCLUSION

Books are one of the main means for visually impaired children to understand the world. However, there are few books in the market that meet the cognitive rule and reading habit of visually impaired children. Based on relevant theories of book art design, this paper studies the psychological characteristics and needs of visually impaired children from the perspective of cognitive psychology. The specific conclusions are as follows:

(1) It is found through comparative analysis that the auditory and tactile sense of visually impaired children are more sensitive than ordinary children. However, their perspective mode and the development of thinking are slower. They have better short-term and permanent memory and the touch reading is the main means of reading for them.

(2) At present, books available in the market for visually impaired children are mainly Braille, which are single in form and lack interestingness and interactivity. Also, the number of these books is limited.

(3) From the perspective of cognitive psychology, this paper proposes the book design strategy for visually impaired children from three aspects, namely book design principles, design concepts and design components. Emphasis should be given to the interest, experience and emotional design of books for visually impaired children. Bright color, innovative shape and appropriate and vivid materials should be selected and the layout design should consider the cognitive ability of visually impaired children of different ages.

Acknowledgement

This research is financed by 2019 Scientific Research Project of Colleges in Inner Mongolia Autonomous region "Research on the creation of Picture Books for Special Children in Inner Mongolia"(NJSY19161).

REFERENCES

Cohen-Kreisberger, L. (2005). The creation of a shared space through fantasy between a seven-year-old child and his therapist: a case study. *Clinical Social Work Journal*, *33(3),* 259-270.

Gratch, J., & Marsella, S. (2005). Lessons from emotion psychology for the design of lifelike characters. *Applied Artificial Intelligence*, *19(3-4),* 215-233.

Howard, T. J., Culley, S. J., & Dekoninck, E. (2008). Describing the creative design process by the integration of engineering design and cognitive psychology literature. *Design Studies*, *29(2),* 160-180.

Kucirkova, N. (2018). Children's agency and reading

with story-apps: Considerations of design, behavioural and social dimensions. *Qualitative Research in Psychology*, 1-25.

Landau, M. J., Sullivan, D., & Solomon, S. (2010). On graves and graven images: a terror management analysis of the psychological functions of art. *European Review of Social Psychology*, *21(1),* 114-154.

Motoshima, Y., Shinohara, I., Todo, N., & Moriguchi, Y. (2014). Parental behaviour and children's creation of imaginary companions: a longitudinal study. *European Journal of Developmental Psychology*, *11(6),* 716-727.

Noy, P. (1979). Form creation in art: an ego-psychological approach to creativity. *The Psychoanalytic Quarterly*, *48(2),* 229-256.

Raisamo, R., PatomKi, S., Hasu, M., & Pasto, V. (2007). Design and evaluation of a tactile memory game for visually impaired children. *Interacting with Computers*, 19*(2),* 196-205.

Schulz, R., Tompkins, C. A., Wood, D., & Decker, S. (2006). The social psychology of caregiving: physical and psychological costs of providing support to the disabled1. *Journal of Applied Social Psychology*, *17(4)*, 401-428.