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Application of Color Psychology in Personalized Children's Clothing Design

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Abstract: *With the diversification of consumer demand and the strengthening of the trend of personalization, personalized children's clothing design has become an important direction in the field of clothing design. However, the existing children's clothing design often ignores the application of color psychology, resulting in the inability of clothing to meet children's emotional needs and parents' expectations to the greatest extent. In order to solve this problem, this paper proposes to combine color psychology with personalized children's clothing design, and explores the best application method of color in children's clothing design by studying the impact of different colors on children's emotions and behaviors. By analyzing the impact of major tones such as red, blue, yellow, green and gray on children's emotions, this paper establishes a correlation model between color and emotional response, and guides children's clothing design based on these data. The study shows that in terms of average activity time, yellow (21.1 minutes) and blue (20.2 minutes) perform best, indicating that these two colors can stimulate children's interest and activity for a longer time. Green (19.7 minutes) is second, and also shows good activity continuity. Color can not only directly affect children's emotions and behaviors but also enhance the attractiveness and comfort of clothing through detailed design.*

Keywords: *Color Psychology, Personalized Children's Clothing Design, Children's Emotions, Emotional Response, Clothing Design Optimization*

1. Introduction

As consumers' demand for personalized products continues to increase, especially in the field of children's clothing, how to enhance the attractiveness and adaptability of clothing through the selection and application of colors has become an important topic of concern for designers and brand owners. As a powerful visual tool, color not only affects the appearance of clothing but also has a profound impact on the psychological state and emotional response of the wearer. Research in color psychology shows that different colors can evoke different emotions and behavioral responses, which provides new perspectives and possibilities for personalized children's clothing design.

This study aims to explore the application of color psychology in personalized children's clothing design, focusing on analyzing the impact of color on children's emotions and behaviors, and optimizing clothing design based on these impacts. By analyzing the psychological effects of different colors, it provides designers with a more scientific basis for color selection, so that they can better combine children's emotional needs in design and create personalized children's clothing with emotional value.

2. Related Work

In the field of children's clothing design, with the technological innovation and changes in market demand, more and more research is devoted to exploring new design methods and strategies. These studies not only focus on the functionality and comfort of clothing but also on the improvement of personalization, fashion sense and sustainability. Hu and Yahaya used modular structure, scalability, adaptability to all seasons and personalized functions. This innovative design is both fashionable and practical, bringing greater convenience to children and families, and promoting innovation and change in the field of children's clothing [1]. Wu et al. solved the limitations of children's clothing size design through a systematic approach. They selected children's jeans patterns and developed a pattern size prediction model using BP (Backpropagation) neural network. By importing the predicted size data into the dialogue control language dialog box of Auto-CAD (Automated Computer-Aided Design), the pattern was automatically generated [2]. Liu extracted more 3D feature information by using texture

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images under different directions of illumination, and used this information to train and classify machine learning algorithms to achieve effective recognition[3]. Silva et al. aimed to explore the motivations and obstacles of parents when purchasing second-hand children's clothing, and specifically examined the potential impact of previous experience on the relationship between these motivations, obstacles and purchase intentions. The results showed that environmental sustainability and risk perception significantly affected parents' intention to purchase second-hand children's clothing[4]. Although existing research has made some progress in the design, customization and functional improvement of children's clothing, it still faces bottlenecks in technology, cost and production processes in achieving large-scale application and standardized production.

3. Method

3.1 Analysis of representative brands and design cases

The "dopamine dressing" trend has swept the fashion circle rapidly in recent years and has become a hot style pursued by international brands and mass consumers. Its core lies in conveying positive emotions and stimulating pleasant experiences through high-saturation and strong contrast color combinations, presenting a visual "happy" expression.

From an international perspective, high-end brands such as Gucci and Balenciaga have taken the lead in leading this trend. For example, in its 2021 spring and summer series, Gucci boldly uses highly saturated colors such as bright yellow and pink, and incorporates geometric patterns to create a strong visual tension. This color language not only highlights the brand personality, but also spreads rapidly on social media, becoming a highlight of the "street shots" of celebrities and bloggers. At the same time, fast fashion brands such as Zara have also made the "dopamine style" popular in the mass market through a series of items with affordable prices and bright colors. The bright-colored daily wear in Zara's 2022 spring series is widely popular among young people and has become an important representative of dopamine dressing in the fast fashion field.

In the Asia-Pacific region, color expression has gradually become an important means for designers. Chinese designer Angus Chiang is famous for his playful and colorful design style. His joint series with McDonald's and sports brand UMBRO are designed with "happiness" and "childishness" as the starting point, and are popular among young fashion circles. Chinese local design brand Oinkoink advocates a gender-neutral style. Its visually impactful items such as "Dragon Fruit Banana Pants" show the creative possibilities of dopamine dressing and become a hot topic on social media. The Jacquemus brand founded by French designer Simon Porte Jacquemus has become one of the preferred brands for dopamine style enthusiasts with its keen control of color structure and emotional expression. In the 2023 spring and summer series, the luxury brand MARNI combines bright color blocks with leather and three-dimensional tailoring, breaking the calmness of traditional luxury style and creating a bright and dynamic visual impression.

From a broader design perspective, the use of color has also become one of the key elements of public space and product experience design. Taking children's space as an example, many children's museums and exhibition spaces in China pay more attention to the combination of unity and diversity in color strategy. On the one hand, the overall space needs to maintain a harmonious color tone to create a stable and comfortable environment, on the other hand, each exhibition area can be divided into different colors to strengthen the theme orientation and stimulate children's desire for exploration and imagination. For example, the children's exhibition area of Shanghai Natural History Museum adopts a color separation design strategy, using green, orange, blue and other colors to represent nature, technology and interactive experience, respectively creating a spatial atmosphere of sensory stimulation and cognitive enlightenment, and enhancing the immersion of learning experience.

At a time when color psychology is gradually being valued, whether it is high-end fashion brands, fast fashion chains, or the color design of public spaces and cultural venues, it reflects the important value of color in conveying emotions, shaping experiences and guiding behaviors. The rise of dopamine style is a typical manifestation of this trend in the field of fashion design, and it also provides a broader source of inspiration for future personalized clothing design.

3.2 Color as a Medium for Conveying Emotions

In children's clothing design, color is not only a visual element but also an important way to express

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emotions. The associations brought by color will trigger emotional resonance at the sensory level, such as cold and warm, soft and hard, simple and gorgeous, and ultimately affect the psychological state of children. Different colors have their own unique psychological implications. For example, bright colors often bring joy and lively emotions, while heavy dark colors may cause feelings of depression and indifference.

Color psychology believes that children's color preferences reflect their personality tendencies: children who prefer red are usually emotional and energetic, but may also be impatient and irritable, children who like yellow are relatively introverted, delicate, and dependent, and children who like blue tend to be quiet, cautious, and introverted. When creating personalized children's clothing, designers should consider the color preferences of different children at different stages of psychological growth, and use colors to convey warm, safe, and positive emotional experiences, thereby enhancing the emotional expression ability of children's clothing.

3.3 Combination of Pattern and Color in Emotional Design

Pattern elements play an important emotional and cognitive function in children's clothing. Children respond significantly to visual stimulation during their growth. The combination of patterns and colors not only provides aesthetic enjoyment but also helps emotional inspiration and cognitive development. Referring to Piaget's theory of child cognitive development, children of different ages have different cognitive abilities for patterns and colors. Infants and young children mainly rely on touch and color block perception, and pattern design should be simple and bright in color, in the pre-operational stage and concrete operational stage, children gradually develop symbolic thinking and emotion recognition ability, and design can convey emotions through specific patterns, animal images, anthropomorphic characters, etc.

3.4 The Associative Effect of Animation Character Colors

One of the key factors that makes many cartoon characters loved by children so widely spread is their highly recognizable color configuration. For example, the bright yellow of "SpongeBob SquarePants" and the pink of "Patrick Star" are not only exaggerated in shape but also very memorable in color matching. Incorporating the representative colors of these characters into children's clothing design can make consumers feel familiar and close even without using the complete image of the characters, thereby increasing their willingness to buy.

Designers can symbolize the colors of cartoon characters according to their personality characteristics, such as refining the colors of the characters' clothing into pattern background colors, trim colors or main fabric colors, and combine the functional needs of children's clothing with popular trends for integration and innovation.

3.5 Color Contrast and Structural Expression in Folk Decorative Style

In the development of personalized children's clothing, traditional folk art provides a rich source of inspiration. For example, the folk art form of "mud dog" has a very decorative and visually impactful color treatment. Mud dog works often use red and green contrast, light and dark alternation, symmetrical layout and other methods to create a jumping and full color structure. This bright color level and high-purity contrast can not only stimulate visual attention but also be extended to children's clothing design to enhance the artistic expression of children's clothing.

In the design of children's clothing patterns, designers can use high-contrast color combinations (such as vermilion and light red, light yellow and medium yellow) to learn from the color rules of clay dogs, and show a lively and bright atmosphere while maintaining harmony. At the same time, symmetrically or staggeredly distributing colors on the left and right, front and back of the body can break the conventional composition and improve the visual appeal and recognition of clothing. This kind of modern translation of traditional artistic colors not only enriches the cultural connotation of children's clothing but also conveys a beautiful vision for the positive growth of children.

3.6 Color Stimulation Stimulates Children's Creativity and Imagination

The physiological impact of color cannot be ignored. When the human eye is stimulated by bright colors, it will cause nerve excitement and psychological pleasure, which will stimulate creativity and

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imagination. Children's perception of color is relatively direct, and colors with high brightness and strong purity can quickly attract attention. Personalized children's clothing should pursue the unity of visual tension and emotional pleasure in color matching, and stimulate children's emotional resonance and thinking development through color language.

For example, using jumping color matching, gradient effects or contrasting color designs can not only satisfy visual interest but also subtly improve children's color cognition level in daily wear. Especially in the design of functional children's clothing (such as casual wear, festive wear, and art performance wear), clever application of color psychology theory can enhance the dual value of clothing in terms of expressiveness and educational significance.

4. Results and Discussion

4.1 Experimental Subjects

Number of samples: 60 children in total, half male and half female

Age distribution: 3-10 years old (lower grades of primary school)

Sample selection method: Stratified random sampling is used to recruit samples from three kindergartens and two primary schools, and written consent is obtained from the guardians

4.2 Experimental Materials

Children's clothing design plan: 6 sets of children's clothing are designed by professional designers based on the principles of color psychology. Each set includes different tones (warm colors, cool colors, neutral colors), different brightness and purity changes. The style of each set is relatively unified, and only the color variables change.

Pattern control: The pattern elements are unified as anthropomorphic animal patterns, but different emotional atmospheres are presented through color processing (such as positive, tranquil, anxious, excited, etc.)

Auxiliary materials: Emotion scale card (with pictures), color preference ranking card, camera equipment for behavioral observation and recording

4.3 Experimental Procedure

Phase 1: Individual testing

Children enter the testing room one by one, and the experimenter shows six sets of children's clothing pictures and plays the corresponding 3D simulated fitting animation. Each piece of clothing is displayed for about 30 seconds

Children give emotional feedback based on the color perception of each set of children's clothing (using graphic expression cards) and complete the color preference sorting task

Observation and recording of children's verbal and non-verbal behavioral responses, including smiling, refusing, pointing, describing, imitating, etc.

Phase 2: Group interaction test

Four-person group, role-playing game, each child is asked to choose a set of clothing to "play a role"

Observation and recording of children's verbal and non-verbal behavioral responses, including smiling, refusing, pointing, describing, imitating, etc.

Phase 3: Feedback on real-life fitting

Some children try on the corresponding color children's clothing and have 20 minutes of free time

The subjects are observed for their comfort level in dressing, emotional stability, and whether they show a clear preference or rejection for the children's clothing they wore.

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4.4 Data Collection and Analysis Methods

Quantitative analysis:

Descriptive statistics and variance analysis are performed on the emotion rating scale data, preference ranking data, and clothing rating data using SPSS

Comparison of the correlation and significant differences between different color attributes and children's preferences and emotional responses

Qualitative analysis:

Content analysis of behavioral observation records and children's expression language is performed to extract typical descriptions and behavior patterns

Analysis of differences in children's performance and potential psychological motivations under different color environments

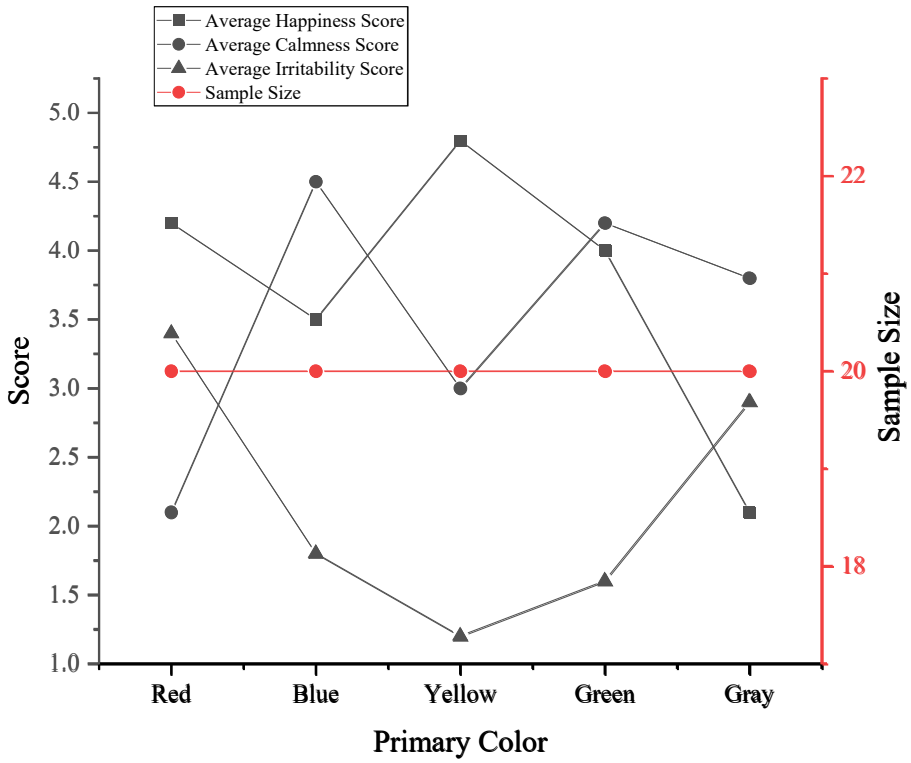

Figure 1 Children's emotional response rating scale to children's clothing of different colors (5-point scale)

In the "average happiness score", yellow ranks first with the highest score of 4.8, indicating that yellow can significantly enhance children's positive emotions, followed by red (4.2) and green (4.0), while gray shows a weaker emotional stimulation ability with the lowest score of 2.1. This shows that bright and lively colors are more likely to stimulate children's sense of pleasure. In terms of the "average calmness score", blue (4.5) and green (4.2) score the highest, indicating that cool colors, especially blue, can effectively convey a stable and soothing emotional atmosphere and help create a quiet and harmonious clothing experience environment. In contrast, red (2.1) scores low in this item, reflecting that it tends to be more stimulating rather than peaceful (as shown in Figure 1).

According to the experimental statistical data in Figure 2, there are obvious differences in the performance of each color in the children's preference ranking, reflecting the psychological preference influence of color in children's clothing design. In the experiment, each child ranks the six colors by preference, with 1 being the most favorite and 6 being the least favorite. The following are the analysis results:

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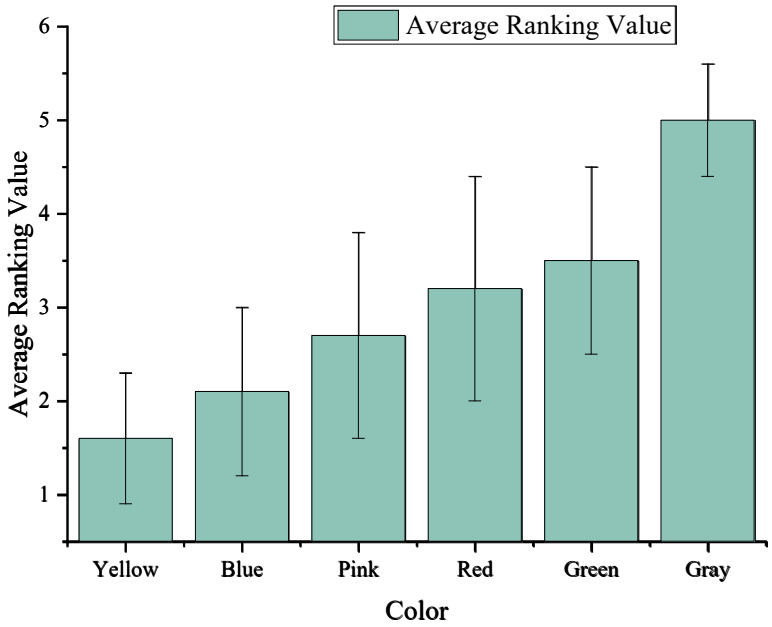

Figure 2 Children's average preference ranking for six main colors of children's clothing (1 is the most favorite/sample size is 60 people)

From the perspective of "average ranking value", yellow ranks first with the lowest average ranking value of 1.6, indicating that most children prefer yellow, which is closely related to the joy and sunshine brought by yellow. It is followed by blue (2.1) and pink (2.7), indicating that these two colors are also highly accepted in children's aesthetics. In particular, blue is often associated with emotions such as calmness and safety, while pink has advantages in softness and intimacy, especially popular among girls. The average ranking values of red and green are 3.2 and 3.5, respectively, which are in the middle and lower positions. Although red can stimulate vitality, it may also affect the degree of preference due to excessive stimulation, although green has a soothing effect, it is not as significant as yellow and blue in aesthetic appeal. Gray has an average ranking value of 5.0, which is significantly higher than other colors, becoming the least popular color among children, as shown in Figure 2.

According to this group of experimental data, children's willingness to try on children's clothing with different main colors, appearance evaluation and comfort perception show significant differences, which fully reflects the practical application value of color psychology in children's clothing design.

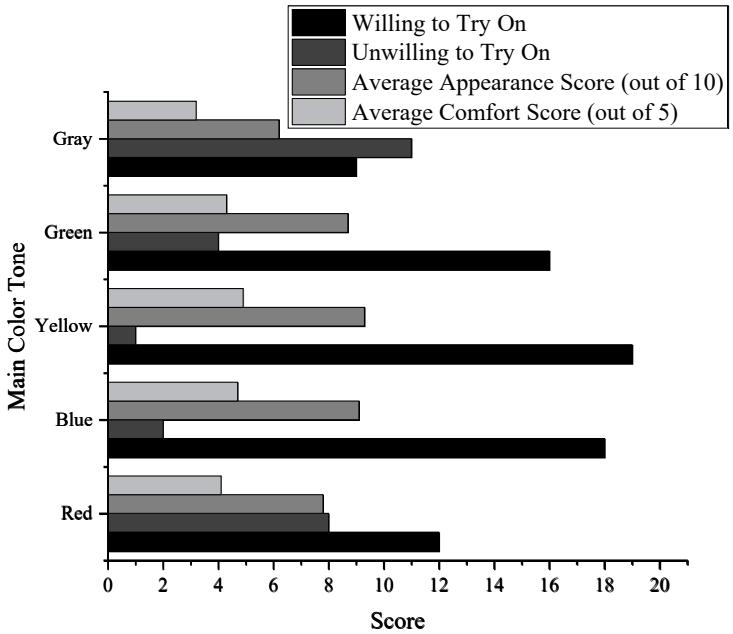

Figure 3 Children's clothing acceptance and willingness to try on

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From the perspective of the number of people willing to try on, yellow children's clothing receives the highest acceptance, with 19 people willing to try on and only 1 person unwilling to try, blue also shows a high degree of appeal, with 18 people willing to try on and only 2 people refusing. In contrast, gray is rejected by most children, with only 9 people willing to try on and 11 people clearly unwilling to try on, showing its disadvantage in visual appeal. In terms of average appearance score (full score 10 points), yellow (9.3) and blue (9.1) take the lead again, further verifying the visual appeal of these two colors in the appearance design of children's clothing (as shown in Figure 3).

From the experimental data in Table 1, children's clothing with different main colors has a significant impact on the activity time, emotional expression and behavioral response of children during the wearing process, further verifying the practical application value of color psychology in children's clothing design.

Table 1 Statistics of behavioral observation experiment (based on a sample of 20 people)

Main Color Tone	Average Activity Duration (min)	Number Showing Positive Emotion	Number Frequently Touching Clothes	Remarks
Red	16.8	9	7	Emotional fluctuations noted
Blue	20.2	16	3	Natural and smooth activity
Yellow	21.1	18	2	Obvious excitement observed
Green	19.7	15	4	Stable activity
Gray	15.3	7	8	Low interest

In terms of average activity duration, yellow (21.1 minutes) and blue (20.2 minutes) perform best, indicating that these two colors can stimulate children's interest and activity for a longer period of time. Green (19.7 minutes) is second, and also shows good activity continuity. In contrast, the activity time of red (16.8 minutes) and gray (15.3 minutes) is significantly shorter, indicating that these two colors are less effective in stimulating children's continuous participation. In terms of the number of people showing positive emotions, 18 children in yellow children's clothing show positive emotions, 16 in blue, and 15 in green, all showing strong positive emotion induction. However, only 9 and 7 children in red and gray show positive emotions, and the lower proportions are related to their limitations in emotional mobilization. Although red is highly stimulating, it is easy to cause emotional fluctuations, gray is dull and difficult to arouse interest.

5. Conclusion

This paper conducts an in-depth discussion on the application of color psychology in personalized children's clothing design, and analyzes the impact of different colors on children's emotions, behaviors, and clothing preferences in combination with multiple experimental studies. The results show that color not only directly affects children's emotional responses, but is also closely related to their behavioral habits and clothing choices. For example, yellow can significantly improve children's happiness index, while blue helps promote calm and stable emotions. These emotional reactions directly affect their intention to try on clothes and their evaluation of clothing comfort. At the same time, the data in the experiment also verifies the actual impact of color on children's wearing experience, further proving the importance of color psychology in children's clothing design. The selection and regional scope of the experimental samples are relatively limited, and may not fully represent children's emotional responses to colors in different cultural backgrounds. Future research can take these factors into consideration more.

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