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A Study of Psychotherapy Plan through Game Graphics Focused on Color Preference of Children

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Abstract

Colors are recognized by human vision or visual organ. In particular, many studies show that these colors have been proved to give great influences on cognitive development and emotional formation of children. The subconsciousness of children is detectable by colors and through this, their inner emotions and subconsciousness can be revealed. Children have higher interaction of emotion and feelings with colors than adults. Moreover, children tend to express their subconsciousness through colors. However, children are defenselessly exposed to colors coming from the IT devices due to the broad diffusion of these appliances. Different types of media materials give impact on the emotions and cognitive development of children. Likewise, the colors represented by media materials considerably exert influence on the emotions and cognitive development of children. With this in mind, this study proposes design game graphics through analysis of colors, composition, nature and character of these colors preferred by children.

Keywords: *color therapy, game graphic*

1. Introduction

Colors are recognized by human vision or visual organ. Many studies show that these colors have been proved to give great influences on cognitive development and emotional formation of children. In other words, the cognitive reaction to colors varies depending on the developmental stage of each child, and unlike adults, children tend to interact with colors. In short, children reflect their emotions and sentiments onto colors. From this point of view, it is considered as the same context when Alschuler and Hattwick mentioned that "the color and the color composition frequently used by children are the expression of their own experiences and emotions about the surroundings. In other words, children are highly liable to recognize and express their surroundings, empathy and particular experiences through colors. In sum, the subconsciousness of children is detectable by colors and through this, their inner emotions and subconsciousness can be revealed. Like this, colors are in charge of showing the emotional state of children as a key medium, giving close impacts on their emotions and cognitive development.

Today's Information Technology is making a quantum leap. IT devices are penetrating in all areas of our lives and giving enormous influences while providing conveniences as a weapon. IT-related companies are constructing IT ecosystem by establishing a priority strategy to provide IT devices loaded with their unique technology. From this perspective, the use and accessibility of IT devices tend to be gradually easier. In sum, all the members composing the IT ecosystem, regardless of age and gender, are exposed to IT devices and are forced to live every day in the world surrounded by IT devices. While the use of IT

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devices is getting easier, the age exposed to them gets younger and younger which can be considered a problem as well. As described above, children express their emotions and sentiments through colors. It is because the Smart devices and Software we are using do not reflect the color response and features of children.

Children are exposed to IT devices for a long time when they are playing games with them. As is explicitly known, games can give great impact on the emotions and sociality of children. That is why it is required to produce games reflecting the characteristics of children, in particular, their color recognition and response this study is going to deal with. For instance, the game rules and competition constitute elements raising frontier spirit, creativity and sociality to children [1-2]. By reflecting color recognition and response characteristics of children along with these advantages of games, it is necessary to equally consider emotions and sentiments of children.

This study aims to propose psychotherapy plan of children through color composition of game graphics, based on cognitive behavior development, color psychology theories and color preference of children.

2. Theoretical Background

2.1. Characteristics of Color as Psychotherapy

Color therapy or Chromotherapy is a therapy applying the property of colors to psychotherapy area. The color therapy is known as a treatment useful to relieve stress, relax mind and body and control inner emotions. It corresponds to psychotherapy method created based on the fact that the nature of colors influences human state of mind and body as well as emotional and aesthetic sides. This way, color therapy helps in finding harmony and balance of human body [3-4].

Moreover, color therapy contributes to maintaining health and emotional balance by applying the nature of each color. In other words, it is a method using the characteristics of colors of which diverse vibrations and wavelengths of colors work for vitalizing and controlling human body structure. Regardless of the presence of human consciousness, colors arouse a variety of psychological reactions, giving great influences on human emotion. Colors are also used to correct unbalance manifested in human mind and soul by applying the characteristics of different types of colors [5-6]. This color therapy allows relaxing human emotion, mind and body by using the nature and wavelength of colors. Likewise, colors exert influences on humans in a psychosomatic way.

Chromotherapy is a method which helps in stabilizing human emotion and body through light and colors. In carrying out color therapy, the attributes of color contributes to giving healing effects to human body, mind and soul, while the inherent wavelength and vibration of colors help in recovering order and balance by giving influences on human body [7-9]. Table 1 shows the different nature and effects represented by each color

Table 1. The Nature of the Color and Therapeutic Efficacy [10]

color	property of color	effect of therapy
red	Red, the color of blood and fire, is associated with meanings of love, passion, desire, heat, longing	It boosts our physical energy levels, increases our heart rate and blood pressure and promotes the release of adrenalin.
yellow	Being the lightest hue of the spectrum, the color psychology of yellow is uplifting and illuminating, offering hope, happiness, cheerfulness and fun.	Yellow makes people more mentally analytical and self -critical of both themselves and others.

orange	The color orange radiates warmth and happiness, combining the physical energy and stimulation of red with the cheerfulness of yellow	Orange helps us to restore balance of our physical energies.
green	This is the color of balance and harmony. From a color psychology perspective, it is the great balancer of the heart and the emotions, creating equilibrium between head and heart.	The color green revitalizes us when we are exhausted physical, mental or emotionally.
blue	This color exhibits an inner security and confidence.	Blue is not impulsive or spontaneous and it doesn't like to be rushed - blue needs to analyze, think things through, and to work to a plan
purple	This color relates to the imagination and spirituality.	Violet is passionate, like red, but inclined to display it only in private.

2.2. Cognitive Development Process and Color Psychology of Children

Unlike adults, the experiences children have in the world around them are limited. For this reason, children are likely to show immediate reaction and emotion to a given situation and environment. The limited experiences of children mean that all kinds of thoughts and behaviors happen only within the radius of action of their own. Therefore, the environment of children is considered the biggest influential factor of psychology and emotions of children. In particular, this concept is supported by a research result regarding the influences of colors on emotion and internal psychology of children [11-12].

Childhood is understood as a period of which the most active development is being formed in terms of chromatic recognition, visual and perceptive senses. Children of this period grow up recognizing the world through multifarious colors present in their surroundings. In other words, children go through the process of physical externalization and emotional internalization through the colors of the environment exposed to them. Colors give specific stimulations to brain by way of visual organ. This external stimulation called color recognition plays a decisive role in forming the view of the world and the concomitant response attitude of children. In the final, colors are considered a factor affecting substantial development of psychology of children [13-15].

Considering this fact, it is necessary to inquire into the correlation between color recognition and sense observed during childhood. In the first place, infancy and early childhood correspond to ludic period of unconsciousness, and the colors used by children of this stage are limited mainly to primary colors. This demonstrates that the colors used by infants and preschoolers are selected depending more on sub consciousness than on consciousness. In the second place, early childhood corresponds to the period of which symbolic and intuitive senses are being shaped. On arriving at this period, the ego is formed and the color recognition is expressed in a more active way as compared with infancy. For instance, when comparing drawings made during infancy with those of childhood, children of early childhood stage show a more concrete shape in terms of objects and colors. In addition, children of this period take interest in embodying the recognition of objects in symbolic and abstract ways. In other words, they express the world and things through their favorite colors. From this point of view, the color choice of infants and children are strongly affected by psychological perspective. Moreover, its meaning presents in a different way to each individual. In synthesis, colors are selected by the emotional perspective of infants and children during this period. In the last place, childhood is actually a schematization period. The ego of children of this period is completely shaped and they treat things based on intuition. This was confirmed by the fact that the drawings children made about the world and objects were manifested in a realistic

way. However, what must be paid attention to is the correlation between the repeated objects and the colors children choose. In other words, there is a distinct correlation between the world recognized by children and colors [16-18].

3. Research and Method

3.1. Analysis of Colors Used in Game Graphics

For the purpose of this study, the graphic colors used for children's game were extracted and a color banding was made based on Photoshop Program. Based on extracted color banding, the influential relationship between color and emotional aspect of children was analyzed.

Figure 1. Color Banding of Red Riding Hood-Games and Puzzles

Figure 1. is an application game for children titled "riding hood-Games and puzzles" invented in USA. This game is composed of different stages and is characterized by its diverse ways of enjoying puzzle games. In general, children prefer simple and static games to dynamic ones. The graphic colors of this game counted on blue green, light green, light purple, red, orange and yellow. The chromatic proportion is properly arranged between cold color scheme and warm color scheme. As for the color attributes, light green, light purple and green are effective for stabilizing mind and body as well as alleviating stress. On the other hand, red, orange and yellow have attributes of improving activity and positivity. For this reason, the game above mentioned is well-balanced between static colors and dynamic ones.

Figure 2. Color Banding of Milman

Figure 2 .Milman is an action arcade game invented by Red T Studio. This game uses blocks to strike a blow to the opposing party. Currently, the services of this game are no

longer available. The colors used for Milman are composed of black, light blue, ivory and brown with low chroma. All these colors are characterized by hard attributes. For this reason, they are more appropriate for adolescence and adults than children applicable to graphic colors of a game. The circumstantial evidence can be seen in the fact that the key target of this game belongs to adolescence and adults.

3.2. MRPE Learning Algorithm

In general, children prefer colors which are not intermixed among yellow, red and blue, that is to say, they simply prefer primary colors. In particular, they tend to prefer vivid and bright colors such as yellow, red and orange belonging to warm color scheme. These colors also have a feature of leaving long-lasting memory to everyone. For instance, the red traffic light means "stop". Children are also aware of the meaning of red signal light. It is because they are well aware of the meaning of red referring to "danger" and "stop". This happens because children also go through memory and recognition reaction to colors.

These colors give cognitive and psychological influences on children. Alschuler and Hattwick mentioned that "the colors used by a child reflect the child's own experience and culture, expressing his or her internal impulse". According to them, colors are considered the faithful mirror reflecting the internal world of each child.

For example, a child who likes red is highly cooperative and active in general. But the emotional state of a child can be differently interpreted depending on how the red is used. Namely, red slightly painted means a longing or desire for affection. On the other hand, if red is vertically painted, the child can have tendency towards aggressive nature. A child who prefers orange is normally cheerful and has a personality easily adaptable to environment. A child whose color preference is with yellow has a smooth interpersonal relationship but possesses dependent inclination as well. A child whose favorite color is blue is good at obeying the rules on the whole. A child who likes green has a strong self-satisfaction and a prudent character. If black is liked by a child, this means that the child is suffering from fear and uneasiness in mind. Like this, colors are factors influencing cognitive behavior and emotional psychology of children.

The graphic figures below show the analysis result of color preference oriented to children aged from 6 to 7 (11 boys and 13 girls) who attend the Daycare Center located in Sindorim, Seoul. For this, the art therapy program (4 sessions in total) carried out at the Daycare Center was analyzed and the color preference of children was statistically digitized.

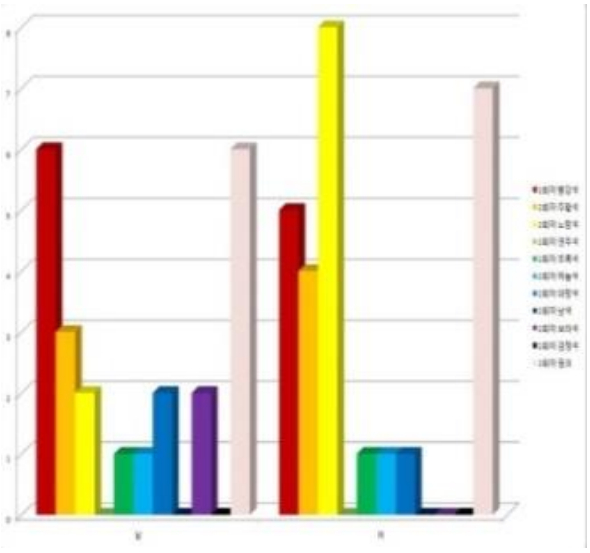

Figure 3. First-Round Analysis of Color Tendency of Children

Figure 3 is the first-round color analysis result of art therapy program. Unexpectedly enough, as the graph shows, boy frequently use red and pink, while girls prefer yellow than pink. Boys use more red color scheme while girls are more attached to yellow.

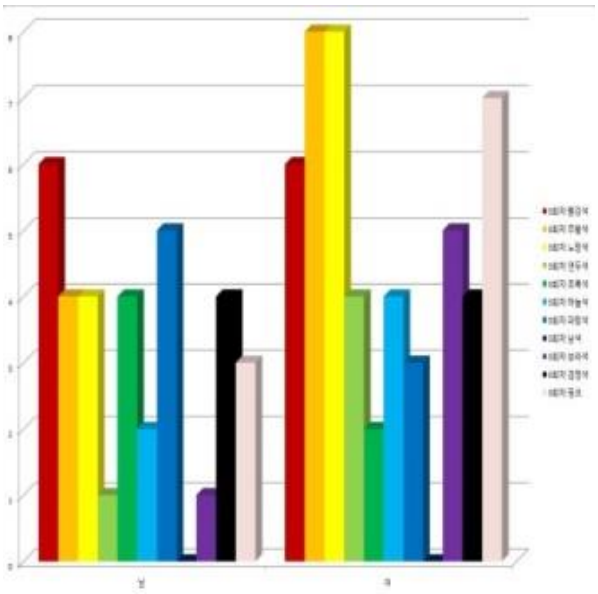

Figure 4. Second-Round Analysis of Color Tendency of Children

Figure 4 is the second-round color analysis result of art therapy program. As we can see in the graph, exactly as in the case of the first-round analysis, boys use more red while girls prefer yellow and orange.

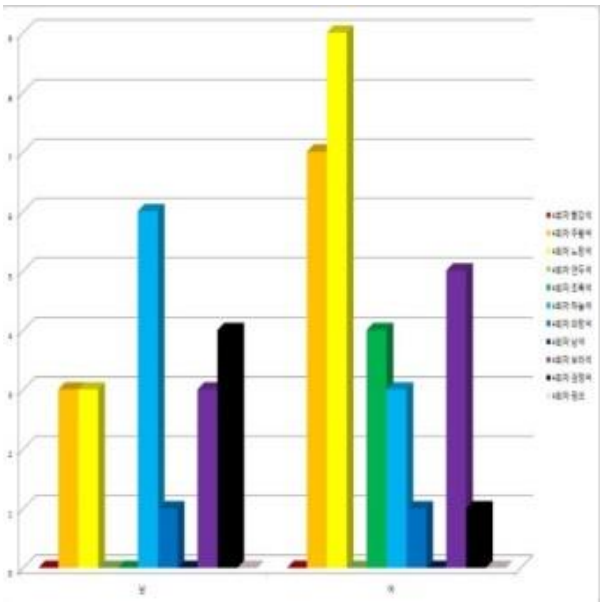

Figure 5. Third-round Analysis of Color Tendency of Children

Figure 5 shows the third-round color analysis result of art therapy program.This art therapy program had some special limits. In other words, the colors were restricted to only 7 colors of yellow, orange, green, light blue, blue, purple and black. As a result, there was a remarkable case of which boys who used to like red chose light blue belonging to

cold color scheme (blue, purple, black, green) instead of warm color scheme (red, yellow). However, girls used more yellow exactly as in the first and the second-round programs.

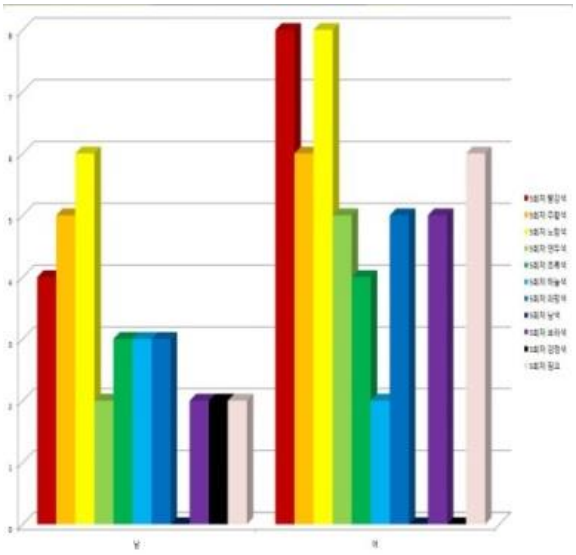

Figure 6. Fourth-round Analysis of Color Tendency of Children

Figure 6 shows the fourth-round color analysis result of art therapy program. In this art therapy program, children were recommended to use diverse colors. As a result, unlike the first and the second-round art therapy programs, most of boys chose yellow, while the majority of girls used yellow and red.

According to the graphic analysis of Figure 4 to Figure 6, it turned out that color preference of boys was with red, while girls liked yellow the most. Out of expectation, the result showed that when there was no presence of red, boys chose cold color scheme instead of warm color scheme. Another surprising thing was that girls preferred yellow to pink.

Making a synthetic analysis of the result of art therapy program, boys have inclination towards active and aggressive character, but they show prudent aspect in all activities. Girls showed high dependency on their parents and teachers. Also, it was analyzed that girls have weaker inclinations towards active and cheerful character than boys. As the joint research of Jae-Eun Kim and Hyoung-Jin Lim shows, this result coincides with the common features observed in children who prefer red and yellow (children who prefer red and yellow are more impulsive) [19,20].

For this reason, it is necessary for children who are excessively active and extroverted to use cold color scheme for giving them psychological stability. On the contrary, for children who are excessively introverted, warm color scheme can be used for stimulating the extroverted side. Like this, color therapy is estimated to give positive effects on psychotherapeutic perspective of children.

3.3. Color Psychotherapy Plan through Game Graphics for Children

The colors used by infants and preschoolers are decided more by subconscious choice than by conscious one. Children of early childhood stage embody recognition of objects in symbolic and abstract ways. Children of childhood stage fully form their ego and treat objects in an intuitive way. The expressions about the world and objects drawn by children are manifested in a more realistic way. Like this, colors interact with emotion and psychology of children and play an important role in developing recognition and emotions of children. Next, early childhood corresponds to the period of which symbolic

and intuitive senses are shaped. On arriving at this period, the ego is formed and the color recognition is expressed in a more active way as compared with infancy.

However, the problem lies in the fact that it is nearly impossible to develop game graphic designs which can consider every different emotion and psychological propensity of each child. Therefore, this study proposes that the color preference of children displayed in the graphs above should be reflected in game graphics. This way, when children find that the graphic colors of the game they often contact are decorated with their favorite ones, they will come to feel emotional stability and comfort while playing the game. In addition, by analyzing color preference of children, if the standard of such psychological state can be reflected in game graphics, the efficacy of psychotherapy can be obtained to a certain level.

Figure 7 shows color preference of children obtained based on experiments and the result is expressed in color banding. In Figure 8, the correlation between color and emotions and sentiments of children was analyzed based on the joint research of Jae-Eun Kim and Hyoung-Jin Lim (1972) titled “Correlation between colors used in free paintings of children and their personality”. The findings of this study are expressed in color banding as below.

Figure 7. Tendency of Cheerful and Bright Colors

In Figure 7, color preference of children is expressed in color banding. In general, it is possible to see that children aged 6-7 prefer warm color scheme such as red, orange, yellow, green and blue as well as cold color scheme.

Figure 8. Emotionally Stable Colors

The colors shown in Figure 8 are brought from the experiment result of joint study made by Jae-Eun Kim and Hyoung-Jin Lim. These colors are the result of research supporting that these colors give stability to emotions and psychology of children. The colors seen above are properly arranged between warm color scheme and cold color scheme.

Figure 9. Bright and Cheerful Disposition of Game Graphic Color Design

Figure 9 is a game graphic designed based on color preference of children of Figure 7. The background of game is expressed in yellow. What is distinguishing in this figure is that the mandala located in the center of the background is expressed in green considering the emotional aspect of children.

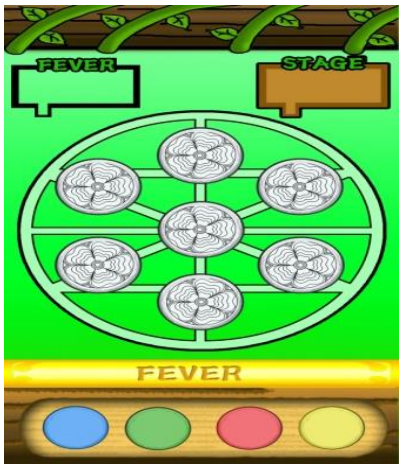

Figure 10. Graphic Color Design Giving Emotional Stability

Figure 10 was designed based on colors giving emotional stability to children by painting the background in bright green and the main game in bright blue.

Game graphics give influences on emotional aspect of children. Children are constantly exposed to the colors used for game graphics. Color greatly influences emotional side of children. For this reason, the use of colors for game graphics should consider the characteristics of children. Figure 9 and Figure 10 are estimated to bring positive effects when the color preference of children is applied to clinical test, adjusting psychological balance to the emotions of the introverted and extroverted children.

4. Conclusion

Children express the world through colors. Therefore, the analysis of colors used by children can help to have information about their emotions and psychological state. Children are sensitive to colors and they express their emotions and sentiments through colors. Since children are more immature in terms of perceptual development than adults, it is required to pay special attention to the colors exposed in this stage of life. Considering the reality in which the user's age of IT devices is getting younger, it is indispensable to create game graphic design focusing on the emotions and psychology of children. With this in mind, this study proposes a design plan of game graphics regarding the emotions and psychotherapy of children, based on color preference of children.

Firstly, colors influence cognitive development, psychology and emotions. In particular, children express their emotions and subconsciousness through colors. For this reason, it is required to make a close observation of emotions and psychological state of children in front of colors and the need of applying this gathered information for psychotherapy comes to the force. It is essential to apply how children express their emotions and sentiments according to their color preference. For instance, children who like red are likely to be active in general. However, they have a hard time in controlling their anger emotion. On the other hand, children who prefer blue are good at controlling their emotions but are liable to be introverted. This color preference is a factor to express their emotions and psychology, so it is important to form game graphics based on this factor.

Secondly, as for color tendency of children, most of boys prefer red while girls are more attached to yellow. Normally, color preference of children is oriented to warm color scheme, for this reason, it is necessary to expose them to cold color scheme to adjust psychological and emotional balances. In particular, this color therapy can be helpful for children with unstable emotion. Hereupon, game graphic planners are required to develop functional games by paying attention to color preference of children. Moreover, regardless of gender, children prefer warm color scheme. Therefore, it needs to implement the cold color scheme for game graphics as well.

In sum, colors play an important role in cognitive and emotional development of children. For this reason, game graphic planners should consider preferred colors of children at the moment of implementing games. With this, it is required to design game graphics which can contribute to forming a healthy ego and developing emotions based on the consideration of emotional and psychological aspects of children. Hereby, we expect that this study will serve as a cornerstone for development of games effective for psychotherapy of children.

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