# A Comparative study on the Preference of Sapphire Jewelry Emotional Lighting in LED Color

**Ye-jin Hwang**

***Abstract:*** ***Background/Objectives:*** ***This study has been conducted on preference of LED lighting as a basic research to calculate systematic and emotional LED color sensibility optimization for optimizing emotions for sapphire LED display. For the research, collection of various emotional vocabulary used in purchasing sapphire jewelry was preceded.***

***Methods/Statistical analysis:*** ***The LED color and the emotional vocabulary to be evaluated are preceded in the consideration of the LED lighting, and the subjective reaction to the color appearance of the LED lighting was evaluated and analyzed. In this study, individual questionnaire survey has been conducted on the LED lighting model for the purpose of the study in a laboratory without a window. The scope of the research was limited that experimental LED lighting color was a mixture of Cool White and LED Blue Color.***

***Findings:*** ***As a result, C-Blue 25% 0.89 and C-Blue 50% turn out to have the highest preference of 0.68 and C-Blue 100% sms -1.08, respectively.***

***In addition, preference of C-Blue 25% and C-Blue 50% was higher than that of Cool White at p <.001, and preference of C-Blue 75% and C-Blue 100% was significantly lower at p<.001 appears.***

***Therefore, Sapphire indicated the highest preference of C-Blue25% and C-Blue50% in blue illumination, the lowest preference of C-Blue75% and C-Blue100%, and the preference of Cool White was moderate.***

***Improvements/Applications:*** ***As a result, the preference for sapphire in the cool_white and blue illumination used for general display was generally high. In case of sapphire, preference in C-Blue 25% 0.89 and C-Blue 50% 0.68 turned out to be the highest in mixed light.***

***It is expected that follow-up studies shall be done among the general public by further subdividing between C-Blue 25% and C-Blue 50%. When these studies are conducted, systematic planning of LED lighting value for emotion optimization can be made.***

***Keywords: Display, LED, Sensibility Optimization, Sapphire, Emotional evaluation***

## I. INTRODUCTION

Lighting in commercial space is one of the most important factors because the lighting creates the environment necessary for the display of the products, makes the products stand out, and focuses the attention of the consumers. In addition to good lighting conditions, it becomes an important means to induce the psychology of the customer and to give a dramatic effect by utilizing better lighting. The lighting in the store is designed to make the customer to be interested in the displayed products considering the psychological and physiological responses of the customer in terms of "how to see, what to see and feel." Therefore, the value of the product can stand out[1,2].

This study has been conducted on preference of LED lighting as a basic research to calculate systematic and emotional LED color sensibility optimization for optimizing emotions for sapphire LED display. For research, collection of various emotional vocabulary used in purchasing sapphire jewelry was preceded[3,4].

## II. MATERIALS AND METHODS

The LED color and the emotional vocabulary to be evaluated are preceded in the consideration of the LED lighting, and the subjective reaction to the color appearance of the LED lighting was evaluated and analyzed. In this study, individual questionnaire survey was conducted on the LED lighting model for the purpose of the research in a laboratory without a window. The range of research was limited that experimental LED lighting color was a mixture of Cool White and LED Blue Color[5].

### 2.1 Methods and conditions

The collection of emotional vocabulary is based on the vocabulary study for emotional evaluation, the study on the preference of emotional image of LED lighting, the study on color and pattern of illumination, the frequency of use among adjectives used in newspaper articles, 40 usable vocabularies were extracted with the emotional vocabulary again. The most frequently used representative emotional adjectives were extracted and used for the study through the verification of the design experts and major groups[6,7].

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**Table 1. Selected sensibility vocabulary (40)**

| | | | | |
|---|---|---|---|---|
| noble | conspicuous | modest | Elegant | **brilliant** |
| Intense | **Haughty** | Noble | Graceful | Immaculate |
| Strong | Flattering | **Mysterious** | Intellectual | **clear blue** |
| High-end | Fascinating | Solemn | Provocative | **Transparent** |
| Elegant | Sparkling | Feminine | Natural | Splendid |
| Authoritative | **Vivid** | Crystal clear | Decent | Gorgeous |
| Sturdy | Sophisticated | Pretty | Delicate | Fantastic |
| Clean | Sexy | Mild | Dignified | Entrancing |

As a result of the above research, the emotional adjectives used in this study were extracted from the six emotional vocabularies of Sapphire as 'clear blue, transparent, vivid, precious, brilliant and mysterious'

### 2.2 Method and condition

This research was conducted to the subject as individual survey form in the laboratory without window by putting Sapphire in LED lighting box manufactured for the purpose of the research and observing from 50cm distanceas shown in Figure 2[8].

- SapphireLED lighting color:

Cool_White, Cool_White+Blue25%, Cool_White+Blue50%, Cool_White+Blue75%, Cool_White+

Blue100% as shown in Figure 1.

| Light | Cool White | Cool White + Blue 25% | Cool White + Blue 50% | Cool White + Blue 75% | Cool White + Blue 100% |
|---|---|---|---|---|---|
| Sapphire |  |  |  |  |  |

**Figure 1. Implemented lighting**

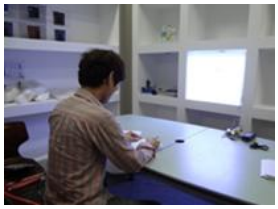
| Lighting | Dimmer | Adapter | LED Bar |
|---|---|---|---|
|  |   |  |  |
| **Size(cm) :550(W) x480(D)x320(H) White acrylic 3mm** | **-White LED -Blue LED -DC12 24V 8A** | **-Input : 100~240V -Output : 12V 5A** | -LED Cool White (SMD 5050) 50cm 2EA -LED Blue 50cm 2EA |

**Figure 2. Experiment environment**

The subjects were 20 design majors and experts who were recognized as fully understand research contents and sensibility adjectives and have no problem to distinguish colour.

## III. RESULT AND CONSIDERATION

### 3.1 Data handling method

In this study, each item of the questionnaire was scored and statistically processed, and statistical program SPSS / WIN 23.0 was utilized for the analysis.

First, descriptive statistics such as frequency, percentage, mean, and standard deviation were used for general characteristics of the subjects, consumer awareness, and feelings in each illumination[9,10].

Second, one-way ANOVA was used to find out the difference of feeling according to lighting, and Scheffe method was used as follow-up test.

Third, one-way ANOVA was conducted to examine the difference in preference according to the five lighting conditions, and a corresponding sample t-test was conducted to compare the preferences of the two illuminations.

The empirical analysis of this study was verified at significance level $p < .05$, $p < .01$, $p < .001$.

### 3.2 Verification of emotional difference from LED light

#### 3.2.1 General information of subjects and consumer recognition

As shown in Table 2 below, the subjects were 20 design students and 16 experts who were fully aware of the contents of the research and had a wide understanding of the emotional adjective Experiment was performed

**Table 2. General information of subjects**

| | | Frequency | Percent |
|---|---|---|---|
| Gender | Male | 8 | 40.0 |
| | Female | 12 | 60.0 |

| | | | |
|---|---|---|---|
| Age | 10~20s | 9 | 45.0 |
| | 30~40s | 10 | 50.0 |
| | Over 50s | 1 | 5.0 |
| Marital status | Married | 10 | 50.0 |
| | Single | 10 | 50.0 |
| Occupation | Students | 10 | 50.0 |
| | career in management | 4 | 20.0 |
| | Specialized job | 6 | 30.0 |
| Total | | 52 | 100.0 |

### 3.2.2 Entire feeling from the light

In the case of sapphire for the entire feeling from the LED light realized in the table 3 and Fig. 3 as below, C-Blue 25% was the highest with 0.89, followed by C-Blue 50% 0.68, C White -0.12 and C -Blue 75% -0.25, and C-Blue 100% -1.08.

**Table 3. Entire feeling from the light**

| | | Minimum value | Maximum value | Average | Standard deviation |
|---|---|---|---|---|---|
| Sapphire | Cool White | -0.83 | 0.83 | -0.12 | 0.52 |
| | C-Blue 25% | 0.17 | 1.67 | 0.89 | 0.33 |
| | C-Blue 50% | -0.17 | 1.67 | 0.68 | 0.47 |
| | C-Blue 75% | -1.00 | 0.50 | -0.25 | 0.38 |
| | C-Blue 100% | -1.50 | -0.50 | -1.08 | 0.33 |
| | Entire | -0.17 | 0.33 | 0.03 | 0.15 |

※The higher the score is, the more the degree of feeling turns out to be.

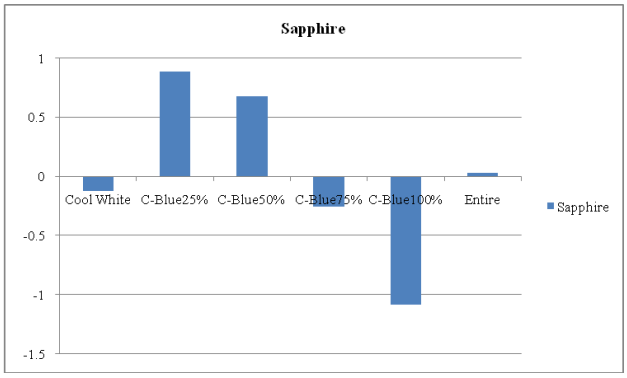



**Figure 3.Entire feeling from the light**

### 3.2.3 .Verification from LED light preference

As shown in Table 4 below, one-way ANOVA was performed to examine the difference in preference between five lights. In order to compare the preferences of the two lights, the corresponding sample t-test was significant at p <.05, p <.01, and p <.001.

**Table 4. Verification from LED light preference**

| | | N | Average | Standard deviation | F | p |
|---|---|---|---|---|---|---|
| **Sapphire** | Cool White | 20 | -0.12 | 0.52 | 66.595*** | .000 |
| | C-Blue 25% | 20 | 0.89 | 0.33 | | |
| | C-Blue 50% | 20 | 0.68 | 0.47 | | |
| | C-Blue 75% | 20 | -0.25 | 0.38 | | |
| | C-Blue 100% | 20 | -1.08 | 0.33 | | |

※The higher the score is, the more the degree of feeling turns out to be.

### 3.2.4.Difference of preference from cool white and light

As a result of comparing the preferences for the five lights, it was found that there was a significant difference in preference according to the illumination of sapphire (p <.001).

As shown in the Table 5 below, the preference of sapphire at Blue25 and Blue50 was higher than that of Cool White at p <.001, and preference of Blue75 and Blue100 was significantly lower at p <.001.

Therefore, Sapphire showed the highest preference of Blue25 and Blue50 in Blue lighting, Blue75 and Blue100 had the lowest preference, and White had a medium preference.

**Table 5. Difference of preference from white and blue lights**

| | Average | Standard deviation | t | p |
|---|---|---|---|---|
| Cool_White | -0.12 | 0.52 | -18.052*** | .000 |
| C-Blue25 | 0.89 | 0.33 | | |
| Cool_White | -0.12 | 0.52 | -11.177*** | .000 |
| C-Blue50 | 0.68 | 0.47 | | |
| Cool_White | -0.12 | 0.52 | -6.018*** | .000 |
| C-Blue75 | -0.25 | 0.38 | | |
| Cool_White | -0.12 | 0.52 | 6.527*** | .000 |
| C-Blue100 | -1.08 | 0.33 | | |

*p<.05 **p<.01 ***p<.001

### 3.2.5.Difference of preference from the brightness of light

As shown in Table 6 below, blue25 and blue50 showed significantly higher preference at the level of p <.05 for blue25 and blue50, and blue25 and blue100 at blue100 and blue100, respectively.

Blue50 showed a higher preference for Blue50 than Blue75 and Blue100 at p <.001 level. Blue75 and Blue100 showed higher preference at the level of p

<.001. That is, Blue25, Blue50, Blue75 and Blue100 showed preference in order.

**Table 6. Difference of preference from the brightness of the light**

| | Average | Standard deviation | t | p |
|---|---|---|---|---|
| C-Blue25 | 0.89 | 0.33 | 2.311* | .032 |
| C-Blue50 | 0.68 | 0.47 | | |
| C-Blue25 | 0.89 | 0.33 | 8.872*** | .000 |
| C-Blue75 | -0.25 | 0.38 | | |
| C-Blue25 | 0.89 | 0.33 | 17.897*** | .000 |
| C-Blue100 | -1.08 | 0.33 | | |
| C-Blue50 | 0.68 | 0.47 | 5.743*** | .000 |
| C-Blue75 | -0.25 | 0.38 | | |
| C-Blue50 | 0.68 | 0.47 | 13.024*** | .000 |
| C-Blue100 | -1.08 | 0.33 | | |
| C-Blue75 | -0.25 | 0.38 | 6.116*** | .000 |
| C-Blue100 | -1.08 | 0.33 | | |

*p<.05 **p<.01 ***p<.001

## IV. CONCLUSION

As a result, C-Blue 25% 0.89 and C-Blue 50% turned out to have the highest preference of 0.68 and C-Blue 100% sms -1.08, respectively.

In this study, LED Cool White and Blue were installed in the lighting box, and a limited survey was conducted through design experts and experts. Therefore, extraction of the emotional vocabulary used in the questionnaire and general factors related to it were found to be more emotional. At the same time, it is considered that follow-up studies shall be conducted among the general public by further subdividing between C-Blue 25% and C-Blue 50% in the future. When these studies are done, systematic planning of LED lighting value for emotion optimization can be done.

## ACKNOWLEDGMENT

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