Exploring User's Preference on the Color of Cavity and Lighting of an Oven Product

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Abstract

Background Although lighting and the color of the space are intuitively related on user's emotional response, there has been little investigation about the combination of both in the context of home appliances. This study tries to figure out user's preference on the interplay of lighting and oven interior color.

Methods A series of workshops were conducted to develop metrics for an empirical experiment. We performed a survey about user's preference on a combination of six oven cavity colors and six light colors that vary in correlated color temperature (CCT) with the developed metrics. The assessments were analyzed through a series of repeated measure two-way ANOVA to statistically examine the main effects of cavity colors and light colors and the interaction effect of both.

Results User's preference of light color depended on the color of the oven cavity. Interestingly,a blue cavity was the most favored by users and a navy color cavity in regard to food was the most appetizing by users.

Conclusions The results contradict the conventional belief that people prefer low CCT or warm lighting on oven usage. Manufacturers may benefit by searching for a proper cavity color and lighting that can best suit their products for building their brand image.

Keywords Oven Style, Cavity Color, Correlated Color Temperature (CCT), Affective Judgment

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1. Introduction

As lighting is an effective element in interior styling, optimized lighting contents as a combination of the brightness and the hue nuance of illuminant on user's emotion has been widely studied. By articulating the two main elements of the illuminant, the optimized lighting contents have also been actively applied in various spaces, such as classroom, office, restaurant, hotel and residence and so forth to create user's desired mood, facilitate user's behavior and increase productivity. For instance, a number of studies prove that warm nuanced light creates a smooth lowering of central nervous system activity, which suggest that warm nuanced illumination can be used effectively in a bedroom or other such environment where it is desirable to facilitate lowered physiological activity (Noguchi & Sakaguchi, 1999). Building on such studies, it has been discovered that warm light can be adequate for free discussion in classrooms (Choi, Shin, Kim, Chung, & Suk, 2019; Lin & Mattila, 2010; Suk & Irtel, 2010) and to relax at home (Butler & Biner, 1987; Choi, Lee, & Suk, 2016), whereas cool nuanced light can improve wellbeing and productivity in a corporate setting (Mills, Tomkins, & Schlangen, 2007). As is empirically examined and proven in many researches, adequately customized lighting properties can increase user's satisfaction. Extending the emotional role of lighting in human living space, this research targeted a product that has its own space. In practice, it is referred as 'cavity lighting' when a home appliance has its independently installed lighting apart from ambient lighting. With the development of LED and OLED technology a more diversified brightness, color hue, and arrangement can be deployed, which is promising for the light as a marketing strategy.

In a way that designers deliver intended emotional effect by properly combining interior color and light color (Pile, 1997), emotional effect of lighting can be diversified depending on the color of the product cavity. Oven has the most diversified interior colors among the products with its own cavity interior lightings, such as refrigerator, dish washer and laundry machine. Black and stainless steel have been typical oven colors, but nowadays more colors are being produced such as grey, blue and navy, which calls for a research in the user's most preferred cavity color. The color of cavity light also needs to be investigated, because nowadays the light source of the oven product has been widely explored. To be specific, light source with the higher correlated color temperature (hereinafter CCT[1)]) such as 5700 K entered into the oven market, where low CCT around 3000 K took most share. Lighting in oven should be carefully designed because oven has its specific context in that the light has its functional aspect of showing the cooking process. In this study, we aim to explore user's preference on ovens of different cavity color and lighting condition in relation to the styles it present.

1) CCT is a specification of the color appearance of the light source, which is in relation to the temperature of an ideal black–body radiator that radiates light of a color comparable to that of the light source. CCT is measured in degrees Kelvin (K) and ranges from red to orange to yellow to white to blueish white. A warm light is around 2700K–3000K, moving to neutral white at around 4000K, and to cool white at around 5000K or more. Although CCT is not related to the color rendering ability of the light source, it plays an important role in human's color perception.

2. Method

The emotional response of users on color has attracted many research efforts (Suk & Irtel, 2010). Whereas color preference can be personal or cultural, it is generally admitted that the general cognitive characteristic of colors is considerable (Hardin & Maffi, 1997). In this field of color emotion study, a number of color emotion variables were found and applied regarding interior color. Whereas such interior color is crucial, it is also important to note that lighting changes user's color perception.

Among the substantial contribution of design elements in retail environments, lighting plays a role in evoking atmosphere and its importance has received some attention (Custers, De Kort, IJsselsteijn, & De Kruiff, 2010). Areni and Kim (1994) has empirically examined the effect of illuminance on consumers on various aspects of shopping behavior and found that brighter lighting influenced shoppers to browse and examine more merchandise in an in-store environment. Quartier, Vanrie, and Van Cleempoel (2014) also examined the impact of lighting on atmosphere perception in a 3-D simulation environment and argued that lighting can change the atmosphere so that users can identify it with a specific corporate

brand. Schielke (2015) revealed that brightness, color temperature and chromaticity influenced several brand personality factors and that lighting can change user's perceived price of a product. The interaction of lighting and interior quality on perceived atmosphere is also explored in a retail environment context (Custers et al., 2010). Such research proves that lighting changes user's perception on a given interior.

Much attention has also been paid on the importance of finding the right color for lighting in grocery shops (Calkins, Goll, & Mandigo, 1986). It has been found and generally accepted that for red meat, light with a warm light color (2700 K to 3000 K) highlights the freshness of meat products. White-meat fish gets a fresh look under cool white light (4200-5000 K) and vegetables are recommended to be displayed under approximately 3000K to accentuate its bright colors. It is important to note that different from the shop display context where each food section may have its own lighting, oven contains various food in its own interior space.

In relation to the lighting of a product with its own interior space, it has been found that people have their preference on the lighting system in a refrigerator context (Raghavan & Narendran, 2002). The influence of the layout of the lighting source for the visual comfort (Ran et al., 2015) and spatial perception (Kim, Jung, & Ha, 2010) are also explored. Recent research by Jeong and Suk (2018) investigated user's desired emotion in refrigerator light and extracted four big emotion categories; abstract quality, light property, space perception, and visual comfort.

3. Objective and Study Plan

This study attempts to explore the interplay of oven cavity color and lighting color on user's oven preference. In order to achieve this aim, a series of workshops are conducted because of the absence of metrics or stimuli in this field of research with oven lighting. Based on the workshop, we select the cavity colors and range of the CCT of lighting for the confirmatory experiment. Oven mock-ups are made and presented with different lightings for user's evaluation. The data is statistically analyzed to reveal oven cavity color and lighting CCT combination of user's preference.

4. Workshop for Metrics Development

We have firstly conducted an explorative study to find out cavity lighting style that may influence user's oven preference. We targeted women in their 30s, 40s and 50s as they constitute the majority of the consumership. A series of workshops were conducted to collect terms that can describe user's emotion derived from the oven with different interior color and lighting.

4. 1. Online survey for workshop material development

Korea has different culinary culture compared to North America, where oven is installed in most households for cooking and baking. Until recently, oven was considered to be somewhat special, something for people with professional cooking skill. Nowadays the number of convection oven sales in Korea has significantly increased and now 23% of population own convection oven or gas oven at home. The sales of convection oven keep increasing with the change of food habit in Korea. However, because of the relatively small market size, oven products in Korea are not much diversified. For this reason, we used Amazon mechanical Turk for online survey to investigate ovens that are commonly used in north America where gas and convection oven are commonly used for baking and roasting (85%).

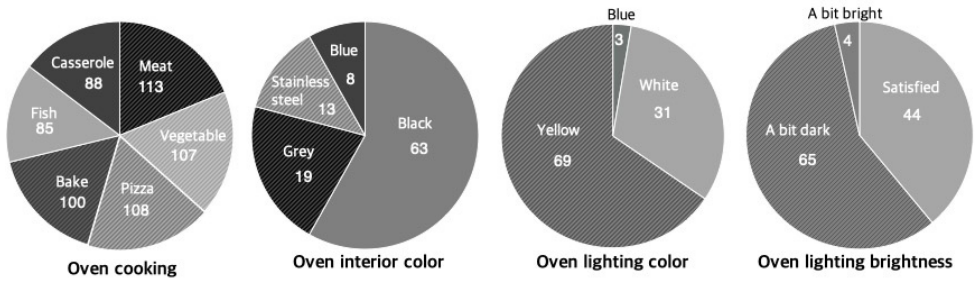

Figure 1 Survey result regarding oven cooking, oven interior color, oven lighting color and oven lighting brightness
* Oven cooking question is a multi-choice question

We surveyed 103 male and female in total, 45 females and 58 males. In order to focus on the distinctive characteristic of oven cavity color lighting, we also included refrigerator lighting in the survey. The survey included basic demographics, brand, oven lighting, oven cavity color, oven usage, how they like their oven color and lighting, and inconvenience they found from the oven usage. Black cavity color was the most common (61%), followed by grey, stainless steel and grey. Regarding the oven lighting color, 74 people perceived oven lighting as yellow or yellowish. (Figure 1)
The result shows that the survey participants had the most usage of oven cooking meat, followed by vegetable, pizza, baking, fish and casserole. Also, more than half of the respondents (52%) wanted the cavity lighting to be brighter than the current luminance. The most often found problem from oven lighting was that they have (1) difficulty of checking the cooking process (usually browning of the food), (2) difficulty of seeing inside through the door, and (3) difficulty of checking the cavity hygiene. Based on the survey result, we could include the most selling oven cavity color and frequently cooked food for stimuli development. Furthermore, as users were not satisfied with their oven lighting color being yellow, we also included lightings with higher CCT.

4. 2. Workshop stimuli

Based on the insights from the online survey, we designed stimuli for the workshop. Ovens released in North American market were used as stimuli because big ovens are not commonly used in Korea. Various oven images with different sizes and colors of cavity are collected. After adjusting white balance of collected images, we standardized the background of images as grey (L*=33). Images were than categorized and grouped considering the size, color, etc. Stimuli include five cavity colors; black, stainless steel, blue, navy and grey and three different sizes; small, medium and large. In order to focus on the lighting condition rather than the image itself, images in the same group had similar level of size, quality, and viewing angle. Finally, images were grouped into 6 categories. (Figure 2)

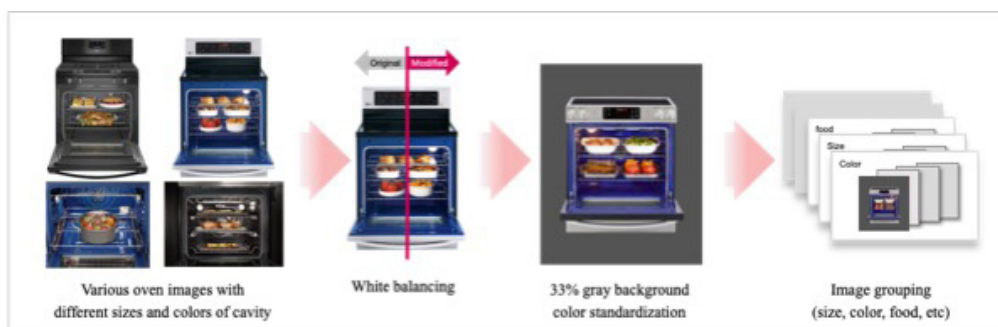

Figure 2 Stimuli standardization process: After adjusting white balance of collected images, we standardized the background of images as grey (L*=33)

4. 3. Workshop procedure

Workshop was conducted 4 times with 15 females in their 30s, 40s and 50s. Participants were provided with an oven image group constituted of different cavity and lighting condition. A survey sheet comprised of close-ended and open-ended questions was given so that the participants could fill in after watching the image group of 4 oven images on display. The participants firstly ranked their favorite oven and secondly wrote down the reason why they favored/detested them. In such a manner, we could explore the oven users prefer and the reason regarding its cavity color and lighting condition. We collected answers like, *"looks very modern and luxurious", "difficult to tell how well the bread is cooked", "I don't like the cavity color because it looks like a dish washer."*, and so forth. A workshop moderator used neutral language throughout the procedure in order not to influence the participant's opinion. After filling in the short answer, discussion between the participants were encouraged to gather more insights.

4. 4. Workshop result and analysis

The factors that decide user's oven preference was categorized from the workshop. To analyze the emotional effect of light and cavity color as a new design element, terms participants used during the workshop were collected and classified into 20 groups using thesaurus relationships. Matching the result and the oven image lighting characteristic, we analyzed how participants responded on a specific cavity color and lighting combination. The term groups were again classified into the 6 big emotion category sets which are: comfortable[편안한] - shiny[눈부신], high end[고급스러운] - general[보급형의], bright[밝은] - dark[어두운], familiar [친숙한]- novel[새로운], warm[따듯한] - cold[차가운], vivid[색 표현이 잘되는] - dull[색이 잘 표현되지 않는], appetizing[맛있어 보이는] - unappetizing[맛없어 보이는]. As for the aim of this research is to explore the interplay of oven cavity color and lighting, we focused on the lighting and style and finalized 5 big emotion categories; favorable[호감도], novel[새로움], properly rendered[색표현력], high-end[고급스러운], and appetizing[풍미감].

In general, participants expressed their desire on a modern oven with high-end feeling, the lighting of which properly renders food, while it also gives the food an appetizing look. Participants preferred oven lighting of 3500K in the workshop, which is currently the most widely used lighting CCT. They reported that the food looks warm and appetizing, and that they feel comfortable as they are already familiarized with the light, whereas a number of participants also indicated that 3500K light makes it difficult to tell the cooking status of food. The main reason of 5000K daylight preference was because of its vivid, realistic and fresh looking. Lastly, participants showed different preference of oven color and lighting on the type of food, which became the base of our stimuli selection for the confirmatory experiment.

Based on our findings from the workshop, we developed six metrics for the confirmatory experiment. The metrics include the following factors: favorable (I like the oven interior color around the food), novel (This oven is original), properly rendered (This oven shows the color of food properly), high-end (This oven has high quality), appetizing (Light color and interior color of the oven are in harmony with the food), and general satisfaction (Public will prefer the oven If this oven is manufactured with this concept).

5. Experiment

A confirmatory experiment was conducted based on the findings from the workshop. The lightings and cavity interiors users prefer were revealed from the workshop, however, it is also needed to confirm the preference in a more objective manner, and also, to explore the interplay between lighting and oven interior color.

5. 1. Method

5. 1. 1. Stimuli

We designed stimuli with a combination of six interior colors and six light CCTs. The size of oven mock-up was about 300 mm height, 450 mm width and 300 mm depth, which is similar to the cavity size of the oven that takes the majority of the sales in Korea. The cavity color includes navy, blue, grey, burgundy, stainless steel, and black.

Except for the stainless steel, we measured the color properties using a spectrophotometer, CM-2600d by Minolta. The spectrophotometer measures the reflected light from the surface of the object, when it emits one of the standard illuminants. We set the D65 and applied a 2-degree of viewing condition and the obtained the color properties in terms of L*, a*, and b* of the CIE1976Lab or CIELAB system. The L*, a*, and b* values of the five cavity colors were [navy: L* = 18 a* = -6 b* = -19], [blue: L* = 21 a* = 12 b* = -47], [grey: L* = 45 a* = -2 b* = 3], [burgundy: L* = 31 a* = 39 b* = 27], and [black: L* = 18, a* = 3, b* = 8]. <Figure 3> describes the oven cavity color and light CCT used for the experiment and how mock-ups are presented to the participants.

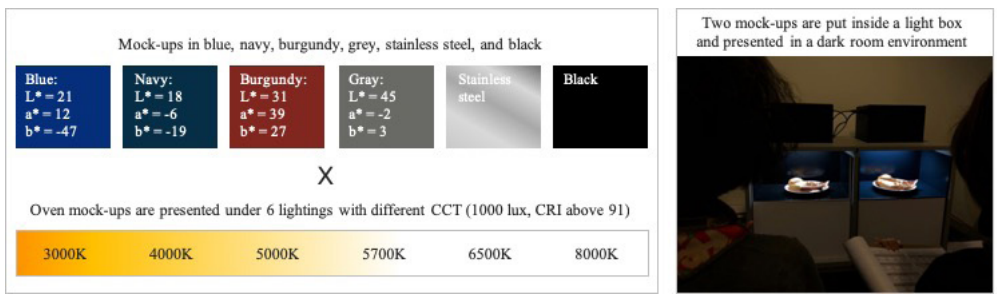

Figure 3 (Left) Oven cavity color and light CCT / (Right) Experiment scene

Regarding the lighting color, we considered a range of color temperature between 3000K and 8000K. Traditional ovens had incandescent lamps and hence were lit yellowish, which corresponds to the color temperature of approximately 3000K. In fact, our workshop participants expressed their familiarity with extant incandescent lamp as well. However, some leading manufacturers started to attempt new light sources such as LED, the CCT range of which is between 5000K and 5700K. In addition, 6500K is included because we tried to examine the effect of typical daylight condition, D65. Finally, we included 8000K to cover bluish hue range of lighting. The illuminance was set 1000 lux and the color rendering index (CRI) was above 91, ranging between 91 to 99.

During the experiment, we showed bread, pizza, and chicken as food stimuli that represent typical oven-baked food. We used vegetable pizza for the diversity of food color. The <Figure 4> shows food in oven mock-up presented under the experiment setting detailed above and the survey sheet used for the experiment.

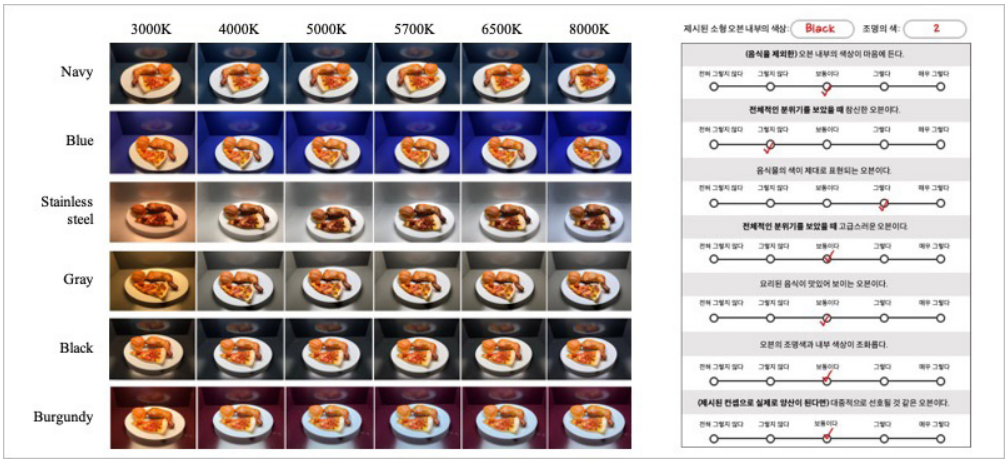

Figure 4 (Left) Combination of cavity color and lighting with food / (Right) Survey sheet

* Photos are taken under raw mode of DSLR camera. The color may differ from the true color users saw with naked eyes.

5. 1. 2. Procedure

The experiment was performed in a lab environment with the light lit about 10 lux. In total, 38 females with normal color vision participated in the experiment (20s: 14 30s: 8, 40s: 14, 50s: 2). A researcher explained the meaning of each question with a detailed explanation to achieve uniform understanding on the words used in the survey.

Two oven mock-ups were inserted in a light booth so that participants can see two mock-ups under 6 lighting conditions simultaneously. A researcher showed 6 light CCT in random order (30-60sec each) and participants filled in the survey composed of 6 questions as derived from the Workshop. The metrics include: favorable (I like the oven interior color around the food), novel (This oven is original), properly rendered (This oven shows the color of food properly), high-end (This oven has high quality), appetizing (Light color and interior color of the oven are in harmony with the food), and general satisfaction (Public will prefer the oven if this oven is manufactured with this concept). Participants evaluated each item using 5 Likert scale (1: not at all 5: very much). When all the participants were done with the 6 lighting conditions, the mock-ups were changed and participants resumed the same procedure with the new interior color. The experiment lasted for around 50 minutes including the introduction and wrap-up session.

5. 2. Result and Analysis

Based on user's responses on this perceptual quality scale, firstly we observed the preference tendency. Then to reveal the statistical evidence, we analyzed how users perceive suggested combination of cavity color and lighting by performing a series of repeated measure Two-Way ANOVA. Overall, each metric showed statistically meaningful level of main effect and interaction effect [$F_{\text{Cavity color}}(7,1775) = 9.81$, $p < 0.01$; $F_{\text{Cavity lighting CCT}}(5,1775) = 7.13$, $p < 0.01$; $F_{\text{Cavity color x Cavity lighting CCT}}(35,1775) = 5.37$, $p < 0.01$]. The result suggests that manufacturers can visualize brand image by renovating oven cavity color and lighting. In the following, we summarize the result by each metric.

"I found the colors favorable."

With regard to feeling favorable, users showed the greatest response on blue 5700 K, burgundy 6500 K, Grey 4000 K, navy 8000 K and stainless steel 3000 K. It is interesting to note that users showed their preference not on the conventional oven setting (stainless steel 3000K) but also on brand new colors such as burgundy and blue. User's preference on high CCT is also remarkable; 5700 K is the most preferred by the users. In general, users favored navy cavity and did not positively evaluated black cavity. The <Table 1> shows average and standard deviation of evaluation score on the 36 combinations regarding how

favorable the oven is. Other four factors; novel, properly rendered, high-end, and appetizing can be found in the appendix.

Table 1 Average and standard deviation of evaluation score of cavity color and lighting CCT combination on "favorable"

Favorable Repeated Measure Two-Way ANOVA, F (35, 1776) = 5.86, p ⟨ 0.01							
Cavity color	Cavity lighting CCT (K)						
	3,000	4,000	5,000	5,700	6,500	8,000	Average
Navy	3.28 (0.89)	2.69 (1.34)	3.41 (0.82)	3.23 (0.74)	2.82 (0.64)	3.45 (0.75)	3.15
Blue	2.53 (0.95)	2.45 (1.16)	2.66 (1.24)	3.82 (0.69)	3.21 (0.74)	2.92 (0.63)	2.93
Stainless steel	3.4 (0.93)	2.98 (0.97)	2.82 (1.06)	3.1 (0.78)	2.97 (1.03)	2.95 (0.93)	3.04
Grey	3.36 (0.78)	3.49 (0.91)	2.69 (1.03)	3.23 (0.81)	3.31 (0.8)	3.23 (0.96)	3.22
Black	2.82 (1.09)	3.06 (0.81)	3.29 (0.72)	3.29 (0.76)	2.82 (0.68)	2.27 (1.1)	2.92
Burgundy	3.11 (1.11)	2.34 (1.05)	2.74 (1.03)	3.08 (0.67)	3.5 (0.69)	3.34 (1.19)	3.02
Average	3.08	2.83	2.93	3.29	3.10	3.03	

* Shaded cells represent top 5 ranked average score per perceptual quality

"I found the colors novel."

On average, grey cavity was evaluated as the most novel, scoring the highest on its 4000 K and 8000 K CCT. Highly ranked combinations were mostly focused on 4000 K and 8000 K with an exception of burgundy 3000 K. Users perceived black cavity color as the least novel, presumably because this color is the most dominant oven color in the current market.

"I found the colors properly rendered."

Users reported that food was properly rendered under 8000 K light condition, the best combination of which was navy cavity color with 8000 K CCT. Whereas food under 5000 K was the least favored by the users, it is interesting to note that navy cavity color of 5000 K was highly ranked.

"I found the colors properly high-end."

Interestingly, blue cavity color with 5700K was evaluated as the most luxurious, whereas blue cavity of other CCT were not much preferred. Navy and grey color were the most favored by the users and the black was ranked the lowest regardless of the CCT because users perceived it as a tame and commonplace style.

"I found the colors properly appetizing."

Lastly, regarding the question on the harmony of food with cavity color and lighting, users showed remarkable preference on the navy cavity color. Another interesting finding is that the black cavity scored the lowest in this category. On top of that, black cavity with 3000 K, which represents one of the most typical ovens, was included in the worst 5 combination.

In general, navy color with 8000 K light temperature was the most preferred by users. The result contradicts the conventional belief that people prefer low color temperature on oven usage. There was no tendency of low color temperature preference from the result. User's preferred light temperature depended on the color of oven cavity.

6. Discussion

Apart from the typical oven colors such as black and stainless steel, navy, blue, burgundy color were also positively evaluated by the users. Black interior color was not preferred by the users, which is the most dominant oven color in Korea, along with stainless steel. In this context, the study suggests that new colors should be investigated for user's satisfactory oven usage. In addition, the study result shows its practical implication that manufacturers may differentiate their oven product if a proper combination of new cavity color and light CCT is applied, which will be especially useful for the premium product line strategy.

The most-selling oven brands in Korea currently are LG, Samsung and SK magic. LG and SK magic have stainless steel cavity with various lighting CCT ranging from 2800 K to 5700 K. Samsung has navy cavity that is positively evaluated from our experiment with the lighting CCT of around 3000 K. However, our study shows that user's evaluation on navy cavity tended to be higher on the CCT of 5000 K than 3000 K. Our experiment result suggests that manufacturers should consider wider oven lighting range that suits their cavity color and also the brand image they pursue for.

Interestingly, the result contradicts the conventional belief that people prefer low color temperature, i.e. warm nuanced light on oven usage. Whereas users referred their preference on conventional yellowish light with low CCT from the workshop, the experiment result shows no tendency of low CCT preference. User's preferred light CCT depended on the color of oven cavity itself. Users also claimed that high CCT is properly presenting the color of food itself compared to low CCT. We can assume that the users recall the image of food they see under kitchen lighting, which is around 6500 K, and are not satisfied with the colors shown under low CCT.

Whereas a number of researches have been conducted in the field of interior light CCT, this paper is one of the first study to reveal the interplay of cavity color and light temperature in home appliance. Further study will be needed to find out the most preferred combination of oven cavity and its light CCT. In addition, if such preference is influenced by the luminance contrast of interior and exterior also needs to be investigated.

The limitation of this research lies on the fact that users observed presented food without oven door, whereas users often watch inside of a closed oven in a daily context. Oven door was not used for this research because the purpose of study was to reveal the interplay between light temperature and cavity color. Oven door significantly decreases the perceived luminance, which hinders users from comparing different lighting conditions. Another improvement point is the mock-up quality. As we used mock-up made of foam-board, users may have been influenced by the material of the mock-up. Not only the color but also material and finishing may make difference on user's perception, and hence a follow-up study with a more realistic oven cavity made of metal is recommended. Lastly, it is also needed to consider that users perceive the difference of lighting between the place itself and the cavity interior.

7. Conclusion

Oven cavity color is often strategically deployed by manufacturers and can be a symbolic feature of the company. Different from office or residence interior color, oven interior color has its specific functional aspect that the color should make users satisfied with the food it contains.

The study shed light on the unexplored area of how users perceive an oven with various cavity color and light CCT. We explored the oven colors that are released on the market and a new oven color that users wanted to have. Users experienced a combination of six cavity colors with six light CCT, 36 stimuli in total, some of which they are familiar with and some very new.

Given the nature of this study being exploratory, we conducted a series of workshop to investigate user's preference on the cavity color and light CCT and to develop metrics for the empirical experiment. The result shows some interesting combinations, for instance, users found food in navy color cavity with 8000

K light the most appetizing. In addition, users showed significant preference on a number of combinations that are not released on the market, such as burgundy cavity color with low CCT (3000 K) and navy with high light CCT (8000 K).

Extant oven light temperature was mainly focused on low CCT (2700-3500 K) because of the heat resistance. However, white daylight CCT (5000 K-6500 K) and even higher color temperature also became available for oven with the development of technology and the study result shows that users can be more satisfied with the oven when higher color temperature is applied. We expect the paper to help designers to explore new oven design that can promote consumer's satisfactory user experience.

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Appendix

Table 2 Average and standard deviation of evaluation score of cavity color and lighting CCT combination on "novel", "properly rendered", "high-end", and "appetizing"

Novel	Cavity color	Cavity lighting CCT (K)						
		3,000	4,000	5,000	5,700	6,500	8,000	Average
Repeated Measure Two-Way ANOVA, F (35, 1776) = 5.43, p < 0.01	Navy	3.41(0.99)	3.87(1.22)	3.59(0.72)	3.36(0.71)	2.75(0.67)	3.13(0.56)	3.35
	Blue	2.89(0.89)	2.92(0.85)	2.97(1)	3.53(0.83)	3.68(0.62)	3.71(0.57)	3.28
	Stainless steel	3.45(0.82)	3.28(0.96)	3.35(0.95)	3.35(0.66)	3.15(0.66)	3.28(1.24)	3.31
	Grey	3.59(0.75)	3.85(0.84)	3.44(0.79)	3.28(0.69)	3.59(0.94)	3.95(0.89)	3.62
	Black	2.76(0.86)	2.76(0.86)	3.56(0.56)	3.03(0.76)	2.73(0.72)	3.64(1.25)	3.16
	Burgundy	3.82(0.77)	3.79(1.09)	3.63(0.91)	3.03(0.59)	3.45(0.6)	3.32(0.96)	3.51
	Average	3.32	3.49	3.42	3.26	3.23	3.51	
Properly rendered	**Cavity color**	**Cavity lighting CCT (K)**						
		3,000	4,000	5,000	5,700	6,500	8,000	Average
Repeated Measure Two-Way ANOVA, F (35, 1776) = 3.81, p < 0.01	Navy	3.28(0.92)	3.03(1.31)	3.46(0.76)	3.13(0.86)	2.95(0.78)	3.8(0.52)	3.28
	Blue	3.28	2.84(1.03)	2.47(1.16)	3.24(1)	3.11(0.92)	2.92(0.88)	2.90
	Stainless steel	2.98(0.97)	2.8(0.72)	2.8(0.72)	2.9(0.84)	3.2(1.27)	3.15(0.77)	2.97
	Grey	3.26(0.75)	3.26(0.91)	2.85(0.9)	2.97(1.01)	3.38(0.78)	3.33(0.74)	3.18
	Black	2.68(0.77)	3.12(0.84)	3.12(0.69)	2.97(0.87)	3.06(0.86)	2.36(1.08)	2.89
	Burgundy	2.97(1.2)	2.47(1.03)	2.63(1)	3.11(0.65)	3.16(0.72)	3.37(0.75)	2.95
	Average	3.00	2.92	2.89	3.05	3.14	3.16	
High-end	**Cavity color**	**Cavity lighting CCT (K)**						
		3,000	4,000	5,000	5,700	6,500	8,000	Average
Repeated Measure Two-Way ANOVA, F (35, 1776) = 5.02, p < 0.01	Navy	3.18(0.89)	2.9(1.27)	3.36(0.84)	3.13(0.66)	2.62(0.95)	3.22(0.53)	3.07
	Blue	2.82(1.04)	2.87(1.3)	2.37(1.26)	3.55(0.6)	2.74(0.95)	2.87(0.94)	2.87
	Stainless steel	3.4(0.78)	3(0.88)	2.35(1.19)	2.68(1.12)	2.63(0.93)	3.15(1.08)	2.87
	Grey	3.23(0.74)	3.15(0.9)	2.56(0.97)	3.28(0.69)	3.31(0.86)	2.82(0.76)	3.06
	Black	2.38(1.07)	2.71(0.72)	2.68(0.77)	2.76(0.78)	2.55(0.79)	2.06(1.03)	2.52
	Burgundy	2.95(1.18)	2.34(0.94)	2.47(1.01)	2.89(0.76)	3.32(0.7)	3.24(0.88)	2.87
	Average	2.99	2.83	2.63	3.05	2.86	2.89	
Appetizing	**Cavity color**	**Cavity lighting CCT (K)**						
		3,000	4,000	5,000	5,700	6,500	8,000	Average
Repeated Measure Two-Way ANOVA, F (35, 1776) = 4.52, p < 0.01	Navy	3.21(0.89)	3.03(1.16)	3.38(0.71)	3.18(0.76)	2.82(0.84)	3.7(0.72)	3.22
	Blue	2.82(1.11)	2.58(1.06)	1.97(1.31)	2.87(0.94)	2.92(0.91)	2.79(0.88)	2.66
	Stainless steel	2.92(0.89)	2.67(0.62)	2.43(1.24)	2.68(0.92)	2.73(0.88)	3.05(1.04)	2.75
	Grey	3.1(0.79)	3.05(0.89)	2.41(0.88)	3.1(0.79)	3.1(0.68)	2.95(0.72)	2.95
	Black	2.5(0.96)	2.85(0.89)	2.88(0.59)	2.59(0.82)	2.85(0.8)	2.18(0.98)	2.64
	Burgundy	2.89(1.09)	2.18(0.98)	2.53(1.11)	3.11(0.69)	3.24(0.63)	3.18(0.8)	2.86
	Average	2.91	2.73	2.60	2.92	2.94	2.98	

* Shaded cells represent top 5 ranked average score per perceptual quality