Psychological effects of tablecloth color on diners under different brightness

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Tableclothの色が喫食者の心理に及ぼす影響——異なる室内照度下での検討——

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喫食者のQOL向上のために、食事の満足感や食心理におけるテーブルクロスの色彩効果を3種類の照度下（12～22ルクス（暗モデル）、400～600ルクス（標準モデル）850～1050ルクス（明モデル））の照明で実験した。

喫食者の心理に与えたテーブルクロスの効果的な使用は喫食者のQOLを上昇させることが示された。

400～600ルクス下において、カラーチャートから選択された好きな色（青と赤）は食卓に相応しいテーブルクロスの色（ベージュや白）と異なっていた。共に食事をしたいと思う人数は、テーブルクロスの色よりも、明るさに影響されていることが示された。大人数で食べたい場合は、850～1050ルクス下での赤・黄・ベージュ・青が、少人数で食べたい場合には、12～22ルクス下での赤や黄、あるいは400～600ルクス下でのベージュ、または850～1050ルクス下での黒が好まれた。カップルで食べたい場合は、12～22ルクス下の黒がもっとも好まれた。

また、850～1050ルクス下のベージュ、白、黄のテーブルクロスは、食欲を増進させたり会話を促したりする効果があった。さらに、瞑想の空間を演出するためには、400～600ルクス下のベージュのテーブルクロスが相応しかった。

このような、ベージュのテーブルクロスは、様々なTPOに最も適応できる色であることが明らかとなった。

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INTRODUCTION

With the advancement of the IT society and changing employment conditions, many Japanese are affected by a lot of stress as shown by the increasing number of persons suffering from melancholy and the increased number of suicides.

Mealtime in a comfortable atmosphere with delicious meals and pleasant and intimate conversation give us a chance not only to gain nourishment, but to also be come relaxed and refreshed. However, many Japanese forget the importance of mealtime and suffer from various mental and physical disorders.

When we have meals, the information obtained through sight is known to play a very important role in increasing our appetite. Especially, the colors used in the dining space are known to have the strongest impact on our emotions that induce various feelings.

Birren reported that the effects of warm color to increased a diner’s appetite had nothing to do with the age and the country of the diners. Okuda and Kawasome also reported that a warm color such as red, orange and yellow increased the diner’s appetite. However, their studies were performed using small color chips or color images.

By the way, the color of the tablecloth might play an
Photograph. 1  Dining tables covered with different color tablecloth were set with dish plate and water goblet glass. (standard room)

Photograph. 2  Dining tables were set with dish plates and water goblet glasses and an indirect lighting lamp in climatic chamber (above: photographs in the case of beige tablecloth)

A : 850–1050 lux (bright room)  B : 12–22 lux (dark room with dim light)

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Photograph. 2  Dining tables were set with dish plates and water goblet glasses and an indirect lighting lamp in climatic chamber (above: photographs in the case of beige tablecloth)

A : 850–1050 lux (bright room)  B : 12–22 lux (dark room with dim light)

Psychological effects of tablecloth color on diners under different brightness

important role in increasing one’s appetite, because the area percent of tablecloth color occupies a relatively large space on the table. In addition, the tablecloth can easily produce various table decoration styles and atmospheres. However, the psychological effect of the tablecloth color at mealtime has only been slightly investigated compared to those in the field of interior design and the food business.

In order to clarify the effects of the tablecloth color on a diner’s emotion, this study was then performed by producing a real dining space under different brightness conditions.

EXPERIMENTAL AND METHODS

1. Brightness

Three kinds of brightnesses, 12-22, 400-600 and 850–1050 lux, were used in this study.

The brightness of the 12-22 lux (dark room with dim light) was used as the model for the relaxing and healing space such as a bar and a lounge. The tea ceremony performed at night, which is known as Yobanashi no Chaji in Japan, has been reported to be held under 5 lux.

The illumination condition of 400-600 lux (standard room) was used as the model of dining spaces at home and at a restaurant according to JIS and IEIJ standards. The illumination condition of 850–1050 lux was used as the model of the dining near a window with or without blinds under 10,000 lux of sunlight.

Experiments under 400–600 lux were performed in the dining room as shown in Photograph 1, and those under 850–1050 lux and 12-22 lux were in the climatic chamber as shown in the Photograph 2, where not only the temperature, but also the humidity and brightness were easily controlled.

Lighting was performed using a fluorescent lamp (FLR 40S·EX·N/M·X·36; National Co., Ltd., Japan, straight-tube and rapid-start type) on the ceiling having three wavelengths (Wavelength: 435nm (44.5%), 545nm (100%), 611nm (59.5%)). In addition, in the experiment under 12-22 lux, an indirect lighting lamp (AT-3805 white sand·PTH·80×H156 with circle type·PTH·05·140×105×H65; TKG Co., Ltd. Japan) placed on the center of the table was turned on (hereafter, we call this condition, the dark room with dim light), and in the experiment under 850–1050 lux (bright room), the indirect lighting lamp was turned off.

The brightness on the table was measured by an illuminance meter (type 51005, Yokogawa Electric Corporation, Japan).

2. Tablecloth color

The tablecloth used in this study was made from cot-
In order to produce a realistic dining atmosphere and to diminish the bias produced by the color harmony between the tablecloth and the dish plate, the dish plate having a color similar to the tablecloth and the transparent goblet glass were used. The color variation of the dishware was far more limited than that of the tablecloth color. The colors used in this study were first determined from the color variation of dish plate, UNO, products made by TAITU Co.,Ltd., and then the tablecloths having a color similar to the dish plate were prepared.

For in the experiment in the dining room, the tablecloth colors consisted of six kinds of chromatic colors (red, yellow, green, blue and violet (purple), beige (ivory)), and 3 kinds of achromatic colors (black, white and grey). For the experiment in the climatic chamber, the tablecloth colors were the same as in dining room, except for the green, violet and grey ones. The hue, value and chroma of each tablecloth color are shown in Table 1.

### Table 1 Munsell values of each tablecloth colour

<table>
<thead>
<tr>
<th>tablecloth colour</th>
<th>Hue</th>
<th>Value</th>
<th>Chroma</th>
</tr>
</thead>
<tbody>
<tr>
<td>beige</td>
<td>2.0Y</td>
<td>8.5</td>
<td>1.4</td>
</tr>
<tr>
<td>red</td>
<td>5.8R</td>
<td>4.6</td>
<td>13.4</td>
</tr>
<tr>
<td>yellow</td>
<td>7.5Y</td>
<td>8.7</td>
<td>9.4</td>
</tr>
<tr>
<td>green</td>
<td>7.9G</td>
<td>3.7</td>
<td>4.0</td>
</tr>
<tr>
<td>blue</td>
<td>1.1B</td>
<td>5.6</td>
<td>7.2</td>
</tr>
<tr>
<td>violet</td>
<td>7.7P</td>
<td>6.5</td>
<td>5.3</td>
</tr>
<tr>
<td>white</td>
<td>2.1PB</td>
<td>9.2</td>
<td>0.2</td>
</tr>
<tr>
<td>grey</td>
<td>5.3PB</td>
<td>8.1</td>
<td>0.2</td>
</tr>
<tr>
<td>black</td>
<td>9.0PB</td>
<td>2.3</td>
<td>0.4</td>
</tr>
</tbody>
</table>

3. Experimental conditions

University students (n = 25–28, 22.1 ± 2.3 years old), who had eaten more than 2 hours ago, participated in each experiment.

The room temperature and the humidity were 20–25°C and 50%, respectively.

In the climatic chamber, three tables (900mm × 1800mm (D) × 700mm (H)) covered with the different color tablecloths were placed. In the dining room, nine tables were available.

Each table was separated by a beige-colored partition, of which the color was matched to the walls and ceilings made from steel, and the location of the tablecloth color was randomly changed every day.

4. Questionnaire study

In the waiting room under a similar brightness to the experimental room, the subject completed a questionnaire concerning one’s attributes, and health and psychological conditions of the diners as shown in Table-2.

In the experimental room, the subject was given time (5 minutes) to accustom themself to the tablecloth color in order to answer the questions concerning the image of the tablecloth color and their induced emotions. Each experiment took approximately 20 minutes.

5. Data analyses

The data analyses were performed using the SPSS (10.0 version for windows) software program. The significant difference was analyzed using the One-way ANOVA and Multiple Comparisons by Games-Howell method[4].

### Table 2 Constitution of questionnaire

<table>
<thead>
<tr>
<th>place of examination</th>
<th>variety of questionnaire</th>
<th>each questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>questionnaire in the waiting room</td>
<td>physical and mental conditions</td>
<td>How about your today’s conditions for; sleeping, health, appetite, mood</td>
</tr>
<tr>
<td></td>
<td>preference colour and recommendable tablecloth colour</td>
<td>Which colour do you like best?</td>
</tr>
<tr>
<td>questionnaire in the experimental room**</td>
<td>effects on the psychology of diner</td>
<td>Which colour do you recommend for dining tablecloth?</td>
</tr>
</tbody>
</table>

* Subjects answered this question by observing the colour chart made by a snip of the tablecloth (15mm × 25mm).

** Subjects answered these questions by sitting in front of the table covered with colourd tablecloth.
RESULTS AND CONCLUSION

1. Relationship between favorite color and recommended tablecloth color

Whether the color preference was universal or not has not yet been clarified. However, the blue and/or red were reported to be the generally preferred colors by all generations in all the countries studied[5].

Whether the favorite color and the recommended tablecloth color were related or not was examined by using a color chart (10×20mm) made from pieces of the tablecloths used in this study. These results are shown in Table 3.

In the standard room, the favorite color bared on the color chart was blue (27%) and red (20%). The recommended color selected for the tablecloth was beige (59%) and white (21%).

The favorite color was similar to the color reported by other researchers[5]. However the recommended tablecloth color selected by the subject was not related to one’s favorite color.

2. A number of people to dine with

The person to dine with is thought to be very important for enjoying the meal. In addition, the number of people to dine with would also be changed depending on the situation. In order to produce the best atmosphere matched to the situation, the recommended tablecloth color was then investigated as shown in Fig. 1.

In the dark room with dim light, the most favorite tablecloth color to dine with a small number of people was a warm colors, such as red (57%) and yellow (52%). The favorite tablecloth color to dine with a couple was black (50%), white (48%) and blue (48%). These results in a dark room with dim light might be connected to the atmosphere produced by the dim light and the tablecloth color.

In the standard room, although there was no significant difference among the tablecloth colors, the warm colors, yellow (55%) and red (37%), were selected for dining with a large number of people. Beige (45%) and green (36%) were selected for dining with a small number of people. In the case of dining with a couple, 40% of the subjects selected violet, white and grey tablecloths, and for dining alone, black, green and grey tablecloths were selected.

In the bright room, yellow (77%), red (63%), beige (57%) and blue (52%) were selected for the dining with a large number of people. Especially, the tables covered with yellow, red and beige tablecloth were more favorable than that with black (p<0.01). However in the case of the dining with a small number of people, black was selected by 52% of the subjects, although there was not significant difference.

Overall, according to the increase of the strength of brightness, the number of people to dine with was shown to be increased in all colors. That is to say, a number of people to dine with was more influenced by the brightness than tablecloth color.

3. Conversation

For the table decoration, the centerpiece and the

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Table 3: Relationship between preferred colour and recommendable colour as tablecloth made from a snip of the tablecloth in the standard room

<table>
<thead>
<tr>
<th>tablecloth colour</th>
<th>red</th>
<th>yellow</th>
<th>green</th>
<th>blue</th>
<th>violet</th>
<th>beige</th>
<th>gray</th>
<th>white</th>
<th>black</th>
</tr>
</thead>
<tbody>
<tr>
<td>favorite colour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>red</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>22</td>
<td>4</td>
<td>11</td>
<td>41</td>
<td>20</td>
</tr>
<tr>
<td>yellow</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>green</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>35</td>
<td>8</td>
<td>8</td>
<td>55</td>
<td>27</td>
</tr>
<tr>
<td>blue</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>18</td>
<td>4</td>
<td>12</td>
<td>1</td>
<td>39</td>
</tr>
<tr>
<td>violet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>17</td>
<td>2</td>
<td>4</td>
<td>23</td>
<td>11</td>
</tr>
<tr>
<td>beige</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>2</td>
<td>6</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>gray</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td>1</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>white</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>1</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>total (a number of people)</td>
<td>2</td>
<td>4</td>
<td>10</td>
<td>1</td>
<td>0</td>
<td>120</td>
<td>22</td>
<td>42</td>
<td>2</td>
</tr>
<tr>
<td>total (%)</td>
<td>1</td>
<td>2</td>
<td>5</td>
<td>0</td>
<td>0</td>
<td>59</td>
<td>11</td>
<td>21</td>
<td>1</td>
</tr>
</tbody>
</table>

Psychological effects of tablecloth color on diners under different brightness

(51) 51
figure are generally placed on a dining table in order to promote conversation among the diners. However, the atmosphere produced by the tablecloth color might be important. Whether or not the conversation was promoted by the tablecloth color was examined.

In the dark room with dim light, about 50% of the subjects answered not to have a conversation at the table covered with a white, black or beige tablecloth as shown in Fig. 2.

In the standard room, beige (64%), red (60%) and yellow (57%) tablecloths were shown to promote diner’s conversations.

According to the increased strength of the brightness, subjects who want to have a conversation increased especially at the table covered with yellow (85%), red (83%), white (78%) and beige (75%) tablecloth.

Overall, a warm color such as red and yellow gave more feeling to having a conversation than the other colors. Among the achromatic colors, only white was shown to promote conversation in the bright room. The color that promoted conversation was not related to the color to dine with.

4. Healing

It might be very important for modern people to refresh themselves at mealtime. The role of the tablecloth color for this refreshment was examined.

In the dark room with dim light, the effect of color on the healing was almost the same as shown in Fig. 3. Since the dark brightness might decrease the characteristics of
Psychological effects of tablecloth color on diners under different brightness

In the standard room, beige (71%) was selected as the healing color. The warm colors, such as yellow (73%) and red (67%), were shown not to be suitable for the healing dining space compared to beige (p < 0.01), green (p < 0.05) and blue (p < 0.05).

According to the increase in the strength of the brightness, the effects of healing by the tablecloth color decreased except for the achromatic colors such as white and black.

Overall, beige was most recommended color in dining with homey atmosphere as with a family, because beige had the effects of not only healing, but promoting conversation during dining with a small number of people in the standard room.

5. Appetite

The influence of the tablecloth color on one’s appetite was examined.

In the dark room with dim light, red (45%) was the most recommended color to enhance one’s appetite compared to black (p < 0.05) as shown in Fig.4.

In the standard room, the most effective tablecloth color to enhance one’s appetite was beige (71%), although there was no significant difference among the tablecloth colors. The color that decreased one’s appetite was shown to be violet (57%), grey (50%) and black (43%).

In the bright room, many people answered that one’s appetite was enhanced at the table covered with beige (75%), white (71%), yellow (65%) and red (45%) tablecloths. However, a black (44%) tablecloth was not suitable for one’s appetite.

The color to enhance one’s appetite was reported to be orange, red and yellow, and the color to decrease one’s appetite was yellow—green and purple. In this study, the tablecloths color that decreased one’s appetite were similar to those previously reported. However, the tablecloth color that increased one’s appetite was not necessarily only the warm color, but also beige.

We already reported the relationship between the table decoration style and the tablecloth color under different brightnesses, of which the experiments were also performed by considering the area effect of the color and the atmosphere around the diner. The table decoration styles (formal, casual, etc.) were shown to be effectively changed by the tablecloth color and/or the brightness of the dining space. Especially, the atmosphere produced by the yellow tablecloth was shown to be mostly influenced by the strength of the blightness, but not for the black one. In this study, the properties of the yellow and black tablecloth colors also showed similar tendencies to these results.

From our series of experiments, the beige tablecloth was shown to be a multipurpose color for various TPOs. The effects of the color family of beige are now under investigation in more detail.

SUMMARY

The effective use of the tablecloth color to produce a comfortable dining space was examined under different brightnesses. The tablecloth color was shown to produce not only a comfortable, but suitable atmosphere that changes one’s emotion depending on the TPO. The stronger the brightness, the more characteristic tablecloth color was strengthened, especially yellow. In a dark room with dim light, the characteristics of the tablecloth color diminished.
Figure 3 Effect of tablecloth colour on the sense of healing

- *p < 0.05, **p < 0.01 (Games-Howell)

Percent showed the ratio of the subjects it to feel or not to feel per the number of the subjects who sit at the table.

Figure 4 Effects of tablecloth colour on one's appetite

- *p < 0.05, **p < 0.01 (Games-Howell method)

Percent showed the relation of the subjects to answer to increase one's appetite per the number of subjects who sit at the table.
Psychological effects of tablecloth color on diners under different brightness

In order to promote one’s appetite and conversation, yellow, beige and white tablecloths were effective under a high brightness. In order to produce a healing space, a beige tablecloth under 400~600 lux was suggested to be most recommended.

The effective use of the tablecloth color and illumination were shown to be useful to change a diner’s emotion and to improve the diner’s QOL.

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