1. INTRODUCTION

In the background of a large body of literature on the psychology of color, with color-emotion and color-preference as two of the most popular topics (e.g. [1-4]), the main objective of this research is to explore and understand the role of color in dining experience, specifically the perception of preference, emotions on tableware color, in various dining situations.

In the previous phase of this study [5], color preference and relationship between the perception of color and different dining situations had been discussed. The results revealed a gap between the preference of colors, and choice of color when given a certain dining situation. It suggested that despite the general preference of colors, participants made their decision on tableware color based on other factors that were provided by different dining situation sketches. Afterwards, the correlation analysis on the emotion adjective words indicated that there were relationships between some choices of the color and the emotion evoked by those dining situation sketches.

Kansei is used to express one’s impression towards artifact, situation and surroundings, and it is generally referred to sensitivity, sensibility, feelings and emotions [6-9]. Kansei is also described as a process, which begins with gathering the sensory related functions such as feelings, emotions and intuition [8,10]. When these senses are triggered, psychological cognition concerned with perception, judgment and memory will surface [10]. Kansei process is implicit and cannot be measured directly, which means the causes and consequences of Kansei process are what could be measured [11]. Kansei can only be measured indirectly and partially, by measuring sense activities, internal factors, psychophysiological and behavioral responses [8,12,13].

Therefore, based on the background of Kansei and the implications so far, it is considered that participants’ perception, cognition, emotion and decision making in the process of selecting tableware colors in different dining situations, could be constructed as parts of a Kansei process.

At the stage by far, it was assumed that emotion played an important role in the choice of tableware colors. However, the evidence is not convincible enough to prove how important emotions are in the Kansei process of the decision making of tableware colors. It was assumed that the moods/emotions in dining situations were the major reasons affecting color selection, but the actual relationship between them remains unclear. It was suggested that colors contain a lot more implications and implicit information that worth digging [5]. More analysis and further experiments are needed to be done in this sense.

To support the assumption that emotion is the key to decision making of tableware color in different dining situations, it is important to explore the process of how...
participants made their selections of tableware colors from a new qualitative perspective.

Qualitative research is the scientific method of observation to gather non-numerical data [14]. This type of research “refers to the meanings, concepts definitions, characteristics, metaphors, symbols, and description of things” and not to their “counts or measures” [15].

Qualitative research dove into aspects of human life that could not adequately be covered by quantitative research; aspects such as culture, expression, beliefs, morality and imagination [16]. Therefore, it is meaningful to conduct a qualitative survey on the participants towards a better all-around understanding on the reason why they select certain color. A follow-up survey is needed to gather the descriptions from participants.

On the other hand, in the previous phase of the study, adjective words describing the moods during dining activities were applied to assess the moods & emotions in different dining situations [5]. Furthermore, the correlation between color selections and adjective words assessment was analyzed. The adjective words rating scale, which was made according to the extracted factors in a research on the mood in various dining situations by Hirai (2005) [17]. However, since the relationship between moods/emotions and the selections of colors was not discussed enough, the adjective words from Hirai’s study should be filtered. When it comes to selecting tableware colors in a dining situation, participants’ emotions and moods could be different from what they simply feel against the dining situation. It is possible that only some of the adjective words in Hirai’s study are connected to color selections. Moreover, there might be other factors apart from emotions and moods, in the Kansei process of decision makings of tableware colors.

Another topic in this phase of the study is discussing about how the visual presentations of the dining situations could affect the emotions evoked. In the previous phase of the study, 6 sketches were designed to represent the 6 typical dining situations. However, in the dining situation sketches, there are many visual elements presented in the sketches that we do not know whether they will influence participant’s emotions or not.

There are other studies that involved visualizations of situations, applying visual stimuli such as cartoonish images or sketches, which are considered more universal than verbal tools that rely on a level of capability of understanding a certain language [18]. For instance, Cartoonish sketches that describe certain situations are employed to visualize and present different situations in previous studies [19, 20]. Concept Cartoon was created approximately 25 years ago and keeps evolving though years [19]. It is a collection of various images using cartoonish characters, in certain situations. It has been used world-wide by educators to attempt to develop innovative teaching and learning strategy in science education and other fields, and the feedback is positive and encouraging [21]. Another cartoonish tool is employed in the Kids’ Empathic Development Scale (KEDS), which is a collection of 12 ‘faceless’ pictographic stimuli [20]. The pictographic stimuli describe certain situations related to kids’ social interactions.

The researchers created visualized situations with specific design/art style of the characters and objects in the image, and the characters have unique features such as hair styles, different outfit and body ratio. Few has discussed about what art style and how simple should the stimuli be [18]. It is not clear that whether the design/art style and the simplicity of the stimuli affect the perception of the people looking at it [18]. Therefore, in our study, it is also important to discuss that whether the way of presenting dining situations could affect the perception, emotion of participants, which might lead to a different tendency of color selection.

2. OBJECTIVE

The objective of this phase of the study is aimed at 2 steps: The first step is to analyze the diversity of color selections, gather and explore the reasons behind tableware color selection from a qualitative perspective, to check whether emotions are the main factors in color selections; The second step is to discuss whether the way of presenting visualized dining situations could affect participants’ emotions, then find out which visual elements have potential influences in color selections.

3. METHOD

In the first step, we followed up the experiment in the previous phase of the study by asking participants another questionnaire. The previous experiment was conducted to collect people’s understanding about different colors and dining experience by showing simple color samples and sketches of different dining situations. The experiment indicated participants to rate their preference of the shown colors, evaluate their emotional responses against presented different sketches of dining situations, and required participants to pick one or multiple color samples from the colors as their preferred colors for tableware to use in each dining situation [5]. Now in this
phase, the same 30 participants from the 1st phase of the study were indicated to write down the reason why they chose certain colors in certain dining situations, explaining the reason why so in free comments. Afterwards, the sentences were broken into words, to observe the various reasons of tableware color selections. The words from their answers were also categorized into 3 groups: Attitude, Impression and Perception. Based on the distribution of words, the tendency of different dining situations was discussed.

In the second step, a new and simpler set of dining situation sketches were designed to compare with the original version by a new group of 25 female participants. Participants were asked to evaluate the emotions they feel against the different dining situation sketches, in simple version and detailed version. The adjectival words for emotions were selected from Hirai’s adjective words rating scale for dining situations [17], but also filtered based on the result from the first step. Non-linear Canonical Correlation Analysis (OVERALS) was conducted to explore potential relations between visual elements in dining situation sketches and emotions of participants.

3.1 Participants
The participants in the first step were the same 30 females from previous study, with the average age of 24.6 (M = 24.6, SD = 2.96). All the participants passed color vision test using Ishihara Pseudoisochromatic Plates [22].

The participants in the second step were 25 females with bachelor degree or higher education level. The average age is between 27 and 28 years old (M = 27.32, SD = 3.01).

3.2 Stimuli
The questionnaire followed the experiment in previous study, therefore the colors are still the 8 colors from previous experiment (Figure 1). Preceding literatures have focused on blue and red colors for dining dishes, with the consideration of white and black in some cases. This study has proposed a more various color collection with different saturations from similar color hue. Considering the application of the study, it is suggested that the colors from real tableware industry might be appropriate to understand real life situation. On the other hand, although white is considered the most common color for tableware, it is not used in this study in order to eliminate the factor of past experience influence. All the 8 colors were extracted from the same tableware producer [5].

As well as the colors, the dining situation sketches are still the same with the sketches used in previous phase of the study (Figure 2).

3.3 Experimental procedure
In the previous phase of the study, participants were required to select their favorite colors as many as they want for tableware in each dining situation sketches. Usually, tableware could include the tools and containers such as plateware, cups, folks and spoons, as well as the decorations such as tablecloth. In this study, participants were indicated that the tableware should be the tools and containers on the dining table, such as plates, bowls, cups, etc. Therefore, the tableware in this study only refers to
the tools and containers directly interact with food and users. As a follow up questionnaire, the first step in this phase was a questionnaire asking these participants to describe the reason why they select the colors in free comments.

For the second step of this phase of the study, another group of 25 female participants were randomly assigned with two groups. Group 1 was presented with simple version of dining situation sketches, and group 2 was presented with the original, detailed version of dining situation sketches. Each dining situation was presented at the beginning of each page, followed by questions (adjective words assessment) about the situation. The order of dining situations was randomized for each participant. At the end of the questionnaire, participants were indicated to answer their overall preference, their age and gender.

3.4 Analysis method of step 1

The first step re-analyzed diversity and reasons of color selections, aiming at understanding more about the reason behind color selections.

Firstly, previous research about color selections on tableware presented us a result with variation of tendencies [5]. Shown as Figure 4, the color selections indicated that different dining situations had different amount of color selections and variations. Tendency of the variation and diversity of color selections could be seen in Figure 4. However, some of the dining situations had same amount of total color selections, but the scatterings of color selections were entirely different. Clear definition and presentation should be made to quantify the diversity of color selection.

Therefore, in order to understand the diversity of color selections, we proposed two main concepts to explain diversity: dispersion and multi-selection. Dispersion is defined to explain how spread out the color selection could be. There are three commonly used measures for the measure of dispersion in data analysis: range, interquartile range, and standard deviation [23].

Range (R) is the difference between largest and smallest observation in the data. It is easy to calculate but it does not explain all the observations in data [24]. Below is the equation of range. \( X \) means the number of times a color being selected.

\[
R = X_{\text{max}} - X_{\text{min}}
\]

Interquartile range (IQR) is similar with range, but defined as the difference between the 1st and 3rd quartile, hence it describes the middle 50% observations. If it is large, then the middle 50% observations are spaced wide apart [23]. \( Q_3 \) means the median of the larger half of the entries, and \( Q_1 \) means the median of the smaller half of the entries. The advantage of IQR is that it is not affected by the extreme values [25].

\[
IQR = Q_3 - Q_1
\]

The standard deviation between the amount of selections of each color is used for representing dispersion. Standard deviation is a common measure that is used to quantify the amount of variation or dispersion of a set of data values [26]. It is a measure of spread of data about the mean. For example, in this study, a low standard deviation of color selections means data points tend to be close to the means, therefore the selections are spread out between all colors. On the other hand, a high standard deviation means that there are clearly popular colors and unpopular colors among all selections. SD is the square root of sum of squared deviation from the mean divided by the number of observations [23]. The equation is below, \( \mu \) represents the mean of \( X \). \( N \) means the number of observations, which is the number of types of colors selected in a situation in this case.

\[
SD = \sqrt{\frac{\Sigma (X - \mu)^2}{N}}
\]

Multi-selection (MS) represents whether participants tend to select multiple colors in the dining situation. Therefore, in this study, the equation of MS is below, \( T \) represents the total sum of selected colors in a dining situation, and \( n \) represents the number of participants.

\[
MS = \frac{T}{n}
\]
Secondly, qualitative analysis of the free comments was conducted. Participants’ answers were broken down into key words of adjective and noun. We consider that the Kansei process behind the explanation thinking could be constructed by different stages. According to Nagamachi (1995), Attitude and Impression are two of the main emotional response in Kansei, which are used to reflect and design the appearance of products [27]. Another research focused on the comparison between cognitive parts and evaluative words using Kansei method also suggested that human’s Kansei are constructed by stages like a pyramid [28]. It is considered that appearance elements of the product are at the bottom as the basement, with human’s cognition or perception on top of it. The next stage is the Impression, which indicates the instant impression of the product, including associations. On the top of the pyramid is the stage of Attitude, which indicates more personal emotions and preferences [28]. Therefore, in the process of explanation thinking and decision making in tableware color selections, Attitude and Impression could be considered as two of the major Kansei stages. Based on the observation of free comments, and following the rules of categorizing Kansei words in previous research [28], both attitude and impression could be extracted following the extraction rules below:

1. Words that describe subjective preference or emotions, mood and affections on the personal experience of the dining situation are categorized as Attitudes. (For example, “happy”, “preferred”, “lonely”, etc.)
2. Words that describe associations, objective impressions of certain color in a common sense are categorized as Impressions. (For example, “bright”, “clean”, “nature”, “contrast”, etc.).
3. Words that describe a specific purpose and objective explaining the color selections, are categorized as Purpose. (For example, “go well with food”, “coordinate with kitchen”, “instagramable”, “make food look more delicious”)

The third concept: Purpose, is a new stage of Kansei in explanation thinking we introduce to this study, because in this case, based on the observation of the free comments, the explanation thinking process did not stop at Attitude. Since participants took actions to select color, the Kansei process structure would go further than attitude to certain objectives.

To calculate the ratio of Attitude, Impression and Purpose in each dining situation, the rules below are followed:

1. Sentences in free comments were separated into adjective words and noun.
2. Adjective words and noun were categorized into either Attitude or Impression by following the extraction rules above. Every single word is counted as Attitude or Impression.
3. However, if a sentence was an objective form in grammar, which contains “wo”, “ni”, “to”, “tame”, “tai” (“wo”, “ni” and “to” are the particles and “tame”, “tai” are words in Japanese grammar to describe objectives), the whole sentence would be defined as Purpose, and the words in the sentence would not be used to count as Attitude or Impression.

Finally, we conducted correlation analysis to explore the relationship between the diversity of color selection and structure of explanation thinking.

3.5 Analysis method of step 2
The second step intended to understand how important the way of presenting dining situations is, in the sense of emotions. The questionnaire was based on the adjective words rating scale for various dining situations by Hirai (2005) [17]. The emotions in Hirai’s rating scale are the general emotions assessing dining situations, however, in this study the emotions were triggered by not only the dining situation but also the process of choosing colors. Therefore, among the original 15 adjective words, we selected the adjective words that appeared in the free comments of participants in step 1. These selected emotion adjective words are considered the emotions that not only exist in general dining situations, but also connected to the Kansei of selecting colors.

Afterwards, visual elements were defined to quantify the way of presenting dining situations. Based on the difference between simple and detailed version of dining situation sketches, visual element factors were extracted from two versions of dining situation sketches.

The data value of emotion adjective words rating and visual elements are both categorical data. Participants were asked to choose the emotions they felt among the adjective words. The visual elements are also discrete numbers, which means the data type of these two groups are both nominal. Accordingly, non-linear canonical correlation analysis (OVERALS) were conducted to explore potential relationship between specific visual elements and evoked emotions.
4. RESULT

4.1 Diversity of color selections

Figure 5 shows the dispersion by representing R (range), IQR (interquartile range) and SD (standard deviation) of the amount of selections for each color. As shown in Figure 5, dining situation No. 1 “dinner dating with partner” shows a very balanced color selection result with the lowest SD, indicating that in this dining situation, the amounts of selection are similar and close to the mean among each color. It also shows lowest R and relatively low IQR, suggesting that in this dining situation, the gap between the most popular color and most unpopular color is very low, and the gap between medium popular colors is also very low. On the other hand, in dining situation No. 6 “hot pot party with friends” that shows highest R and highest SD, with the second highest IQR, indicating that the gaps between participants’ amounts of selection among each color are notably big. In the case of dining situation No. 4, R is medium but IQR is the highest, close to the value of R, and SD is the second highest. This indicates that in this dining situation, there is not just one popular color, popular colors and unpopular colors are both multiple colors and they are clearly separated.

Figure 6 shows the multi-selection (MS) of colors in each dining situations. This indicates how many colors participants selected on average in each dining situation. As shown in Figure 6, dining situation No. 5 shows the highest MS (2.2), suggesting participants tend to select more than 2 colors in this dining situation. Participants tend to select between 1 and 2 colors on average in the rest of the dining situations. ANOVA with repeated measures showed that there was a significant effect of dining situation on MS (multiple selection), Wilks’ Lambda = 0.522, F(5,25) = 4.586, p = 0.004, indicating that the number of colors selected by participants on average is statistically different between dining situations.

4.2 Explanation structure in color selection

Based on the categorization of extracted words from free comments, the explanation structure is presented in Table 1. Ratio of words categorized in Attitude, Impression and Purpose were extracted from free comments explaining why participants selected certain colors. dining situation No. 1 “dinner dating with partner” shows smallest proportion of Attitude: 29%, along with the biggest proportion of Impression: 56%. On the other hand, in dining situation No. 6 “hot pot party with friends”, the biggest proportion of Attitude: 62% and smallest proportion of Impression: 24% are found. All dining situations show similar percentage of Purpose in the explanation structure, ranging from 14% to 30%.

4.3 Correlation between color selection diversity and explanation structure

Four factors representing color selection diversity: R (range), IQR (interquartile range), SD (standard deviation) and MS (multi-selection per participant) were involved in a correlation analysis with the other three factors representing explanation structure of color selection: proportion of Attitude, Impression and Purpose.
Table 2: Result from correlation analysis, showing the Pearson correlation (r) and P value (p). "*" means p<0.05

<table>
<thead>
<tr>
<th>factor</th>
<th>R</th>
<th>IQR</th>
<th>SD</th>
<th>MS</th>
<th>Attitude</th>
<th>Impression</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
<td></td>
<td>p</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R</td>
<td>1</td>
<td></td>
<td>.60</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IQR</td>
<td></td>
<td>.89</td>
<td>.24</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td>.64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MS</td>
<td></td>
<td></td>
<td>.56</td>
<td>.59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attitude</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impression</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.51</td>
<td>.48</td>
</tr>
<tr>
<td>Purpose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-.15</td>
<td>.78</td>
</tr>
</tbody>
</table>

Before the correlation analysis, test of normality using Kolmogorov-Smirnov method was conducted. The result shows that the distributions of the data set of all seven factors are not significantly different from a normal distribution (p>0.05). Therefore, the correlation analysis was run using Pearson’s method. Table 2 shows the result of Pearson correlation analysis, indicating the correlation strength, direction and significant value.

As shown in Table 2, Pearson correlation coefficient was conducted among the relationship of R, IQR, SD, MS, Attitude, Impression and Purpose. There is a positive correlation between two variables R and SD (Pearson r=0.889, p=0.018). The Pearson correlation between Attitude and Impression is highly negative (Pearson r=-0.88, p=0.021). On the other hand, Both R and SD show a highly positive Pearson correlation with Attitude (with R: Pearson r=0.884, p=0.02; with SD: Pearson r=0.978, p=0.001). Both R and SD also show a highly negative Pearson correlation with Impression (with R: Pearson r=-0.839, p=0.037; with SD: Pearson r=-0.895, p=0.016). Overall, there is a strong positive correlation between Attitude, and the range/standard deviation of color selection frequency. The increases of the ratio of Attitude are correlated with increases of the range and standard deviation of color selection. On the other hand, there is a strong negative correlation between Impression, and the range/standard deviation of color selection frequency, indicating that increases of the ratio of Impression are correlated with decreases of the range and standard deviation of color selection.

4.4 Emotion adjective words screening and visual elements extraction

The adjective words for assessing emotions in previous research by Hirai (2005) contains 15 words that cover the emotions and moods in general dining situations [17]. Based on the extracted words form free comments explaining why participants selected certain colors, we picked up adjective words that appeared in both the list of Hirai’s research and the free comments. These words are considered the key emotion words that connect dining situation emotions and color selections. The words are listed as Table 3.

Visual elements form simple version (Figure 3) and detailed version (Figure 2) are extracted by observing the difference between and within two versions. The visual features that only appeared in detailed version were extracted. In addition, the visual features that showed the difference between the dining situations in the same version were also extracted. Basically, the differences in visual elements were listed in 2 types: whether the sketch has the feature or not (“yes or no” factors in Table 4), or how many are counted for the same feature in the sketch (“how many” factors).

First of all, the facial features between simple and detailed versions were obviously different. The detailed version revealed mouth, nose, ears and hair of the characters. In the mouth elements, there were also smiling mouth and yawning mouth. Therefore, these facial elements were extracted as visual element details. Secondly, the dressing elements on the characters were also shown only in the detailed versions. Thus, clothes and shoes were also listed as visual elements in the sketches. In the detailed version, there were clear gender identity and generation identity. Therefore, the number of males, females, elderly and kids were extracted as visual elements. The number of people in the sketches was not a difference between simple and detailed versions, however, the population in a dining situation was considered effective on the atmosphere. Accordingly, the number of people was added as a
visual elements in the sketches. Detailed version clearly describes the hand of the characters, and there was also a difference of whether the characters are holding something or not in the sketches. Therefore, hands and holdings were also listed as visual elements. In addition, the objects related to the tableware, including the cups, bins, sharing bowls and plates were also observed as visual elements in the sketches.

In summary, the visual elements extracted above are shown in Table 4. These are the visual element factors that indicate the difference between simple and detailed dining situation sketches, or key differences within the same versions. For instance, factor “elderly” indicates whether there are elderly people in the sketch. “Plate&Bowl” indicates how many plates and bowls are shown in the sketch.

4.5 Non-linear canonical correlation analysis on emotions and visual elements

Non-linear canonical correlation analysis (OVERALS) was conducted to determine whether there are correlation relationships between emotion adjective words and visual element factors. Table 5 shows the result of OVERALS, presenting only the factors with component loadings higher than 0.500.

Dimension 1 is defined by items in set 2, which are “joyful”, “lively”, “warm”, “happy” with positive correlations and “quiet”, “lonely” with negative correlations. Correlated visual element factors are shown in set 1, with the number of “people” alongside “female” and “kids”.

Table 5: Result from OVERALS, showing factors in each dimension with the component loadings higher than 0.500. Set 1 is the group of visual element factors. Set 2 is the group of emotion adjective words.

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Set 1</th>
<th>Set 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Female (0.567)</td>
<td>Joyful (0.895)</td>
</tr>
<tr>
<td></td>
<td>People (0.836)</td>
<td>Lively (0.781)</td>
</tr>
<tr>
<td></td>
<td>Kids (0.606)</td>
<td>Warm (0.673)</td>
</tr>
<tr>
<td></td>
<td>Tableware (0.650)</td>
<td>Happy (0.600)</td>
</tr>
<tr>
<td></td>
<td>Platebowl (0.700)</td>
<td>Quiet (0.642)</td>
</tr>
<tr>
<td></td>
<td>Food* (-0.830)</td>
<td>Lonely (-0.674)</td>
</tr>
<tr>
<td></td>
<td>Bin (-0.701)</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bin (0.513)</td>
<td>Lonely (0.589)</td>
</tr>
<tr>
<td></td>
<td>Tableware (0.511)</td>
<td>Lively (0.536)</td>
</tr>
<tr>
<td></td>
<td>Holdings (+0.603)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cap (+0.658)</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>N/A</td>
<td>Happy (0.580)</td>
</tr>
<tr>
<td>4</td>
<td>N/A</td>
<td>Refreshing (0.631)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Peaceful (0.531)</td>
</tr>
<tr>
<td>5</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>N/A</td>
<td>Peaceful (0.572)</td>
</tr>
<tr>
<td>7</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>8</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

“Tableware”, as well as “plate and bowl”, are also considered positively correlated with dimension 1. “food” and “bin” are negatively correlated with the dimension.

Similarly, dimension 2 is defined by “lonely” and “lively” in set 2. “Bin” and “tableware” show positive correlation and “holdings”, “cups” show negative correlations with the dimension.

Dimension 3, 4, 6 are respectively definable by “happy”, “refreshing” and “peaceful”, however, there are no visual element factors showing notable correlations.

Dimension 5, 7, 8 couldn’t be defined by any emotions.

5. DISCUSSION

5.1 Diversity in color selections

In Figure 5, it is observed that different dining situation sketches showed different tendencies in the dispersion of color selection. The tendency of multiple color selection is revealed in Figure 6. Figure 5 and Figure 6 could represent and visualize the color selection tendency in Figure 4. For instance, in Figure 6, 2.2 colors were selected on average per participant in dining situation No.5 “picnic with family at park”, suggesting that participants tended to select more colors at the same time in this dining situation. However, in Figure 5, dining situation No.5 “picnic with family at park” shows relatively medium or low range, interquartile range and standard deviation. This indicates that participants tended to select different, various and diverse colors in this situation; the gap between popular colors and unpopular colors are relatively small.

In Figure 6, dining situation No.1 “dinner dating with partner” and No. 6 “hot pot party with friends” show same amount of color selection, with 1.65 color selections on average per participant. Nevertheless, in Figure 5, they respectively have the lowest (SD = 3.34) and highest (SD = 7.28) value of standard deviation, lowest (R = 9) and highest (R = 19) value of the range of color selection, and relatively low (IQR = 5) and relatively high (IQR = 9) value of the interquartile range of color selection. This indicates that between these two dining situations, participants selected the same amount of colors, but in dining situation No.1 they had various individual tastes, in dining situation No.6 there are some popular colors being shared by most of the participants. The gap between popular and unpopular colors is very big.

On the other hand, in dining situation No.3 “drinking alone at home” and No.4 “breakfast at home”, colors were selected 5 times on average, which suggests that participants tended to select less colors in this situation relatively. However, the pattern of the dispersion of color
5.2 Kansei process of diversity and structure of explanation thinking in tableware color selections

To explore more on the difference and characteristics of dining situations, especially to understand why color selections are so diverse and different in dining situations, the explanation thinking structure was analyzed. As shown in Table 1, when it comes to letting participants explain themselves on why choosing certain colors, the compositions of explanation are quite different among the 6 dining situations. For instance, in dining situation No.1 “dinner dating with partner”, participants tended to use many words related to Impression (56%) to describe the reason, including anything they associated from the dining situation, or any descriptions about the color or the dining situation that very objective and related to common sense. In dining situation No. 6 “hot pot party with friends”, Attitude (62%) seems to be dominant in the descriptions, indicating that the explanation thinking of color selection in this situation are mainly constructed by Attitude, which involved preference, subjective emotions, etc.

Results from correlation analysis in Table 2 provided implications on the relationship between explanation structure and color selection diversity. Range and standard deviation show strong positive correlations, however, Interquartile range does not show any relationship with other variables. Attitude and Impression show highly negative correlations, indicating that when the proportion of Attitude increase, Impression will always decrease. Purpose does not show any correlation with other factors, suggesting that there is not clear effect of how much Purpose related words participants use to describe, on the diversity of color selection. In the model of Kansei stages and the categorization of Kansei words, Attitude and Impression are emphasized; however, Purpose does not appear in any of these models and concepts [27, 28]. Although in this study, we defined and separated Purpose from Attitude and Impression, due to the structure of free comments, Purpose does not affect the choices of participants very much. This suggests that Attitude and Impression are still the key Kansei responses in color selections for tableware. In summary, in the structure of explanation thinking on why they choose certain colors, Interquartile range and Purpose are more independent factors. Range, standard deviation, Attitude and Impression are more interactive. It could be considered that there are Attitude dominant dining situations, and Impression dominant dining situations.

Similarly, multi-selection shows no notable correlation with other factors, which indicates that there might be no potential relationship found between the average amount of selected colors and other factors. Therefore, the average amount of how many colors participants tend to select in a dining situation, has no relationship with the explanation structure.

Dispersion is explained by R, IQR and SD in this study. Among these 3 variables, R and SD explained how dispersal the color selection could be. IQR, which represents how the spreading of the middle 50% of the popularity of color selections, could not be connected to other variables. R and SD showed strong correlations with Attitude and Impression, in respectively positive and negative relationship. It is considered that if R and SD are high, the color selection is more polarized, if R and SD are low, the color selection is more spread out and distributed.

Explanation structure shows relationship with the dispersion of color selections, in the sense of the gap between the most popular and most unpopular color, and the variation and spread of color selection popularities. In an Impression dominant dining situation, participants tended to select more diverse and various colors, the chance of each color being selected was more averagely distributed. On the other hand, in an Attitude dominant dining situation, color selections were more polarized, colors were clearly divided into popular colors and unpopular colors.

Figure 7 presents the proposal model that summarize the Kansei process observed in the flow of explanation thinking and tableware color selection in dining situation. From the observation, analysis and results so far, it is considered that when participants saw a dining situation sketches and asked to select suitable colors for tableware, they constructed the explanation mainly with Attitude and Impression based on what they perceive. Some dining situation sketches triggered more Impression, and some triggered more Attitude. Afterwards, dining situations with more Impression led to a more distributed color selection, and those with more Attitude led to a more
polarized color selection. A distributed selection means many colors were selected similarly in amount, and a polarized selection means only a few colors were selected by the majority of participants.

Why did participants tend to choose the same colors for tableware when they show stronger Attitude towards a dining situation? As being defined in literatures [27, 28] and this study, Attitude mainly contains the emotions and affections. Thousands of literatures have proved that colors are strongly connected to emotions. When the dining situation could easily trigger emotions, it is very easy for participants to relate the color with certain emotions. The emotions towards specific colors might differ between cultures, however, the Japanese female participants in this study are more likely to share the same emotions for colors, which could lead them to choose the same colors in a “strong emotional dining situation”.

On the other hand, why did participants tend to choose different colors equally when they show stronger Impression towards a dining situation? To understand more about this, the sum of words and types of words categorized into Attitude and Impression in each dining situation were summarized as Table 6.

As shown in Table 6, when calculating the ratio of Attitude and Impression, the sum of the words were used to determine whether Attitude or Impression were used more in a dining situation. However, if we take a look from another perspective, we can also count the types of words used in each category. In an Attitude dominant situation, the sum of Attitude words is clearly more than Impression, however, the type of Attitude is not necessarily more than Impression. In general, the types of Impression words are more than Attitude words in most of dining situations. This indicates that no matter which of them is dominant, Impression always has more variation than Attitude. A dining situation could trigger some kind of emotions, but people could feel more different kind of impression towards it. This might explain the reason why in an Impression dominant dining situation, participants tended to select different colors. The Attitude people have on a dining situation is more likely to be shared, but the Impression people have on the dining situation could be more various and different. In addition, the Impression defined in this study also included associations, which also suggests that the things associated by individuals could easily be different.

5.3 Visual elements in dining situation sketches and emotions

Following the observation above, it is considered that the sketches, which are the tool of presenting dining situations, provided the information and stimuli that influenced the perception of participants. The next question is, what kind of dining situation sketches are Impression dominant, or Attitude dominant.

Towards a better understanding of the dining situations, the second step of this phase of the study intended to analyze from a perspective that digs into the details in these dining situation sketches. In this step, emotions are the target variables.

As shown in Table 5, the first dimension could be defined as “cheerfulness”. “Happy”, “joyful”, “warm” and “lively” all being together with “quiet” and “lonely” being the opposite, this dimension could be interpreted as an emotional state close to cheerfulness. It is suggested that more “female”, more “people”, more “kids” and more “tableware” in the dining situation sketch would increase the feeling of cheerfulness. More “food” and “bin” might decrease cheerfulness.

In dimension 2, Both “lonely” and “lively” are presented as the keyword to define this dimension, which means dimension 2 could be interpreted as a feeling of “mentally isolated”. “Mentally isolated” could be defined as a feeling of loneliness while the surrounding is very lively and crowded. When there are more “bins” and “tableware” in
the dining situation sketch, the feeling of “mentally isolated” increase. However, it decreases if there are more “cups” and “holdings” in the sketch.

The more tableware and more people in a dining situation, the more cheerful it feels. It is found that the major dimension of emotion in a dining situation is cheerfulness, which is influenced mainly by the number of people, female, kids and tableware. This indicates that the other details such as the facial features and dress are not the key factors. Dining activity is often considered as social activity [29,30]. The most important factors are the persons/relationships, even in a visualized dining situation. The number of people and the composition of the social group are more important in the emotional responses.

Another interesting finding is that “holdings” and “cups” could decrease the feeling of mentally isolated in dining situations. “Cups” and “holdings” represent the situation of having something to drink or holding something. Literatures have been talking about the important role of drinks in social activities [31]. Studies have also revealed the relationship between social anxiety and drinking, suggesting that people tend to drink more in socially stressed situations [32]. Accordingly, it is considered that in this study, when participants felt social stress and mentally isolated in the dining situation, having cups or something to hold, might reduce the negative feelings. In a lively social dining situation, when a person feels isolated and stressed, he/she might want to keep drinking, or at least have something to hold to reduce the uncomfortableness.

These observations provided potential important factors in the visual elements of dining situation sketches, with potential effects on emotions, specifically emotions related to tableware color selection. It is possible that by changing these micro details in a dining situation sketch, the emotion participants feel would change, which eventually lead to a different color selection pattern on tableware.

6. CONCLUSION

In this research, we explored the diversity of tableware color selection and the structure of explanation thinking behind it by providing different dining situation sketches. Afterwards, in order to observe whether micro visual element details affect the emotions of the participants, we provided a simple version of dining situation sketches to compare and determine the potential relationship. The results show that the color selections in different dining situations have different patterns, the diversity of color selection is highly correlated with the structure of explanation thinking. Impression dominant thinking led to a more distributed, and Attitude dominant thinking led to a more polarized color selection pattern. On the other hand, it is found that micro details, such as the number of people, tableware, cups, or presentation of nose on the face of characters, in the dining situation sketch might have certain potential effect on emotions, specifically emotions related to color selections. Considering emotion is an important factor in the Kansei process of color selections, the micro visual element details might eventually influence the decision making on tableware color selections, which needs to be further explored in future studies.

The Kansei process of tableware color selection contains a lot of implications and implicit information that worth digging. We believe that understanding the Kansei process of customers’ decision making on colors and digging deeply into the micro and macro factors of dining situation sketches would provide researchers, designers and retailers more knowledge on the connection between dining situations and customers, improve the way of presenting dining situations.

7. LIMITATION AND FUTURE STUDY

In step 1 of the study, we proposed the model of Kansei process of tableware color selection. We tried to explain the diversity of color selections by using range, interquartile range and standard deviation for dispersion, along with the tendency of selecting multiple colors in one dining situation. Range and standard deviation are connected and related to explanation structures, however, interquartile range and multi-selection tendency are not able to be related and connected by explanation structure. Future research should intend to focus on these two characteristics of color selections.

In step 2, we conducted an experiment to determine whether visual element details could have effects on emotions. However, as shown in the model, emotion is important, but not the only factor in explanation thinking. Visual element details are also just one of the many perspectives to analyze sketches. The experiment in step 2 is not enough to follow up the Kansei process proposal. Towards a more complete understanding of the relationship between tableware color selection and dining situations, future studies should focus on exploring dining situation sketches and the connection to color selections from different perspectives, to expand the proposed model.
REFERENCES


