

**Effects of Color Preference and  
Atmosphere of Visualized Dining  
Situations on Choice of Tableware Color**

食器の色選択における色嗜好と視覚化  
食事場面の雰囲気の影響

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by

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# Abstract

This dissertation mainly discussed the effects of color preference and atmosphere of visualized dining situations on choice of tableware color. The research was motivated to develop a new method to support the measurement of Kansei, therefore a new way of presenting product usage situations (hand-drawn sketches of dining situations) was proposed in the experiments.

In Study 1, two versions of dining situation sketches (simple, abstract version and detailed, concrete version) were compared in terms of comprehension and the evoked atmosphere. Afterwards, it was found that the visual details in the sketches had potential effects on participants' evaluations on the atmosphere of the dining situations. For example, participants tended to feel less atmosphere of "being isolated from the social group", when the characters were holding something (cups or bowls) in the dining situation. The number of characters, facial features, body parts details and clothing are also revealed as potential factors to atmosphere of dining situations.

In Study 2 and Study 3, it was found that pure color preference (initial preference of the color without any context) had little impact on choice of tableware color. Participant's choice of tableware color was unpredictable simply depending on their pure color preference. However, when presented with the visualized dining situations, it was found that the atmosphere of the situation might have a bigger impact on choice of tableware color. For example, when participants felt "lively" in the dining situation, they tended to select orange as tableware color; when participants felt "quiet" in the dining situation, they tended to select dark blue as tableware color.

Previous research applying different product has suggested that pure color preference could be used to predict the choice of product

color. However, the results of the experiments in this research did not agree with this observation. Further analysis including more types of product was conducted. As a result, it was found that different types of product showed different relationships between pure color preference and product color preference. Products could be separated into two types: personal products and ambient products. Personal products are the products like cloth, pen, etc. These products are always attached to user's body when being used, either worn or held by the user. For these products, people tend to choose the colors based on their pure color preference, to express themselves. On the other hand, Ambient products are products like furniture, tableware, etc. These products are always laid on the floor or table, put in the environment when being used by the user. Ambient products are more likely perceived as part of the surroundings, and the choice of product color might be more influenced by the atmosphere of the usage situations.

The differences between males and females were also found in the sensitivity of atmosphere, the preference of colors, choice of tableware color, and the perception on products. For example, males might tend to perceive cars as personal products, whereas females might tend to perceive them as ambient products.

The attempt of using visualized usage situations for Kansei study in this dissertation was found efficient. As a new approach in Kansei study, it is also expected to expand researcher's perspective, and provide intriguing insights for future studies. It is suggested that involving visualized usage situations of a product might help us measure and understand the Kansei of appreciating the product in a better way. Future studies exploring and developing visualized situations are highly encouraged.

# 要 旨

本論文は主に食器の色選択における色嗜好と、食事場面の雰囲気の影響を検討した。感性研究では、人の製品に対する感性は極めて主観的であり、それを客観的に測るのは難しいとされる。本研究は、この点を改善することも研究の動機としながら、食器と食事場面を視覚情報として提示するプロセスを開発し、感性に関する情報をより有効に収集する新しい研究方法を提案した。

実験1において、実験参加者は先ず単純化されて抽象的、複雑で具象的という二種類の精細度の異なる食事場面のスケッチを評価し、食事場面に対する理解と感じられた雰囲気を比較した。結果から、食事場面スケッチの中の具体的な視覚要素は、雰囲気を感じ方に影響し、評価の違いを生む可能性があることが分かった。例えば、食事場面の中の人々がグラスなどの手にもものを持つ場合、「輪に入りにくい（孤立される）」雰囲気が減少する傾向があった。食事場面の中の人数や顔の特徴など、他の視覚要素も雰囲気評価に影響を与えるという結果が得られた。

実験2と実験3の結果から、具体的な製品情報がない段階での色嗜好＝純粋な色に対する好み（pure color preference）は食器の色選択における重要な要因ではないことが明らかになった。すなわち純色嗜好だけを考慮して食器の色選択を予測することは難しいということで、これは必ずしも既往研究を支持しない結果であった。逆に、視覚化された食事場面を提示する場合にはその食事場面の雰囲気が、純色嗜好より食器の色選択に大きい影響を与えることが示された。例えば、食事場面から賑やかな雰囲気を感じた場合は、オレンジ色を食器の色として選ぶ傾向があり、静かな雰囲気を感じた場合は、深い青色を選ぶ傾向が見られたといった結果である。

食器以外の製品に着目した既往研究では、純色嗜好は製品の色選択にとって重要な要因であることが示されていた。しかし、食器を対象にした本研究では異なる結果が確かめられた。様々な製品を含めた分析を行った他の研究との比較から、純色嗜好と製品の色選択の関連性は人間が抱く様々な製品に対する認識によって異なるという可能性が見出された。そこで本研究の考察では、製品をパーソナルプロダクト (personal product) とアンビエントプロダクト (ambient product) という二種類の製品に分類することを提案した。衣服やペンなどのパーソナルプロダクトは、身につけられたり手に持たれたり常に体に近い状態でユーザーに使われる。ユーザーはこのような製品に対して自己表現をする傾向があり、製品の色選択を行う際にも色そのものに対する好みに基づいて選ぶ傾向があったと考えられる。それに対して、食器や家具などのアンビエントプロダクトは、地面やテーブルなど、環境の中に置かれて使われる場合が多い。そのため、ユーザーは製品の色を選ぶ時、製品を周辺環境の一部として認識する傾向があり、色そのものに対する好みよりも、使用場面の雰囲気によって色を決めることが多い可能性があると考えた。

本研究は性差についても検討した。女性の雰囲気に対する感受性は男性より高いことが見受けられた。男女の色嗜好と色選択の大きな違いも明らかになった。また、製品に対する考え方の違いも示された。例えば、自動車に対して男性はパーソナルプロダクトだと認識する傾向に対し、女性はアンビエントプロダクトだと認識する傾向があった。

本論文では、感性科学の考え方を基盤に、視覚化された製品の使用場面を用いた感性評価実験手法を試み、感性計測に対して有効であることを示した。このような研究方法は、感性研究の新しいアプローチとして、研究者の視点を広げ興味深い知見を導くことが期待される。製品に対する感性情報を収集し理解するために、視覚化された使用場면을応用することは高い潜在力があると考えられる。今後の研究は、視覚化された使用場面を用いた研究方法をテーマとしての発展し推進して行くべきであると結論づけた。

# 摘要

本论文主要讨论了人们的色彩喜好，以及在饮食场景中感受到的气氛，对餐具颜色选择的影响。在感性研究中，由于人们对于产品的感性认知通常受到明显的主观因素影响，所以对于研究者来说，使用客观的测量方法收集有效的数据比较困难。因此，本研究旨在提出一个利用视觉化的产品使用场景来收集感性认知相关数据的方法，从而降低感性评价中主观因素给研究带来的影响。

在实验1中，实验对象比较了两种手绘饮食场景图（简易抽象版与多细节具象版），对饮食场景的理解以及对气氛的感知进行了评价。分析结果表明了手绘饮食场景图中的各种细节对于特定氛围评价的潜在影响。例如，如果饮食场景中的人物手里持有物品（酒杯或其他餐具），那么实验对象感受到的“被社交圈孤立”的氛围会有减少的倾向。场景中的人数，面部特征等其他视觉要素也显示出了一些潜在的影响。

实验2与实验3的结果证明，色彩的纯粹喜好（在未知具体产品的情况下，单纯的对于颜色的偏好）对人们的餐具色彩选择没有明显的影响。单纯凭借实验对象对于颜色的偏好，无法预测他们对于餐具色彩的选择。然而，在视觉化的饮食场景中能够感受到的氛围，似乎对实验对象的餐具色彩选择造成了相对更大的影响。例如，当实验对象在饮食场景中感受到了活跃热闹的气氛时，他们有选择橙色作为餐具颜色的倾向；当他们感受到安静的气氛时，更倾向于选择深蓝色作为餐具的颜色。

以其他产品为研究主题的现有研究曾指出，色彩的纯粹喜好可以用来有效预测人们对于产品的色彩选择。但是，本研究的结果指出，对于餐具色彩选择而言，色彩的纯粹喜好并不能作为一个有效的预测因子。通过进一步针对更多产品种类的数据分析，这一问题可以从人们对不同类型产品的感性认知这个角度来解释。分析结果指出，人们对于产品的认知可以大致分为两类：私人产品（personal product）和环境产品（ambient product）。用户在使用服装和笔等私人产品时，通常将其穿

在身上，或者握在手中。此类产品具有用户自我表达的作用，因此人们在选择此类产品的颜色时，更依赖平时的色彩喜好。另一方面，用户在使用餐具和家具等环境产品时，通常将其放置在地上或者桌子上。用户在看待此类产品的时候更倾向于把它们当作环境的一部分，因此在选择此类产品的颜色时，人们平时的色彩喜好并不会产生关键作用。反而，整个使用场景的氛围可能会产生更大的作用。

本研究还多方面讨论了性别的差异。相比男性，女性对于视觉化饮食场景的氛围更加敏感，能够感受到更多更强烈的气氛。男女对于色彩的喜好和餐具色彩的选择也有明显的差异。同时，男女对于同样的产品，有时也会有不同的认知与看法。例如，分析结果证明，男性更倾向于将汽车视为私人产品，而女性则更倾向于将汽车视为环境产品。

作为感性研究，本研究尝试了利用视觉化的产品使用场景来辅助收集人们对于产品感性认知的相关信息。结果证明，作为一种新的感性研究方法，视觉化产品使用场景可以有效辅助感性信息的收集，拓宽研究者的视野，并得到耐人寻味的结果。在有关产品感性认知的研究中，视觉化产品使用场景的应用具有很大的潜力。应用视觉化产品使用场景的研究方法，应被作为将来的感性研究主题，被广泛拓展以及开发应用。

# **Abstract (long version)**

## **Background**

Kansei research in general, including Kansei Information Science, Kansei Engineering and Kansei Design, have been always focusing on human's Kansei process, cognitions, perceptions and behaviors against artifact. In most of the cases, the aims of Kansei research are linked to product development and marketing.

Kansei is subjective. The challenge in Kansei research is that human's Kansei is too subjective and difficult to measure. Many Kansei studies ended with a result of individual differences, without a clear answer to the question which was asked at the beginning of the study. How researchers measure Kansei is important, however, what we add to support participants in the experiment might help us measure Kansei in a better way as well.

Literatures have explained Kansei with different, various, and diverse definitions. The word "situation" could be found in some of the definitions. The particular situation of users and the product might be essentially important to understand the Kansei process. In psychology, situation research is being developed, more and more noticed and emphasized. It is said that the person and the situations are interwoven. It is also said that we could not explain a person's personality and behavior without considering what kind of situations he/she is in, or has been through. Principles of situation research are being established in recent years. As Kansei research takes implications, concepts and methodology from psychology research very frequently, Kansei researchers could not ignore the notion of situation, either. On the other

hand, product and the usage situations have been found with deep relationships in the literatures, how we interact with a product depending on the usage situations in many cases.

Based on the observation above, this study attempts to propose a new way of conducting Kansei research: using visualized usage situations of the product, to support measuring people's Kansei process.

Moreover, it is stated that situations and atmospheres are deeply interconnected. Some also called situation and atmosphere as two sides of a coin. In Kansei research, emotional responses, moods, and feelings are always the primary aspects to evaluate. This makes atmosphere stand out as the factor that we want to explore in situation for Kansei research. Studying atmosphere is considered a valid approach to study situations and the influences on Kansei along with behavior.

When considering usage situations of products, dining situation is one of the most common daily life experience. A dining situation involves the 5 cues of a situation, social interaction, and target product (tableware, food, furniture, etc.). Dining situations are also shared by different cultures and ethnics. In dining experience, eating is the primary activity, but there are more than just eating. People socialize, educate, meditate, entertain in dining situations. Studying dining situations could be essentially practical and applicable as an example of Kansei research or consumer research using situations.

In dining experience, tableware is the most common product. We hold and touch tableware, use tableware, put it on the table to decorate, see tableware and eat the food on the tableware. Tableware also has cultural meanings and social meanings, it reflects the occasion, cuisine, religion, culture, and personal identity. Studies on tableware are usually focused on the shape of the tableware or colors on it. The shape of tableware is most often discussed in the case of wine glasses. For plate ware and other tableware, size and color are mostly discussed.

Color plays an important role in culture, society and our daily life. Color preference is always a factor that continues changing through

different time, place, culture and personality. Color also plays an important role in our dining experience. The color of the food, tableware, or even table sheet, will always be in our sight while people have the meal. Research on the color of food is the majority in the field of color-dining research. Several research could be found on tableware colors. However, research on tableware colors have been focused on appetite, and usually only consider limited number of colors. This study would take a look at the sentimental and behavioral responses to various tableware colors.

There are many existing research that studied color and decision making of products. Mostly, color preference and the decision making of product are the topics. Based on observations from literatures, it is found that color preference exists on different levels. The first level is the initial, pure, overall preference of a color without any context. This has been described as color automatic preference (with color implicit/explicit preference), overall color preference, universal color preference, or context-free color preference. In this study, it is defined as “pure color preference”. On another level, our preference of a color might be different when there is a context (e.g., a product). Furthermore, it is considered that a third level might exist, called “situational product color preference”, representing the preference of a color on a product in a particular usage situation.

Literatures have discussed the relationship between color preference and behavioral choice of product colors. When it comes to the behavior on choosing colors for product, it is always about the Kansei of appreciating a product. At a very shallow level of cognition, people tend to explain themselves by describing “I chose this color just because I like it”, which means that the pure color preference might be one of the most important reasons why people select certain colors for a product. However, various studies have different observations on this. Some have stated that the pure color preference is the best way to predict the behavior of choosing colors for product, on the other hand, others have emphasized that people’s preference of a color on a product is different from the pure color preference. There is not enough evidence

to clarify the relationship. This is one of the major discussions that needs to be made in this study.

Thus, in summary, the major objectives of this study are:

1. To test the relationship between color preference and choice of product colors, in the case of tableware.
2. To understand the patterns of people's choice of tableware in different dining situations, and explore the reasons why people select specific colors for tableware, when given various options to choose.
3. To determine whether the choice of tableware color could be predicted by the atmosphere of dining situations.
4. To obtain more knowledge about how visualized dining situations are perceived, understood and responded, then attempt to involve visualized dining situations in understanding tableware's color evaluation and preference.
5. To verify whether applying visualized dining situations helped us measure Kansei.

## **Framework**

The framework of this research is composed by three studies: Study 1, Study 2 and Study 3.

First of all, the visual presentation of dining situations needs to be designed. As introduced in literature review, the simplicity of visualized situations is not discussed enough about the effects and impacts. The first part of the study designed two set of dining situations: a simple, abstract version and a detailed, concrete version. Study 1 mainly contains a preliminary experiment, intended to investigate the comprehension and atmosphere of the situation, and compare the result

between simple dining situation sketches and the counterparts (detailed sketches), as well as the result between males and females.

In Study 2, colors were collected from real tableware. An experiment was conducted, with the colors being presented in geometric round circle to participants for them to rate their pure color preference on each color and select their favorite colors for tableware. Study 2 is aimed at understanding male's and female's pure preference of color, and the choice of color when they know it is used for tableware.

Study 3 contains the main experiment of the research, which adapted visualized dining situations from Study 1 and colors for tableware selection from Study 2. Pure color preference, impressions on colors, and atmosphere of the dining situation were assessed using Likert scales, in order to predict choice of tableware color. Furthermore, the reasons of selecting colors were collected using open-ended questions.

From the result of Study 1, it was expected to find out whether simple(abstract) or detailed(concrete) dining situations is better in creating atmosphere, and whether male and female perceive atmosphere differently. Afterwards, the results from Study 2 and Study 3 were compared, to determine the role of pure color preference in choice of tableware color; to see how participant select tableware color differently, with or without visualized dining situations; to explore the reason why participant select specific colors for tableware when shown visualized dining situations.

## **Results and Conclusion**

The results showed that the simplicity of visualized dining situation could affect how people comprehend and perceive the atmosphere. Moreover, females were found to be more sensitive on perceiving the atmosphere of visualized dining situations.

Furthermore, the effects of visual details on the perceived atmosphere in dining situation sketches were also discussed. Although this part was not the main objective of the study, analysis still revealed potential effects of visual details on the evoked atmosphere. For example, participants tended to feel less atmosphere of “being isolated from the social group”, when the characters were holding something (cups or bowls) in the dining situation. The composition of people (how many people, females and kids), tableware, holdings (cups, etc.) and food affected the atmosphere. People’s facial features, body parts details and clothing are also potential factors to atmosphere. This partially explained the reason why detailed version of dining situations evoked more and stronger atmosphere, and proved that specific details have their specific effects on atmosphere in visualized dining situations.

As a result, it was also found that choice of tableware colors could not be predicted by the pure color preference, but the atmosphere of the dining situation showed more effects on the choice. However, literatures have stated that behavioral choice of product should be best predicted by color preference, suggesting that the result of this study is different from previous study in literature.

By comparing the different experimental settings and conditions, adding extra analysis and observation from other literatures, we concluded that the product category is one of the major reasons why pure color preference sometimes has impact and sometimes not. It is suggested that products could be classified into 2 categories: personal products and ambient products.

Personal products are the products that are always attached to users when being used. Users carry them, wear them, hold them in hands, etc. This type of products are perceived as a personal representative artifact that express the preference and taste of the user. When choosing colors for personal products, the preference of the color (pure color preference) plays an important role in the decision making process.

On the other hand, ambient products are the products that are always attached to the environment when being used. Users usually put the product on the floor, on the wall, on the table, etc. This type of products are perceived more like aspects that construct the surroundings. When choosing colors for ambient products, the pure color preference is not as important, and the atmosphere of usage situations of the product might play a more important role in the decision making process.

In addition, gender differences were found in color preference and choice of tableware color. Males were found specifically preferring dark blue for tableware; on the other hand, females accepted wider range of colors in different hues but only the light (pale) colors for tableware. These results could be explained by observations and implications from the literatures. No disagreement is stated in this study about gender effects.

However, after adding dining situations in Study 3, it was found that females' choice of tableware color could be influenced by different dining situations. In some dining situations, female chose the less preferred dark colors over the light version of the colors. For example, in general, females prefer light pink to dark pink; light blue to dark blue for tableware colors. However, in the situation of "picnic with family at park" and "hot party with friends", dark pink was chosen more than light pink; and in the situation of "drinking alone at home" and "dinner dating with partners", dark blue was chosen more than light blue. Based on the results, it was found that the atmosphere of "happy" and "quiet" had significant effects on the choice of dark pink and dark blue respectively.

This suggests that with the presentation of dining situations with certain atmosphere, the trend in female's preference of tableware color could be changed. Marketers could use this observation to adjust the strategy in order to expand the potential of less popular colors.

In overall, the whole research was motivated by the goal of overcoming the subjectivity of participants' way of describing Kansei in Kansei research, in order to find a better way to measure Kansei. Based

on the model of Kansei process by Yamanaka (2012), this study proposes to add the usage situation of the product into the experimental procedure, to reduce the individual differences of the way participants describe their perceptions and behavior. As a result, we might understand better about why people make a decision on a product, and how Kansei process is working behind that.

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# Chapter 1: Introduction

## 1.1 Kansei Research

As human beings in the modern society, we have grown the desires on artifacts for not only the practical functions, but also the psychological feelings, such as affections, emotions, moods, aesthetics, etc. Designers, marketers, and researchers have noticed that fulfilling user's conscious or unconscious needs of senses and feelings are now the primary objectives of any kind of design activities, such as designing an artifact, planning an event, or creating an experience.

The concept of Kansei and Kansei related research are the exact fields aiming at fulfilling user's internal, psychological needs of the artifact. Levy (2013) has summarized three main fields related with the concept of Kansei: Kansei Engineering, Kansei Science and Kansei Design [1]. Researchers in the regarding fields have gathered concepts from literatures and summarized such feelings and other things by using the word "Kansei", to cover and represent sensitivity, sensibility, customers' feeling and needs relating to a product, etc. (S. Ishihara, K. Ishihara, & Nagamachi, 1999 [2]; Kiyoki & Chen, 2009 [3]; Nagamachi, 1995 [4]).

The studies of Kansei have been developed into a large body in the industrial and academic world, including Kansei Engineering, Kansei Science, Kansei Design. Other fields such as marketing, management, and information science also showed some latest studies regarding the concept of Kansei. Being the biggest and most developed research field among Kansei studies, Kansei Engineering is a consumer-oriented technology for product development based on ergonomics and

computer science [4]. It is part of a family of engineering methods aiming at translating user's feelings into concrete product parameters [1].

Compared to Kansei Engineering, which focuses on product development from the engineering perspective, Kansei Science is a field that is built on brain science, cognitive neuroscience and psychophysiology, relies on related philosophies, and started by Harada who tried to describe users' cognitive processes related to preference and choices of products from a holistic perspective [1][5]. Kansei Science has aimed to characterize and to evaluate emotional experiences and creativity, to contribute to a better understanding of the mind based on the knowledge derived from physiological and psychological approaches [1]. According to Beuttel and Yamanaka (2010), Kansei research is also considered as a research field that studies the aspects such as creativity, feelings, intuitive cognition, the "asobi" gap in communication, and delay which is also relevant to understanding subconscious brain function [6]. Kansei Science, or Kansei Information Science, is a field that provide knowledge to designers and marketers for a better understanding on users' mind process against the design outcomes.

Kansei Design is another approach for the field of Kansei research. According to Levy (2013), Kansei Design intends to return to earlier philosophical or cultural works related to Kansei, and use them as inspirational means for design [1]. It is inspired by Japanese philosophy and culture, founded on a non-reductionist point of view, which can be used both to focus on and to comprehend the phenomena of perception and experience, and considers not only the experience of the users, but also the meaning trough the intentionality of the designer [1].

## 1.2 A Small Discussion on the Subjectivity of Kansei

The concept of Kansei is so broad and general that researchers always have to make their own definition of Kansei based on specific project. There is no need to decide or make the judgment of the various definitions of Kansei, or make any new definition of Kansei. Kansei covers a lot of meanings, concepts and notions, which suggests that it makes sense to define Kansei in different ways for different research targets.

In modern literatures, Harada (1998) has described Kansei as an internal process (a high function) of the brain, involved in the construction of intuitive reaction to external stimuli [7]. Nagamachi (2001) described Kansei as “individual’s subjective impression from a certain artifact, environment, or situation using all the senses of sight, hearing, feeling, smell, taste, as well as recognition” [8].

At this point, the “intuition” and “subjectivity” of Kansei were emphasized. It is always challenging for scientific research to deal with subjectivity, the fields of Kansei research intend to solve the puzzle by using multivariate methods, taking many factors into consideration. However, the subjectivity of Kansei has caused many confusions, or made the result of a study using Kansei approach very unclear. The subjectivity of Kansei needs to be overcome, in order to make Kansei understood better. Except from the differences between individuals’ past life experience, there are still other factors that cause the subjectivity of Kansei.

Schütte (2005) has mentioned the concept of the hierarchy of Kansei, indicating that Kansei has a “situational complexity”. It was suggested that Kansei has different degrees, with lower degree of Kansei create higher degree of Kansei which in turn build up a general Kansei [9]. He considers that when looking at the same thing, some people stoped at lower degree of Kansei, which is more intuitive and arises instantly [9]. On the other hand, some people’s Kansei goes to the higher level, which is built by lower Kansei and summarized into one

general Kansei [9]. This results into the gaps between people's Kansei on the same stimulus, some people show more simple impressions, but the others show deeper thoughts and feelings on it.

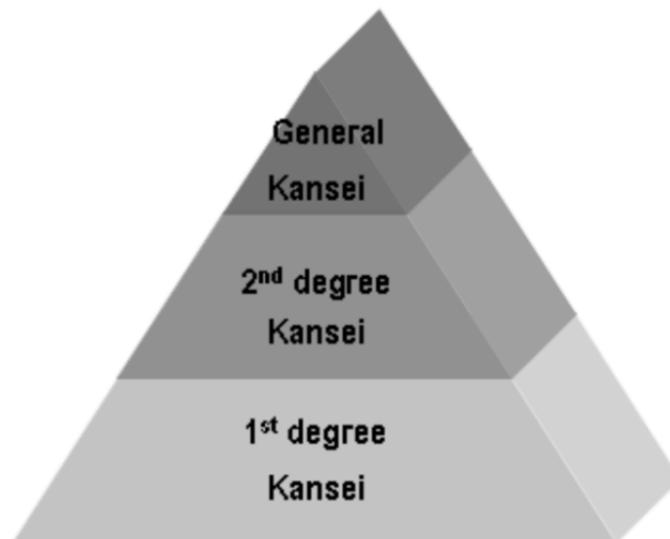


Figure 1: The hierarchy of the Kansei. (Schütte, 2005 [9]).

Yamanaka (2012) has proposed the mechanism of Kansei process being an intuitive cognition [10]. In his explanation, Kansei contains mind, sensibility, intuition and intuitive cognition, which sets the direction of understanding of the external stimuli. Afterwards, human beings build up the logical understanding in mind, and try to describe the perception. Finally, it leads us to the decision making [10]. Figure 2 shows the Kansei process. In this process of Kansei, subjectivity could happen because of the past life experience of individuals, which make differences from the beginning. Subjectivity could also happen at “A” (see Figure 2), which indicates that Kansei might set a different direction of understanding among different individuals. On the other hand, subjectivity could also happen at “B” (see Figure 2), which indicates that individuals might also use different ways to describe the perception, or fail to describe. Any of these 3 reasons could lead to different decisions.

However, the problem of the subjectivity of Kansei is, even when people make the same decision at the end, the Kansei process are still different in many cases. Since Kansei is very difficult to measure

directly at “A”, we usually measure “B” to see how people describe their perception. The individual differences at “B” would make it difficult to measure Kansei.

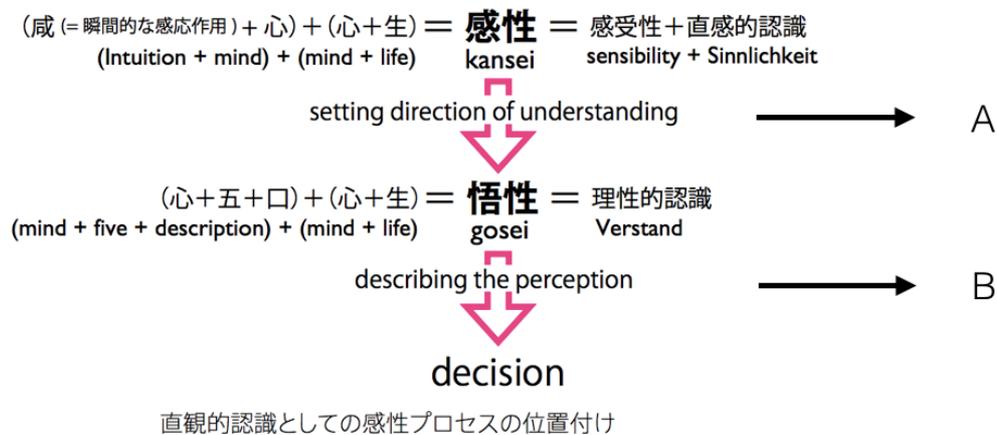


Figure 2: Kansei process, from intuitive cognition to decision making.  
(Yamanaka, 2012 [10]).

Yamanaka’s Kansei process flow chart enlightened us that when we define Kansei as a process of receiving intuitive cognition, towards decision making, there are different points that different direction could be set and led to completely different decision making outcomes. This gave us a holistic interpretation of why Kansei is so subjective, differs among individuals. On the other hand, Schütte suggested that Kansei has lower and higher degrees, and our subjectivity of Kansei happens when we end up making decision or describing ourselves at different degrees of Kansei.

Why are there gaps between individuals in the process of Kansei, setting different direction of understanding? Why do people end up with different degrees of Kansei? We believe that there are many factors, and it is necessary to take these factors into consideration in Kansei research.

If we track back to the definition of Kansei by Nagamachi (2001), who described Kansei as an “individual’s subjective impression from a certain artifact, environment, or situation using all the senses of sight, hearing, feeling, smell, taste, as well as recognition” [8], we could find

the word “situation” appears in the definition. Usually, Kansei studies target on artifact or environment, considering the large industrial and academic world of product design, architecture design, art, environmental design, etc. However, “situation” is not an established field of any kind of design. Shouldn’t “situation” also be considered as important as the artifact or environment?

“Situation” is a developing research field in recent years of literatures of psychology. Rauthmann, Sherman and Funder (2015) proposed the basic principles of situation research, giving an outline of situation research and the importance of considering situations in the research of personality and psychology [11]. Basically, in the field of psychology, researchers have been incorporating situational influences in most of the psychological theories, and acknowledging that persons and situations at any given moment are inextricable interwoven [11]. Although the development of guiding principles of situation research has just been started, the notions of situation are always important and emphasized in psychological research.

The development of situation research in fundamental psychology indicates that it is also important to take situations into consideration in design psychology, affective engineering, emotion research and Kansei studies, as all these research fields numerously use psychological methods as the basis or methodological foundation. On the other hand, it has been proved that there is a gap between designer’s planned actions and the real user’s situated actions, which caused certain problems in human-machine communications [12]. The designers tend to identify representations of action, like plans, with situated action [12]. It is suggested that it is necessary for designers to content with the action-world relation, to substitute a description of the situation of action, for access to the actual situation to fill the gap and solve the problem [12]. Both the growth of attention on situation in psychological research and the human-machine communication problem have notified us that we need to take user’s different situations into consideration in design/consumer/emotion research and Kansei study. Using the same product evokes different emotions in different situations [13].

In the research by Ozaki and Iwamoto (2006), the subjectivity of Kansei was also indicated similarly to other Kansei research, by stating that Kansei is unique to each person and often related to experience [14]. However, in their definition, Kansei was described as an “Ability of the human mind to determine how one feels in a particular situation” [14]. “Particular situation” was emphasized at the end of the definition, suggesting that the Kansei of human mind might differ in various situations, and it is important to consider the particular situation when discussing Kansei.

In summary, in the literatures, researchers have stated the subjectivity of Kansei, and pointed out that the process of Kansei has different degrees, creates gaps between individuals, sets different direction of understanding and decision making. The subjectivity might occur because of past life experience, however, except that, situation might be one of the other factors that we have been ignored in many Kansei research. The definition of Kansei by Nagamachi (2001) and Ozaki & Iwamoto (2006) both mentioned the importance of considering “situation”, with Nagamachi suggesting that situation can also trigger Kansei, and Ozaki & Iwamoto suggesting that Kansei should be discussed regarding the particular situation of the stimuli and person [8] [14]. Moreover, considering the development of situation research and the importance of situational influence in psychology research, and what the situational gaps between human-machine communication have enlightened us, it is proposed that the particular situation might be one of the main reasons why Kansei is so subjective.



Figure 3: The Kansei of appreciating an artifact: the specific usage situations of the product might play important roles in user's Kansei process

### 1.3 Motivation of this Study

The Kansei process of human perceiving, understanding, and interacting with artifacts, then expressing themselves, and making decisions, has always been the theme of Kansei research and could be extended to marketing, consumer studies and branding. Realizing the subjectivity, the role of “situation” in the definition of Kansei, and seeing the trend of attention on situation research in psychology, it is quite interesting and motivative to put these notions together. Kansei research should take situations into consideration, in order to fully understand the interaction between human and artifact.

Therefore, in this study, the attempt of using visualized situations to present participants about the particular situation of using a product was made, to conduct an experimental study on a topic involving dining situations and colors on tableware.

As an attempt of situation study in Kansei research, dining situation was targeted. Dining situation might be one of the most common situations that we experience almost every single day, by ourselves or with other people. In a dining situation, there is tableware,

which is a typical type of product that could be the target of the research of Kansei, design, consumer's decision making and branding.

By collecting all these information and ideas together, this study was mostly motivated by the idea of involving visualized dining situations, to evaluate consumer's impression and decision making on tableware's colors. On the other hand, after targeting on dining situations, the unclear relationship between color preference and choice of product color was also highlighted as the most important question that needs to be answered. This was also another motivation through out the study.

# Chapter 2: Literature Review

## 2.1 Situation

### 2.1.1 Definition of Situation

#### *Situation in Dictionaries and General Daily Life*

Situation is a word being widely and commonly used in our daily conversations and literatures. Our life is filled with all kinds of different or similar situations, which leads us repeat the same experience through time or encounter new experience.

There are multiple definitions of situation in modern English dictionaries: 1. “the manner of being situated, location or position with reference to environment”; 2. “a place or locality”; 3. “condition, case, plight”; 4. “the state of affairs, combination of circumstances”; 5. “a position or post of employment, job”; 6. “a state of affairs of special or critical significance in the course of a play, novel, etc.”; 7. “in Sociology, the aggregate of biological, psychological, and sociocultural factors acting on an individual or group to condition behavioral patterns” [15].

#### *Situation in Psychology*

Situation is being considered as an important factor in psychological research, and the principle of situation research is still being established in recent years. According to Rauthmann, Sherman and Funder (2015), the person and the situation at any given moment are inextricably interwoven, and almost all psychological theories have

acknowledged this truism [11]. In simple words, situation has always been taken seriously in psychological theories to explain human psychology, personality and behavior. However, the lack of guiding principles has been one of the problems that researchers have shown difficulties to describe and explain situations in their results or theories.

### 2.1.2 The Basic Information of Situations

To know how to apply situations in Kansei research, we need to know what are the basic information in a situation. Rauthmann, Sherman and Funder (2015) proposed the principles of situation research, summarized the basic compositions and characteristics of situations [11]. By gathering experts in the related fields, they were able to summarize three kinds of basic situational information: cues (composition information), characteristics (psychological meaning information) and classes (category information) [11].

#### *Cues*

Cues are the basic composition of situations, represent physical present, scalable and (relatively) objectively quantifiable stimuli (Block & Block, 1981, [16]). Literatures suggest that the cues of situations can be categorized into 5: (i) persons, relationships and social interactions; (ii) objects; (iii) events and activities; (iv) locations; (v) time (e.g. Mehl & Robbins, 2012 [17]; Pervin, 1978 [18]; Saucier et al., 2007 [19]). Based on this categorization, the basic composition of situations can be measured by asking 5 easily answerable “W-questions”: Who is with you? Which objects are around you? What is happening? Where are you? When is this happening [11]?

#### *Characteristics*

Characteristics are the psychological meanings that perceived from cues, and represent the psychological power of situation (Edwards & Templeton, 2005, [20]; Rauthmann et al., 2014, [21]). To explore the

characteristics of situations, Rauthmann and colleagues (2014) identified the ‘Situational Eight’ DIAMONDS to describe different profiles of characteristics: Duty (does something need to be done?), Intellect (is deep information processing required?), Adversity (is someone being overtly threatened?), Mating (is the situation sexually and/or romantically charged?), pOsitivity (is the situation pleasant?), Negativity (do negative things taint the situation?), Deception (is someone deceptive?) and Sociality (is social interaction and relationship formation possible, desired, or necessary?) [21].

### *Classes*

Classes are the categorization of situations [11]. They are used to describe the different types of situations, and the classification can be conducted following the similar cues or characteristics of situations [11]. For example, working situation, dining situation, etc., are the classes based on cues.

In summary, cues are the basic objective composition of situations. When making situational stimuli, we should make sure that participants understand the 5 cues of a situation, and complete the situation by precisely presenting the cues of situations. Characteristics are the psychological meanings, which would be the subjective, personal affective responses, emotions and moods, affections and so on (in other words, this is the part that we refer as Kansei or Kansei process). They are usually measured in the experiment as the dependent variables. Classes are the overall categorizations of situations, and they should be classified at the beginning of the study. For instance, working situations and dining situations are two big classes, the compositions and psychological factors in these two types of situations are completely different. Therefore, when studying situations in Kansei research, we should classify the classes of the situations based on the target of the research.

### 2.1.3 Situations in Marketing

In our daily life, we can always find advertisement or commercials using the usage situations to describe a product or service. Advertisement and commercials applying the actual using situations of the product or service are commonly seen everywhere. The involvement of situations in the advertising strategies and branding strategies is so common that we barely pay attention on it. Actually, the usage situation of a product or service is the origin of developing, producing and marketing the product or service.

In 1978, Fennel (1978) had already stated that usage situations are the activities and conditions for which products are actually created and marketed [22]. Any product we try to design, develop and promote, it all came from the first spark of the idea about a situation of doing something. By always thinking about the usage situations, designers and marketers could keep on track of what they are creating and promoting, and remember the original needs of human beings.

Following the indication by Fennel, Forbes (2008) recommended that wine industry members need to predominantly focus on the creation and marketing of wines which can be consumed in four major usage situations: meal with a partner or spouse, meal with family, drink with friends and meal with friends, indicating that these four situations are the primary usage situations for which consumers purchase wine, and therefore wine industry should focus on the production of wines which are suitable and appealing for these occasions [23]. The study showed that how important situations are in the process of developing product and marketing.

The power of usage situations in marketing is not just limited to enhancing on the major usage of the product. Wansink and Ray (1996) indicated that situation comparison advertising increased consumption of brands in the featured situations [24]. In their study, they attempted to encourage consumers to use a mature brand in a new situation by designing expansion advertisement. Situation-Comparison ads, which use both existing usage situations and new usage situations, were

presented to participants, and reportedly affected the usage attitude of the product [24]. The study showed that using situations in advertising strategy could affect consumer's attitude and behavior. Presenting new usage situations can have an influence in the consumers as well.

#### 2.1.4 Product and Usage Situations

Literatures have shown that the usage situation of a product influence how consumer interact with the product.

Hall and Lockshin (1999) reported that consumers could recall the most important attributes of wine product to them and link these to specific usage situations [25]. On the other hand, Hall, O'Mahony et al., (2001) reported that wine consumers used the important attributes they utilized differently depending upon specific situation [26]. Halstead (2002) suggested that consumers changed the set of criteria they used when selecting a wine, depending on the situation in which they planned to consume the product [27]. The researcher in this study mentioned that the consumers changed their product preferences depending on the situation in which they are going to consume the product [27].

In studies focused on food or beverage products, similar results were found that the usage situation had a significant influence on the product that is selected and purchased by the consumer (Ahlgren et al., 2005, [28]; Belk, 1974 [29]; Koster, 2003, [30]; Sandell, 1968, [31]).

Bearded & Woodside (1978) stated that the conspicuousness of the usage situation affected consumer choice behavior [32]. As an example of this, the result of a study on wines by Forbes (2008) suggested that consumer typically feel greater risk when they are purchasing a product for a public usage situation; they are concerned by concepts such as social acceptability and enhancement of their self-image or esteem [23].

According to the literatures above, we can see that product and the usage situation have a very strong connection that is difficult to

ignore. The usage situations have a strong effect on consumer's interaction with the product. Moreover, some research indicated that most products can be used in a wide variety of situations (Ratneshwar & Shocker, 1991, [33]; Srivastava, Leone, & Shocker 1981 [34]). However, it has been indicated that consumers tend to quickly become "functionally fixated" and use products in familiar or routine ways (Warlop & Ratneshwar, 1993, [35]). Wansink and Ray (1996) explained this by stating that consumers generally do not attempt to associate particular products with non routine usage situations unless such an association is presented to them [24]. Therefore, the usage situations are very powerful but not necessarily controlled by the consumers themselves, designers and marketers can manipulate the presentation of situations to consumers, in order to have a big impact on how they perceive and behave on the product. It is very important to understand how to use situations in advertising strategies.

## **2.2 Presenting Situations**

### **2.2.1 Three Ways of Presenting Situations**

After understanding the power of usage situations in consumer's understanding and behaviors, and how important the role of usage situations is in marketing, we need to figure out the best way to present situations. Typically, there are three ways of presenting situations in literatures: text, pictures/videos and sketches/illustrations.

#### *Text*

Text can be used to describe a situation. It can be a whole paragraph, one or few sentences, or just the combination of a few words. For example, Evans (2005) and Frazier (2008) used a few sentences to describe situations [36][37]:

*At the coffee shop, Joan was reading near the back.  
The table was a bit tippy.*

*Sam brought his bicycle to the campus bicycle  
shop. The front wheel was misaligned.*

### *Pictures/Videos*

Another typical way to present situations is using pictures or videos of real-life people. For example, Yatskar, Zettlemoyer and Farhadi (2016) used images with real life people and environment to describe and present situations [38]. Figure 4 shows examples of some of the images in their stimuli.



Figure 4: Examples of the images that depict situations (Yatskar, Zettlemoyer and Farhadi, 2016, [38]).

Wansink and Ray (1996) used videos to present usage situations of soup product for breakfast [24]. The videos included audio as well, with actors in the video speaking lyrics.

### *Sketches/Illustrations*

The third way of presenting and describing situations is using sketches or illustrations, which is not as common as the previous two methods. One example is the situational stimuli in the Kids Empathic Development Scale (KEDS), developed by Reid, Davis, Horlin, Anderson, Baughman, and Campbell in 2012 [39]. Figure 5 shows one example of the sketches to present a situation regarding kids' social interactions.



Figure 5: An example of the sketches that describes a situation with kids: Kids Empathy Development Scale complex multi-perspective item: 'Ring-a-rosie' (Reid, Davis, Horlin, Anderson, Baughman, & Campbell, 2012, [39]).

Another example of using sketches or illustrations to describe situations is the concept cartoons, which were developed by Naylor and Keogh [40][41]. The concept cartoons are broadly used for various purposes such as class room feedback and educational assessment in western cultures for more than 20 years [42]. The concept cartoons in fact combined both illustrations and text. In the illustration, cartoonish characters have a quote bubble to speak their scientific ideas of

something, to make it look like a situation of a conversation involving a common topic. It is often used for scientific educations.

### 2.2.2 Advantages of Visualized Situations using Sketches or Illustrations

The fastest way to create stimuli for presenting situations in experiment is using text or audio stimuli to describe a certain situation. However, reading or listening to the stimuli would consume a relatively longer time than looking at visual stimuli. It is difficult to detect participant's instinct responses of emotions, feelings, or reactions against text, because participants need time to read, listen and process the information. The language capacity of the participants is also another problem, since verbal stimuli often requires people share the same level of abilities in a specific language. Therefore, except for some cases, generally visual stimuli are better than semantic stimuli such as text for Kansei research, which often involves intuitive responses and reactions.

Visual stimuli such as pictures or images, are usually more universal than verbal tools that rely on a level of capability of understanding a certain language. Therefore, visualizing a situation is a suggested way to be used in an experimental design process for research. Pictures or images might be very fast in the sense of delivering information to participants. However, in Kansei research, which often needs to take care of multivariate analysis, reducing the number of variables is always an important procedure in the experiment. Pictures (videos) or images contain a large amount of extra information which is hard to control. The actors in the video or characters in the picture have specific appearance, different clothing, or personalized gestures and facial expressions. These information have ethnical and cultural meanings, which might influence the results of the experiment. The colors in the picture, or other visual elements with details, could all have effects on the responses of participants. In overall, pictures or videos

with real persons are too complex, contains too much information and extra factors that are difficult to control.

To solve this problem, cartoonish sketches or illustrations that describe certain situations were employed to visualize and present different situations in previous studies [40][39]. As introduced above, concept cartoons were created approximately 26 years ago and kept evolving through years [40]. They are collections of various images using cartoonish characters, in certain situations. Concept cartoons have been used world-widely by educators to attempt to develop innovative teaching and learning strategy in science education and other fields, and the feedback is positive and encouraging [41]. Another cartoonish tool introduced above is employed in the Kids' Empathic Development Scale (KEDS), which is a collection of 12 'faceless' pictographic stimuli [39]. The pictographic stimuli describe certain situations related to kids' social interactions.

Visualized situations using sketches or illustrations, are very easy to manipulate in the sense of controlling the details and information in the situation. Unlike pictures, the appearance and other features of the character could be easily added, reduced or adjusted. These kinds of visualized situations could be very simple, or a little more detailed, or sometimes very detailed based on the specific purpose of use, yet still very intuitive in the sense of presenting the situation. With sketches or illustrations, participants are able to take a look at the stimuli and have an understanding of the situation, along with the intuitive emotional responses, and so on. On the other hand, researchers are able to eliminate unneeded factors. Therefore, for most of the Kansei research, visualized situations using sketches or illustrations, are recommended to present situations and control factors.

However, few descriptions in the literature could be found to explain how the researchers designed these sketches or illustrations. For example, as shown in Figure 5, the kids in the situation are very detailed, with clear gender identification, facial features, and clothings. Would these details influence the response of participants in the experiment? It needs to be find out.

## 2.3 Dining, Tableware and Color

Dining situations are arguably the most common daily life experience that involve the 5 cues of a situation, social interaction, and target product (tableware, food, furniture, etc.). They are also shared by different cultures and ethnics. Studying dining situations could be essentially practical and applicable as an example of Kansei research or consumer research involving situations.

### 2.3.1 Definition of Dining

#### *Origin of Dine*

The origin of “dine” is from Old French *disner* (Modern French *dîner*) in late 13th century, “to dine, eat, have a meal,” originally “take the first meal of the day,” from stem of Gallo-Romance *\*desjunare* “to break one’s fast,” from Vulgar Latin *\*disjejunare*, from *dis-* “undo” + Late Latin *jejunare* “to fast,” from Latin *iejunus* “fasting, hungry” [43].

#### *Definition of Dining in Modern English Dictionaries*

According to Oxford Online Dictionaries, the definition of dining is “the activity of eating a meal” [44]. Based on Random House Dictionary, “dine”, as the verb of “dining”, has two meanings: 1. “to take any meal, or to eat the principle meal of the day”; 2. “to entertain at dinner” [45]. One of the British English definitions of “dine” indicates that “dine” means: 1. “to eat dinner”, 2. “to make one’s meal”, 3. “to entertain to dinner” [46]. Basically, “dining” could be any activities of eating a meal, or an entertainment based on having a meal.

Based on the definition of dining, we could see that dining is not just about eating food, it contains the attached activities of eating food such as rituals, ceremonies, entertainment and social interactions.

### 2.3.2 Dining Experience, More Than Just Eating

Since dining is not simply just eating, we can see that in dining experience, food is not the only thing that needs to be good in quality and satisfying. Food can primarily fulfill the biological needs, however, there are also other needs or desires in the dining experience. Similarly, other products or objects in a dining experience, might be required to be more than just enough to fill the biological needs. For example, the tableware should be big enough to hold the food, chairs should be steady enough to sit on it, but users might look for some advanced features and experience, such as how beautiful the tableware, furniture and environment are.

Dining experience is also a kind of product user experience (the target product could be the food, the tableware, the interior, or even the service of the restaurant, etc.). Literatures have suggested that conceptions of product and service features can be described in terms of concentric rings (Levitt, 1983, [47]; Clemmer, 1990, [48]; Rust & Oliver, 2000, [49]). In the inner ring there are certain product attributes to perform the basic function. The next adjacent ring contains adornment to the basic product and the included attributes can be called “satisfiers” (Rust & Oliver, 2000, [49]). Afterwards, there are so called “delights” in the outer ring, which are above the unexpected features, surprisingly enjoyable to users or customers (Hanefors & Mossberg, 2003, [50]). Based on these implications, Andersson and Mossberg (2004) proposed a model describing as concentric rings for dining experience, to illustrate what aspects influence a customer’s multidimensional dining experience in a restaurant [51]. Figure 6 shows the model of the concentric rings for dining experience.

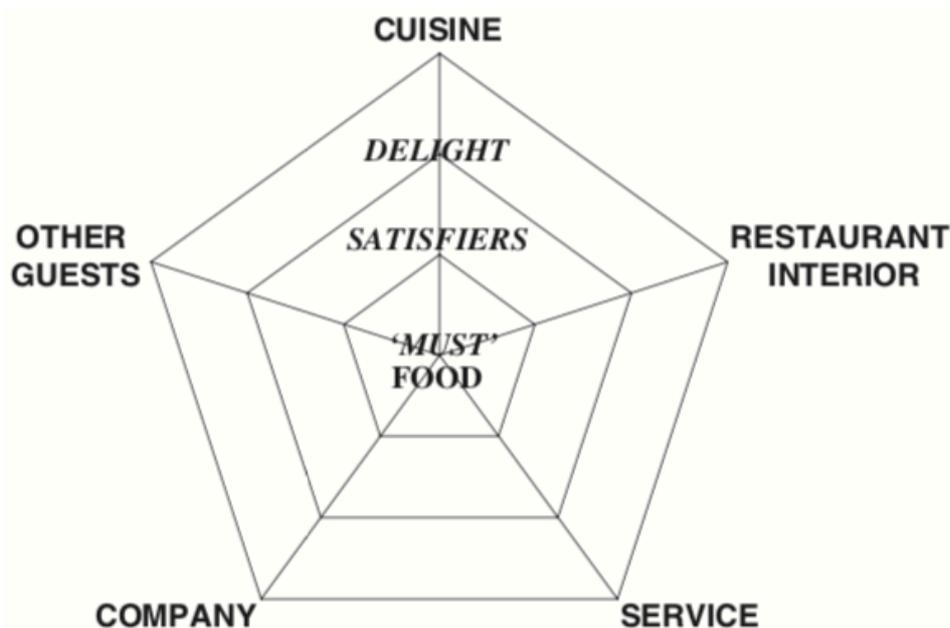


Figure 6: Factors influencing diners' experience in restaurant (Andersson & Mossberg, 2004, [51]).

As shown in Figure 6, the 'must' is food in the center, and in the adjacent ring, there are five groups of satisfiers, defined as (1) service; (2) fine cuisine; (3) restaurant interior; (4) good company; and (5) other customers [51]. In the study by Andersson and Mossberg (2004) using this model, it is reported that customers expect evening restaurants to mainly satisfy social and intellectual needs whereas lunch restaurants mainly cater for physiological needs [51]. The researchers suggested that physiological needs (satisfied by food and beverage) are not the only needs that customers wish to satisfy by going to a restaurant, and managers must learn more about these customer needs in terms of different dining situations [51].

### 2.3.3 Tableware in Dining Experience

Tablewares are the dishes used for setting table, serving food and dining, including cutlery, glassware, serving dishes and other items for practical as well as decorative purposes [52][53]. They are the most

common products in our dining experience. We hold and touch tableware, use tableware, see tableware and eat the food on the tableware. Tableware also has cultural meanings and social meanings, it reflects the occasion, the cuisine, religion, culture, and personal identity. We also use tableware to socially interact with other people in the same dining situation. For example, we use glasses to cheer with friends, family members and colleagues. Tableware is so common that almost everybody uses them every single day in dining situations. However, far less research on tableware could be found compared to research on food or dining environmental elements.

Research on dining experience have been putting attention on food and flavor perception, with a large body of literature. Other research have also emphasized the importance of atmospheric/environmental cues in determining what, how much, and how quickly we eat and drink, and even how much we report liking the experience (Gal, Wheeler & Shiv, 2007, [54]; Oberfeld, Hecht, Allendorf & Wickelmaier, 2009, [55]; Spence, 2002, [56]; Spence & Shankar, 2010, [57]). These studies reported the atmospheric/environmental cues such as lighting and auditory. There are very few research that studied the role of tableware in dining experience, in terms of eating, drinking, and flavor perception (Spence, Harrar & Piqueras-Fiszman, 2012, [58]). Spence and colleagues have been studying on the impact of tableware from many different perspectives (e.g., [56][58][59]). They have studied on the qualities and expenses of tableware, suggesting that our perception (such as how heavy it looks) of the tableware could transfer on the food [58]. They also took a look at the visual effects. For example, color contrast effects have explained that food might taste stronger when served on white plate than the same food served on a black plate [58].

On the other hand, it is reported that the size of tableware has an impact on our perception on the food. Same amount of food could be perceived as more filling when eaten from a smaller bowl compared to from a larger bowl [58]. Ittersum and Wansink (2012) also suggested that plate size would cause opposing biases that lead people to over serve on larger plates and bowls and underserve on smaller ones [60].

The shape of tableware is often discussed in the world of wine glasses. Russell, et al. indicated that certain glass shapes will presumably release more organic molecules from wine than other glass shapes [61]. On the other hand, other researchers criticized this point by stating that the taster's awareness of the glass shape and size appears to be crucial in order for the shape/size of the glass to affect the aroma and flavor of the wine [62][58].

Spence et al. also mentioned that spoons made from different metal might taste different because they interact with foods in a physiological or chemical way, depending on the properties of the food and the material of the spoons, such as their pH or temperature [58].

More research on tableware could be found regarding the color of tableware, which will be reviewed and discussed in the next section.

#### 2.3.4 Color of Tableware in Dining Experience

Color plays an important role in our dining experience. The color of the food, tableware, table sheet, will always be in our sight while having the food. Research on the color of food is the majority in the field of color-dining research.

There are various studies on the color of tableware as well, however, most of the study conducted the experiment with only a small sample of colors (red/blue or black/white, e.g. [59][63][64]). A few research focused on a wider range of tableware colors [65]. One previous study involved a wide range of tableware colors showed that when Jelly was used as the target food, dull color schemes were not liked as the color of the tableware (black and cool colors were the most disliked), but warm scheme colors were mostly liked by participants [65]. Little is known about how the colors of non-edible items such as tableware affect people's perception of food, emotional responses and mood in dining activities. Previous research on the color of tableware mainly aimed to only investigate the influence of the color of plate ware

on appetite, or the flavor perception of the food placed on it. For instance, a research group in Oxford University provided sweet and salty popcorn in containers with different color to the participants. The results showed that the flavor perception of sweet and salty popcorn changed when switched to red or blue containers [59].

Another study on the color of dining tray showed that the color of the tray affected not only the appetite of the diner, but also some other emotional responses such as “brightness” and “peacefulness” [66]. Moreover, some other research took place in United States and Japan indicated that warm colors increase appetite and cold colors do the opposite [67][68].

Although color contrast between plate ware and food was considered as the key factor in some studies, the explanations for the fact that the color of the plate ware impacts flavor perception have not been fully developed yet. On the other hand, emotional responses and mood during dining, which are considered more easily affected by colors, have become very important and noticeable.

In overall, the studies on the color of tableware have been limited to appetite. There are few studies considering the color of tableware as the factor to affect other psychological or behavioral responses in dining experience. More research targeting on this need to be done.

## **2.4 Color and Decision Making**

### **2.4.1 Color Preference and Color Emotion**

The sensibility on colors has been improving through the development of modern life. Color is everywhere in our daily life as an important visual element. People’s preference, opinion, taste, understanding on colors are becoming more and more subtle, various, dynamic in different culture, contents, and situations. There is a large

body of literature on the psychology of color [69]. The research on color is a topic that will never get old.

Color-emotion and color-preference are two of the most popular topics for color research (e.g., see [69][70][71][72]). Our past experiences influence our emotion and preference on colors, and individual experiences, cultural conventions and stereotypes also provide subtle connotation and multiple meanings of the same color to people [73].

Inanami et al. (1994) invited 100 participants to conduct an experiment on the emotional responses of various colors [74]. The results showed that, for example, red was perceived as hot, bright, beautiful, joyful, and strong; yellow was very similar to red, but also perceived as lighter; blue was reported as cold, sad, beautiful, quiet and masculine; purple was reported as similar to blue; pink was evaluated as feminine, light, beautiful, bright, and joyful; orange was also similar to red and yellow, yet reported as brighter; green was reported as a stable and neutral color in terms of all emotions [74].

Valdez and Mehrabian (1994) conducted experiment on the effects of color on emotions using PAD model (Pleasure, Arousal and Dominance). They found that the saturation and brightness evidenced strong and consistent effects on emotions [69]. Saturation was reported to enhance all three dimensions, especially arousal; Brightness was reported to enhance pleasure, and reduce arousal or dominance [69].

Ou et al. (2003) identified three color emotion factors: color activity, color weight and color heat, and suggested that color emotion might be culture-independent [70]. Kara and Epps (2004) used 10 fully saturated colors to examine color emotion associations and the reason for emotional reactions given to colors [71]. The results revealed that the principle hues comprised the highest number of positive emotional responses, followed by the intermediate hues and the achromatic colors [71]. They suggested that color related emotions were highly dependent on personal preference and one's past experience with that particular color [71].

Madden, Hewitt and Roth (2000) intended to explore how color and color combinations can be understood and applied to brand image strategies, by conducting research on color preference and meanings [72]. They found that blue, green, and white are all well liked across countries and share similar meanings; In contrast, black and red received high liking ratings, yet showed different meanings [72]. It is also suggested that color's emotional meanings and associations could represent brand's image, for example, high-technology company in markets could use blue to express the impression of "gentle" and "peaceful", to provide a better mood for the consumers feeling easy to work with [72].

#### 2.4.2 Color of Product and Decision Making

The appearance of product is essentially important in consumer's choice of the product. Literatures showed that the visual appearance of a product can influence consumer product evaluations and choice in several ways (Bloch, 1995, [75]; Garber, 1995, [76]; Garber et al., 2000, [77]; Veryzer, 1993, [78]; Veryzer, 1995, [79]). For example, Bloch (1995) mentioned the communication of easy of use, which was also described by Lobach (1976) as part of the aesthetic function ([75][80]). Veryzer (1993) indicated that the appearance of product has communicative function [78]. Creusen and Schoormans (2005) summarized these literatures by listing six roles of product appearance for consumers: (1) communication of aesthetic, (2) symbolic, (3) functional, (4) ergonomic information, (5) attention drawing, and (6) categorization [81]. It is suggested that the aesthetic and symbolic roles were mentioned most often by people [81]. In Creusen and Schoormans's study (2005) on product appearance, shape, color and size were discussed and color showed most mentionable impacts on participants. They found that bright colors may be valued from an aesthetic point of view but may diminish the impression of quality (i.e., functional value) [81].

Color of product might be one of the most important product appearance features, in the sense of affecting consumer's impression of the product and choice of the product. Other literatures have provided evidences on the influence of the color of product on our perception, impression and behavior on the product. Hagtvedt (2016) indicated that consumers perceive a product to be more durable if its color is dark rather than light, but more convenient if its color is light rather than dark [82]. This result agreed with the study by Creusen and Schoormans (2005), which suggested that bright color diminished the impression of quality [81].

Lynch et al. conducted a large sample questionnaire by investigating 1750 customers to determine the effect of product color and educational materials on the purchase intent for vacuum packaged ground beef, and the result showed that 74% of the customers indicated that color was important in their product purchase intent decision [83]. Essays about marketing also suggested that in their investigation, more than 80 percent of customers said color was the primary reason of buying a product [84][85].

### *Pure Color Preference*

Kareklas, Brunel and Coulter (2014) investigated the effects of color preference on product preference [86]. In the study, they brought up the concept of "automatic color preference", stating that individuals have an automatic, non-conscious preference on colors [86]. In their review of literatures, it was suggested that early experience theories and color symbolic theories, etc., have affected our opinions, impressions and preference on some colors, as a background knowledge before we actually interact with the color on any product. For example, the association and cultural meaning of color white are more positive than black (e.g. white: pure, light and decency; black: darkness, evil and fears), therefore people might automatically prefer white to black [86]. Based on this, the researchers conducted experiments to prove that automatic color preference would be a significant predictor to product preference. In the experimental settings, automatic color preference was

tested by using the Implicit Association Tests (IATs; Greenwald, McGhee, & Schwartz, 1998, [87]), presenting participants a group of different geometric shapes and images of products (shoes, sunglasses and automobiles, etc.) using color white and black, for participants to select based on their preference [86]. The results suggested that automatic color preference was able to be used to predict automatic product preference [86].

Furthermore, Kareklas et al. (2014) conducted study following the findings above, by adding “explicit color preference”, which is the self-report of color preference using semantic differential method [86]. After evaluating automatic color preference and explicit color preference, participants were able to choose product (pen) between black and white color. As a conclusion, the authors suggested that the behavioral product choice is best predicted by a combination of automatic color preference and explicit color preference [86].

According to the study, automatic color preference was tested by the Implicit Association Tests (IATs; Greenwald, McGhee, & Schwartz, 1998, [87]), and could be understood as the unconscious, implicit or initial color preference created by background knowledge and past experience. On the other hand, the explicit color preference is the self-reported, expressive, conscious color preference. The study suggested that by combining these two together, we could predict the choice of product [86]. In other words, it is suggested that pure color preference, which is the initial preference on the color itself without any attached context, can predict the choice of product. Although it is noted that the study only considered white and black.

### *Product Color Preference*

The pure color preference was emphasized as an important predictor to product choice by the study of Kareklas and colleagues. However, the observation is not convincing enough, due to the fact that they only used black and white in the experiment. Other studies involved more colors have shown different observations.

Saito and Wada (2009) suggested that the preference of colors from the color chart, was different from the preference of colors on products; females had a wider range of interests in choosing colors for cellphone compared to males [88]. Participants had shown differences and gaps between their color preference when presented with the color chart, and their color preference when presented on cellphone. The authors debated that some of the reasons of that might be the shape or other visual features of the cellphone, and more types of product should be tested in future studies.

Amsteus et al. (2015) indicated that universal color associations (impressions) were different from the associations with the colors when they were displayed in a specific context (product: toothpaste), and suggested that we should consider the associations colors in the specific context rather than relying on universal associations of colors [89]. The study included blue and black, with toothpaste as the product context.

Here we can see that the relationship between pure color preference and product color preference is very unclear. Kareklas et al. suggested that the pure color preference was the best predictor to product choice. On the other hand, In the study by Saito and Wada, it was indicated that pure color preference was different from product color preference. Amsteus et al. also suggested that universal color associations were different from the associations with colors when they were on a product. However, all of these three studies used different experimental method. Kareklas et al. involved different types of products (shoes, sunglasses, automobiles, etc.), but only tested pen as the product in the test for choice of product; more importantly, they only considered white and black; Saito and Wada took more colors into consideration, but they indicated that the shape and other features of the cellphone they used in the experiment might cause the gap between pure color preference and product color preference; The study by Amsteus et al. was more focused on the associations and impressions of the color. The relationship between pure color preference and choice of product (or product color preference) remains unclear. Future studies need to fill the hole and provide a clearer result on this point.



Figure 7: Pure color preference and product color preference.

## 2.5 Atmosphere

### 2.5.1 Atmosphere and Situation

Researchers have summarized the principles of situation research [11], however, they barely mentioned about the atmosphere of a situation. On the other hand, Schmitz (2016) suggested that atmosphere were closely interlinked with situations [90][91]. Atmospheres and situations are called "two sides of a coin" [90][91].

Atmosphere might not be part of the basic composition of a situation, but it is an important feature of a situation. Schmitz (2016) mentioned that the atmosphere builds the emotional side of experience, and the situation builds the cognitive side of experience; situations are permeated with atmospheres, lending the situation its specific and emotional character [91]. In Rauthmann and colleagues' (2014) definition of the characteristics of situations, Duty, Intellect, Adversity, Mating, Positivity, Negativity, Deception and Sociality compose the psychological meanings of situations [21]. These eight characteristics of situations could be the psychological responses of the atmosphere of situations.

Especially in Kansei, design, emotion and customer studies, when we focus on the perception and behavior on a product, we often consider the emotion, mood and feelings of the product. These psychological responses could be affected by the atmosphere of a situation. How we

perceive and interact with the product, might be influenced by the situation, especially the atmosphere of the situation.

### 2.5.2 Definition of Atmosphere

According to Cambridge English Dictionary, atmosphere is: 1. the character, feeling, mood of a place or situation; 2. a feeling that a place has of being pleasant and interesting or exciting [92]. The first definition is the general inclusion of atmosphere in a broad sense, indicating that atmosphere could mean the character, the feeling, and mood of a place or situation. The second definition is atmosphere in a narrow sense, specifically used when the atmosphere only means the positive feelings or moods. Therefore in general, atmosphere includes character, feeling and mood.

Feeling and mood, as well as emotion, are the general concepts we usually use to talk about atmosphere in daily life. We consider that atmospheres give us the feelings, moods and emotions, thus we often use these words to describe atmosphere. However, the character of atmosphere is also very important but often ignored. Norberg-Schulz (1980) uses the term “character” in relation to atmosphere, stating that atmosphere is denoted by place and characters made up by organization of elements [93]. Character in a more general and concrete concept than space, it denotes atmosphere and also the concrete form and substance of the space-defining elements, determine not so much by what things are, but how things are [94].

Although the definition of atmosphere in dictionary is simple and easy to understand, the concept of atmosphere is often defined in different ways in different fields. Sometimes, even in the same field, researchers and authors look at atmosphere from different perspectives. Thus, the definition and conception of atmosphere are needed to be reviewed from various research fields, in order to clarify the concept of atmosphere in this study.

### 2.5.3 Atmosphere in Various Research Fields

There is a growing body of research across disciplines and fields arguing that the atmosphere constitutes a vital aspect of social life and experience (e. g., Anderson, 2009 [95]; Böhme, 1993 [96], Böhme, 1995 [97]; Borch, 2010 [98]; Grant, 2013 [99]; Griffero, 2014 [100]; Hauskeller, 1995 [101]; Julmi, 2015 [102]; Langewitz, 2007 [103]; Rauh, 2012 [104]; Schouten, 2007 [105]; Sonntag, 2013 [106]; Sørensen, 2015 [107]; Zumthor, 2006 [108]) [91]. In organization research, scholars are increasingly focusing on emotional phenomena that exceed the private inner sphere of a psychological state [91]. It is recognized that emotions are not only individual, but also social or even organizational phenomena (Ashkanasy, 2003 [109]; Elfenbein, 2007 [110]) [91]. Accordingly, in their recent Call for Papers for Organization, Fotaki, Kenny, and Vachhani (2015) [111] emphasize that affect “is what hits us when we walk into a room and inexplicably sense an atmosphere, an ineffable aura, tone, or spirit that elicits particular sensations” [91]. Broadly defined, an atmosphere is “a total or partial, but in any case comprehensive, occupation of an area-less space in the sphere of that which is experienced as being present” (Schmitz, 2016, p. 4, [90]) [91]. This kind of atmosphere is sometimes referred to as “affective atmosphere” (Anderson, 2009 [95]; Ash, 2013 [112]; Michels, 2015 [113]) [91]. In overall, atmosphere is often discussed in the field of psychology, marketing, management and organization, as well as business settings and hospitality settings.

Julmi (2016) has distinguished the concept of atmosphere into two categories: dualistic concept and non-dualistic concept, and proposed that non-dualistic conceptions of atmosphere are more appropriate for atmosphere research [91].

#### *Store Atmosphere and Group Atmosphere*

The longest tradition of studying atmosphere is arguably store atmosphere, also known as marketing management [91]. In the field of management research, store atmosphere and group atmosphere are two

research approaches that deal with atmosphere from different perspectives. Store atmosphere was taken as a marketing tool early by Kotler (1973), defining that atmosphere is “the air surrounding a sphere” or “the quality of the surroundings” [114]. Baker (1987) considers atmosphere as ambient factors, design factors and social factors [115]. Bitter (1992) distinguishes atmosphere between ambient conditions, space or function and signs, symbols and artifacts [116]. Basically, store atmosphere considers atmosphere as external stimuli that affect internal emotional states. However, researchers have been treated atmosphere as variables in different stages of our cognition process.

Kotler (1973) has defined atmosphere as a quality of the environment and lies with in the stimulus, which in turn influences individual internal states [91][114]. Donovan and Roster (1982) stated that “store atmosphere effects are basically emotional states” (p. 35) [153]. However, Julmi (2016) indicated that “their interpretation somehow rather suggests that the atmosphere is something in between external stimulus and internal state” [91]. There are researchers who locate atmosphere within the stimulus, as the external surroundings. However, other researchers also treat atmosphere as a psychological variable (Berman & Evans, 1979/2013 [117]; Buckley, 1987 [116]; Ghosh, 1990 [119]). According to Milliman (1986), atmosphere should be used to describe the experience felt by a person [120].

On the other hand, group atmosphere is a notion often appear in the study of group dynamics [91]. In this type of research, atmosphere often refers to the social interaction and relationship within a group of people. Group atmospheres are consistently regarded as psychological state variables [91]. Thus, the atmosphere is often measured by using the classic positive/negative emotional responses. Fiedler (1962) describes positive atmospheres as pleasant and relaxed, and negative atmospheres as unpleasant and tense [121]. Other researchers consider atmosphere should be detected by using the valence (pleasure/displeasure) and arousal (arousal/sleepiness) dimensions [122][123][124][125].

As Julmi (2016) has discussed, the presented conceptions of atmospheres can emanate from physical surroundings as well as from

social gatherings such as groups [91]. However, in the studies on store atmosphere, social aspects of store environments (other customers and service providers) (Tombs & McColl-Kennedy, 2003, [126]) were largely ignored, although these aspects may be important in creating an overall atmosphere within a store [91]. On the other hand, research on group atmospheres largely ignore the influence of physical surroundings as external stimuli [91]. It can also be argued that physical stimuli such as (cold or warm) light might influence a group's atmosphere [91]. In sum, dualistic atmosphere conceptions are not enough to clarify the nature of atmosphere [91]. It is not clear in store atmosphere and group atmosphere research that whether atmosphere is a phenomenon of the environment or mind, whether it is a feature of a group or an individual, and whether atmospheres affect people or could be affected by people [91].

### *Aesthetic Atmosphere and Emotional Atmosphere*

In order to answer the questions above, Julmi (2016) has proposed that non-dualistic conceptions of atmosphere such as aesthetic atmosphere and emotional atmosphere [91]. The non-dualistic conceptions of atmosphere accept atmospheres as being both subjective and objective and/or in-between subjectivity and objectivity [91]. As an example, Böhme's (1993) concept of new aesthetics emphasizes that the atmosphere is the “in-between, by means of which environmental qualities and states are related” [96].

Emotional atmosphere was introduced by De Rivera (1992), who indicated that the term emotional atmosphere referred to the actual moment when a group focuses on a common event [127]. Schmitz (2016) has stated that atmospheres are emotions spatially poured out in the domain of what is corporeally experienced as present [90]. Atmospheres are objectively present in the space, but can on the other side also become subjective facts for anyone affectively involved in an atmosphere [91]. Atmosphere is conceptualized as situationally bound phenomena by Schmitz (2016), and closely interlinked with situations [90][91]. Atmospheres and situations are called "two sides of a coin",

with the atmosphere building the emotional and the situation building the cognitive side of experience, and situations are permeated with atmospheres lending the situation its specific and emotional character [91].

That being said, it is suggested that the traditional dualistic conceptions of atmosphere, which only consider positive/negative way of measurement, are not recommended for atmosphere research. Nowadays, non-dualistic conceptions of atmosphere are developing more and getting more attention after the end of 20th century, and being encouraged until now [91]. However, further works are needed to illuminate the phenomenon of atmosphere, not only in environmental psychology and marketing research, but also in other fields.

### *Atmosphere of Places*

Another perspective for atmosphere research is the study of atmospheres in places. Since the end of 20th century, studies have been carried out on the experience of atmosphere in public places (in squares, Saemon and Nordin, 1980, [128]), in landscapes (Altman and Wohlwill, 1983, [129]), in institutions (Goffman, 1961, [130], Moos, 1976, [131]), and in home (Pennartz, 1986. [94]). These studies take the concept of place importantly while exploring atmosphere. Atmosphere is the most comprehensive characteristic of a place [94], and pleasantness is often the theme of related studies in terms of atmosphere. Pennartz (1986) conducted interviews to study on home atmosphere from a qualitative approach [94].

### *Atmosphere in Dining Experience*

The atmosphere in dining experience is important. The most common topic is restaurant atmosphere, which usually focuses on the ambient of a restaurant, like the interior settings, lighting colors, scents or music, and the purpose of the study usually involve the satisfaction of experience (Petzer and Mackay, 2014 [132], Heung and Gu, 2012 [133]) or purchase intention (e. g., North and Hargreaves, 1998 [134]). Dining atmospheres are described about more likely in terms of conscious

design factors which encourage specific emotional effects in customers, in order to ultimately enhance the willingness to purchase (Heung and Gu, 2012 [133]). Literatures have named the different dimensions of dining atmosphere, such as style, layout, colors, lighting, furnishings and ambience (Countryman & Jang 2006 [135]; Ha & Jang 2012 [136]; Kumar et al. 2010 [137]).

The majority of atmosphere research on dining experience have taken atmosphere as the lighting, auditory or olfactory cues (e.g. Spence, 2002, [56]; Spence & Shankar, 2010, [57]; Gal, Wheeler & Shiv, 2007, [54]; Oberfeld, Hecht, Allendorf & Wickelmaier, 2009, [55]; North and Hargreaves, 1998 [134]; Spence, 2011, [138]; Stroebele & Castro, 2004, [139]; King, Meiselman, Hottenstein, Work & Cronk, 2007, [140]; Weber, King & Meiselman, 2004, [141]). Few research have focused on the atmosphere in dining experience, regardless of whether it is a restaurant, at home or even outside, and have taken atmosphere as the psychological vibe of the situation, which is not necessarily caused by lighting, scent and music, but could be caused by the persons, objects, location, time and activities in the situation. In Japan, researchers who are targeting the psychological relationship within family, especially teenagers or kids with parents, have been talking about the atmosphere of dining experience as an important parameter, and defining the atmosphere of dining situations as a psychological vibe, from which we can detect emotional responses. Hirai (2006) has suggested that the “pleasant atmosphere” in dining situations is the most important factor in building the family relationship [142]. It is also suggested that the atmosphere is the base of psychological connections in a dining situation [142].

Previous research on dining atmospherics indicated that the indirect effect of perceived atmospherics on behavioral intentions through perceived quality was greater than the direct effects like services and food themselves, which means in some cases, the environment might have bigger influence on customers than the food or service [143]. Different dining environment and interaction around the dining table (which are various situations or scenes) should also be

taken into consideration as an important factor in the evaluation of dining experience.

### *Atmosphere of Colors*

Atmosphere in colors could be found in a few studies. However, there are few research can be found that clearly focus on the atmosphere of color. Usually, atmosphere research concerning colors are research on colors, lighting and interior ambience (e. g., Maki and Sawa, 1999, [144], Kitagawa, Maki, Kuno, 1986, [145], Higuchi, etc., 1988, [146], Kojima, 1987, [147], Miyamoto and Yanase, 1993, [148], Muto, 1990, [149], Tabuchi, Nakamura and Hasegawa, 1985, [150], Nakamura and Karasawa, 1997, [151]). These research mentioned the effect of colors, usually alongside lighting, on the atmosphere of interior ambience. There are few research about the atmosphere of color itself. Therefore, since the atmosphere studies are always focusing on a place or a situation, color is usually considered as a variable that affect the atmosphere.

The atmosphere assessments differ among studies, depending on the purpose of the study and the kind of situations or place. Therefore, since there is no clear guideline and method about assessing the atmosphere of colors, it is considered that the assessment method should consider the atmosphere of the situation or place. For instance, in the examples of studies introduced above that involved colors and interior ambience, the evaluations of colors were focused on the atmosphere of the interior room.

In summary, atmosphere includes the physical surroundings of the place, time, objects, and the social surroundings of people relationship and interactions. Sometimes, it is also directly used to describe the feelings and experience felt by a person. The atmosphere felt by a person can be individual variable, but can be as well influenced by the people surrounding the person. Based on the literature review of atmosphere studies in different fields, some principles could be outlined as below:

1. Atmospheres are the characters, feelings, moods and emotions of a situation or place.
2. Atmosphere includes the physical surroundings, and the social interactions.
3. Atmosphere should be measured by various approach, instead of just using dualistic tools which only consider positive and negative.
4. Atmosphere is the most comprehensive characteristic in a place, and it is in-between internal emotional state and the external stimuli. Thus, it is difficult to measure directly, however, it can be measured indirectly by assessing participants responses on the internal emotional state and external stimuli characters.
5. The internal emotional state is the main part of atmosphere, however, the external characters of stimuli should not be ignored.

#### 2.5.4 Assessment of Atmosphere in Dining Situations

Few assessment and measurement of atmosphere related to dining experience could be found. Hirai (2005, 2006) has proposed assessment tools on the evaluation of the quality of atmosphere. In Hirai's (2005) study on the factors of past meal scenes, 15 items were concluded as representing the quality of atmosphere, shown as Table 1. In Hirai's (2006) another study on the factors of past meal scenes, "pleasant atmosphere" was found as the most important factor and the measurement involved two items: "feeling joyful" and "feeling relaxed" [142]. Although researchers in the study defined these items as the assessment to the quality of atmosphere, based on what we can see from the items, these are the psychological feelings of atmosphere, including emotions and moods of atmosphere in dining situations.

Based on the basic principles summarized above, Hirai's (2006) measurement of "pleasant atmosphere" in dining experience is a very

simple approach, however, it is the typical dualistic conception of atmosphere. It only considers atmosphere from two dimensions, which are joyful/not joyful, and relaxed/not relaxed. On the other hand, Hirai's (2005) measurement of quality of atmosphere included a broader range of variables in emotional state (Table 1).

Table 1: Items for evaluating quality of atmosphere in Hirai's study (2005, [152])

<b>List of items originally in Japanese</b>	<b>List of items translated into English</b>
1 楽しさを感じる	1 I feel joyful
2 賑やかさを感じる	2 I feel lively
3 幸せを感じる	3 I feel happy
4 安らぎを感じる	4 I feel peaceful
5 暖かい感じがする	5 I feel warm
6 冷たい感じがする	6 I feel cold
7 爽やかな感じがする	7 I feel refreshing
8 変な感じがする	8 I feel weird
9 のびのびできる	9 I feel free
10 静かさを感じる	10 I feel quiet
11 退屈な感じがする	11 I feel boring
12 寂しさを感じる	12 I feel lonely
13 空っぽな感じがする	13 I feel empty
14 窮屈な感じがする	14 I feel cramped
15 一緒にいると感じる	15 I feel being together

As shown in Table 1, the items for assessing quality of atmosphere, could be considered the assessment for emotions, moods and feelings of atmosphere technically. In a narrow sense, the emotion

and mood of atmosphere are the notions of atmosphere in general in our daily life. However, in a broad sense, the definition of atmosphere also included the characters [92]. The 15 items of atmosphere emotions are reliable in the sense of regarding atmosphere as the outcome moods or emotions.

The lack of method of assessing atmosphere in dining experience is clearly shown here, and the assessment method by Hirai (2005) is the one of the most widely covered set of items that includes diverse emotions in the atmosphere [152]. Based on the observation and literature review in various fields of atmosphere research, it is suggested that emotions are the main parts of atmosphere, and atmosphere is often tested from emotions (e. g., Donovan and Roster, 1982, [153], Berman & Evans, 1979/2013 [117]; Buckley, 1987 [116]; Ghosh, 1990 [119]), thus these 15 items are considered reliable for dining situation studies. However, since atmosphere has another layer, which is on the external stimuli side, a.k.a. the characters in the definition of atmosphere, could be assessed by using other qualitative methods (e. g., Petzer and Mackay, 2014 [132]).

Therefore in this study, the atmosphere in dining situation is the main part that we want to focus on, and Hirai's (2005) method could be used as the reference of measurement for emotions in atmosphere. However, since the external characters of stimuli in an atmosphere could not be ignored, this part of atmosphere would be evaluated by measurement using qualitative method. Figure 8 shows the characteristics of measuring atmosphere. Atmosphere is difficult to measure directly, and literatures introduced in this section have shown us that atmosphere is basically measured through the evoked emotions, or through the external characters in surroundings.

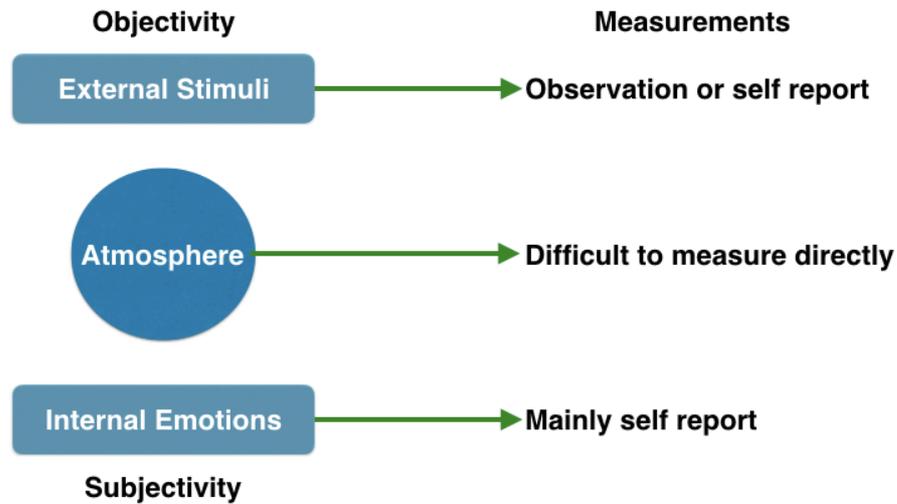


Figure 8: Atmosphere and how to measure it

## 2.6 Close-ended and Open-ended Questions

Following the indications of involving both qualitative approaches and quantitative approaches to evaluate atmosphere and other variables, the discussion of different types of questions for the measurement cannot be avoided in this study.

Questions are primary tools in collecting necessary information from respondents of a survey [154]. In scientific studies like psychology, social sciences, consumer studies and Kansei science/engineering that usually conduct questionnaires to investigate human-beings, different types of questions are always involved based on the purpose of the experiment. The pros and cons are often discussed among different types of questions. In this study, the types of questions used in the questionnaire are also discussed and compared, in order to collect wider range of answers with different depth.

## 2.6.1 Types of Questions

In general, as Sincero (2012) has summarized, there are two types of questions: Close-ended and Open-ended questions [154].

### *Close-ended Questions*

Close-ended questions limit the answers of respondents, require respondents select the options on the questionnaire that has been designed by the investigator or researcher [154]. According to the categorization by Sincero (2012), there are several types of close-ended questions:

1. Dichotomous or two-point questions (e. g., Yes or No, Unsatisfied or Satisfied)
2. Multiple choice questions (e. g., select among A, B, C, or D)
3. Scaled questions (e. g., Likert scale or Semantic differential scale)

Close-ended questions are considered more time efficient, respondents are easier to code and interpret the question, and they are ideal for quantitative research, which is a good approach for scientific research for providing scientifically reliable results rather than just some insights [154].

However, sometimes respondents are asked to choose a response that does not reflect their answer. The researcher needs to further explore the answer [154].

### *Open-ended Questions*

Open-ended questions require no need for designing options. Participants are asked to answer the question supplying their own words in a free way. According to the categorization by Sincero (2012), there are several types of open-ended questions:

1. Completely unstructured questions (asking the opinion or view)
2. Word association questions (asking the first word that pops into mind, instinct association)
3. Thematic apperception tests (asking explanations and views of a presented picture)
4. Sentence, story or picture completion (asking to finish an incomplete sentence, story, picture, etc.)

Open-ended questions are ideal for qualitative research, participants can answer the questions in the exact way they want to answer, and provide extra information that worth investigating [154].

However, the procedure of open-ended questions are usually time-consuming, and difficult for researchers to code and interpret [154].

### 2.6.2 Likert Scale, Multiple Choice and Open-ended Free Comments

In close-ended questions, Likert scale (Likert, 1932, [155]) is the most commonly used approach to scaling responses in survey research [156]. When responding to a Likert item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item [157].

Based on the classification and definition of types of questions, the assessment of atmosphere (Table 1) is a Likert scale. It includes the basic emotions to describe the atmosphere of a dining situation according to Hirai (2006). However, considering the dining situations would be presented to participants by using visualized sketches, it might be different from asking participants to recall their daily dining

experience. Therefore, it is not clear that whether the Likert scale of atmosphere is able to detect all items of emotions. Furthermore, it is discussed that there might be descriptions about the external stimuli, the characters of an atmosphere rather than just the internal emotions. Therefore, open-ended free comments letting participants explain by using their own words should be considered. Both Likert scale and open-ended free comments should be used in this study.

Although qualitative approach and quantitative approach are usually separated, there are studies used both of them at the same time. In a study on the motives in volunteering, researchers conducted both Likert rating scale and open-ended probe [158]. Researchers found the Likert rating scale capable of delivering promising results. However, on the other hand, the analysis on the open-ended probe also discovered three additional motives for the researchers [158]. Researcher in education also recommended that combining close-ended questions and open-ended questions, by asking a close-ended question first then ask the open-ended question following the previous question is a better idea in classroom educations to maintain the concentration and richness [159].

According to Hirai (2008), open-ended questions encourage respondents to use their own terms, which can also lead to repetition, the gathering of irrelevant information, misunderstanding of the question, and difficult to analyze [156]. On the other hand, close-ended questions (e. g., Likert scale) or multiple choice questions are easier to answer or analyze, and they are well administered and structural towards the goal of survey compare to open-ended survey questions [156]. However, open-ended questions are better sometimes in exploratory studies, where additional insights are sought [156].

### 2.6.3 What Types of Questions Should be Used in this Study

In conclusion, based on the observations and reviews above, Likert scale is the primary tool that suggested by literatures to measure

the atmosphere of visualized dining situations, and open-ended free comments would be needed to explore the additional insights. Choice of tableware color should consider multiple choice questions to reduce the restrictions to participants.

## **2.7 Summary**

In summary, this chapter has reviewed the literatures in various fields regarding situation research, dining experience, tableware, color, atmosphere, and different types of questionnaires. Some of the related research have been reviewed. These concepts and notions seem to be separated in different research from various fields, however, they interconnect with each other in many ways. In summary, these are the findings and insights of the interconnections among them:

1. Situations are very important in daily life and it is taking more and more attention in recent years in psychology studies. It is significant to consider the concept of situation in Kansei, design and consumer studies as well.

2. Situations and atmosphere are deeply interconnected. Some called situation and atmosphere are two sides of a coin. Studying atmosphere is a very valid approach to study situation, situation's influences on Kansei, and its influences on human beings' behavior.

3. The visualization of a situation is often used in marketing and retailing, and when a situation is visualized, it is easier for us to get involved and receive the atmosphere of the situation.

4. Dining situations are relatively very common in the world and different cultures can share a lot of similarities. On the other hand, dining situations always include person(s), and common objects such as tableware and food. Having common objects could be useful in studies that focus on a target product. Thus, it is decided to use dining situations in this study.

5. Study of consumer's Kansei on a target product is always essential to the application of Kansei research to real world market. In the case of dining experience, tableware plays important role and should be considered as one of the main products. In dining situations, tableware is always the main object except food.

6. Color is an important factor when it comes to product design and personal choice of a product. Color is also emotional, and deeply interconnected with atmosphere in a situation or a place. However, the Kansei process of people deciding tableware color is not well explained yet by other research.

This research is motivated by the lack of attempts and observations in the literatures, in terms of several concerns below:

1. The lack of considering usage situations for product evaluation and choice might be one of the reasons why Kansei research have been facing the difficulty of the subjectivity of Kansei. In this study, it is attempted to use visualized usage situations to evaluate the impressions and behavioral choice of product. It is expected that the use of situations would expand the results and provide more insights and implications about people's Kansei on product.

2. Research on dining experience have been focusing on food, flavor, and environment. However, it has been indicated that dining experience is not just about eating experience. From product design and development perspective, it is interesting to research on the effect of tableware on the dining experience. There are few tableware studies could be found, and most of them put their attention on the perception and flavor of food in the tableware. This study intend to explore the psychological, emotional experience of tableware and dining situations.

3. Color is one of the most important features of a product when it comes to personal preference and choice. It is indicated that color preference and color impressions might differ or change when put

into a context (e.g. on a specific product). However, literatures did not provide us a clear relationship between pure color preference and choice of product. Previous studies either only considered very limited types of colors, or could not filter out the other visual factors of the product such as shape or size. The relationship between pure color preference and choice of product needs to be understood better.

4. Atmosphere of dining situations was limited to the lighting, olfactory or auditory cues of the situations. However, the atmosphere of a situation could also represent the psychological vibe of the situation, which is not necessarily caused by lighting, scent and music, but could be caused by the persons, objects, location, time and activities in the situation. Few studies have taken atmosphere from this perspective in previous literatures, and far less studies discussed the effects of atmosphere as this psychological vibe (not caused by lighting, scent or music) on the choice and impression of product.

# Chapter 3: Objectives, Terminology and Framework

## 3.1 Objectives

Based on the motivation of this study and summary of literature review, the objectives of this study are:

1. Obtain more knowledge about how visualized dining situations are perceived, understood and responded, then attempt to involve visualized dining situations in order to understand tableware's color evaluation and preference.
2. Clarify the relationship between pure color preference and product color choice, in the case of tableware.
3. Understand the patterns of people's choice of tableware in different dining situations, and explore the reasons why people select specific colors for tableware, when given a various options to choose.
4. Determine whether the choice of tableware color could be predicted by the atmosphere of dining situations.

## 3.2 Terminological Definitions

### *Visualized Dining Situation and Simplicity*

**Dining Situation** is the scene or situation of a dining activity. It mainly includes the person, or people with social interactions, the behavior of eating food or drinking, objects like tableware, food, furniture or other alternatives, and reflect a specific place and time.

**Visualized Dining Situation** is a cartoonish sketch or illustration that visualize and describe a specific dining situation.

**Simplicity** in this study, means how simple, how abstract the visualized dining situations are, in terms of the details in the visual elements. For instance, the facial features of the characters, gender or age identification of the characters, clothings, food on the table, etc.

### *Comprehension and Atmosphere of Situations*

**Comprehension** is defined as how participant understand the basic composition of the dining situations, including the 5 cues: persons/relationships, objects, activities, time and location.

**Atmosphere** is the psychological vibe of the visualized dining situation, which is the responses related to emotion, mood and feelings. Unlike most of the literatures, which consider that atmosphere is created by auditory, olfactory and lighting cues, the atmosphere in this study is created by the visual presentation of dining situations. The atmosphere follows Hirai's (2002) evaluation method [152].

### *Pure Color Preference and Pure Color Impression*

In the literatures, the pure, initial preference of colors was defined or tested in different ways. The implicit, non-conscious preference of a color was defined as automatic color preference, and the explicit preference (self-report) of a color was defined as explicit color preference (Kareklas, Brunel and Coulter, 2014, [86]). Saito and Wada

(2009) discussed the preference of a color from the color chart [88]. Amsteus et al. (2015) mentioned the association (impression) of color as universal color association, compared to the association of color in context [89]. All of these notions of preference or associations/impressions, are the pure, initial response or attitude of people on the color itself, without any attached information (e.g., knowing the color would be used on a product or anything other context). Based on this, it is defined as pure color preference and pure color impression:

**Pure color preference** (universal color preference, context-free color preference, overall color preference) is how much a person like a color without any context. It is the attitude of the person purely on the color itself.

**Pure color impression** is the impressions a person have on a color, when the color is shown to the person visually, but without any other context. It is the feelings or emotional responses purely on the color itself.

### *Product Color Preference and Choice of Product Color*

Amsteus et al. (2015) discussed the association of color on a product (e.g., toothpaste bottle) as contextual association of color [89]. Other studies have just simply described the preference of color on a product as product color preference. The relationship between pure color preference, color preference on a product and choice of product is still unclear, hence it is necessary to separate some concepts and notions, in order to compare the relationship between them. To make the definition simple and less confusing, the definitions of pure color preference and choice of product color are below:

**Product Color Preference** is the preference of the color when it is on a product. The preference is still about the attitude towards color itself, however, at this point the respondent already knows the color is on a specific product.

In addition, since this research also consider the preference of the color when it is on a product in a specific usage situation, this preference is defined as **Situational Product Color Preference** for future references.

**Choice of Product Color** is the behavioral decision making result of selecting a color for a specific product.

The reason why these two notions are clearly defined as two different things, is that a person could like a color on a product, but somehow he/she might still make a decision of selecting another color for the product.

After the choice of tableware color, open-ended questions would be conducted to explore what kind of words people use to describe the reason why they chose certain color. Whether people used one word or not, is defined as **Word Usage** in this research.

### **3.3 Framework**

The framework of this research is composed by three studies: Study 1, Study 2 and Study 3.

First of all, the visual presentation of dining situations needs to be designed. As introduced in literature review, the simplicity of visualized situations is not discussed enough about the effects and impacts. The first part of the study designed two set of dining situations: simple version and detailed version. Study 1 mainly contains a preliminary experiment, intended to investigate the comprehension and evaluation of atmosphere, and compare the result between simple dining situation sketches and detailed ones, as well as between male and female.

Study 2 collected colors from real tableware, and conducted an experiment in which the colors were presented in geometric round circle to participants for them to rate their pure color preference on each color

and select their favorite colors for tableware. Study 2 is aimed at understanding male's and female's pure preference of color, and the choice of color when known it is used for tableware.

Study 3 contains the main experiment of the whole study, which adapted visualized dining situations from Study 1, Colors for tableware selection from Study 2. Color preference and impressions, Atmosphere of the dining situation are assessed using Likert scales, then considered as factors to predict choice of tableware color. Furthermore, the reasons of selecting colors were collected using open-ended questions.

From the result of Study 1, we expected to find out whether simple or detailed dining situations is better in creating atmosphere, and whether male and female perceive atmosphere differently. Afterwards, Study 2 and Study 3 would be compared, to determine the role of pure color preference in choice of tableware color; to see how participant select tableware color differently, with or without visualized dining situations; to explore the reason why participant select specific colors for tableware when shown visualized dining situations.

Figure 9 and Figure 10 show the framework of the studies, explaining the contents and connection between the three studies. Figure 9 explains that Study 3 combined the stimuli from Study 1 and Study 2, to see the overall effects of visualized dining situations on choice of tableware color. Figure 10 explains the different purposes and key variables in three studies, and how these studies are compared and discussed together.

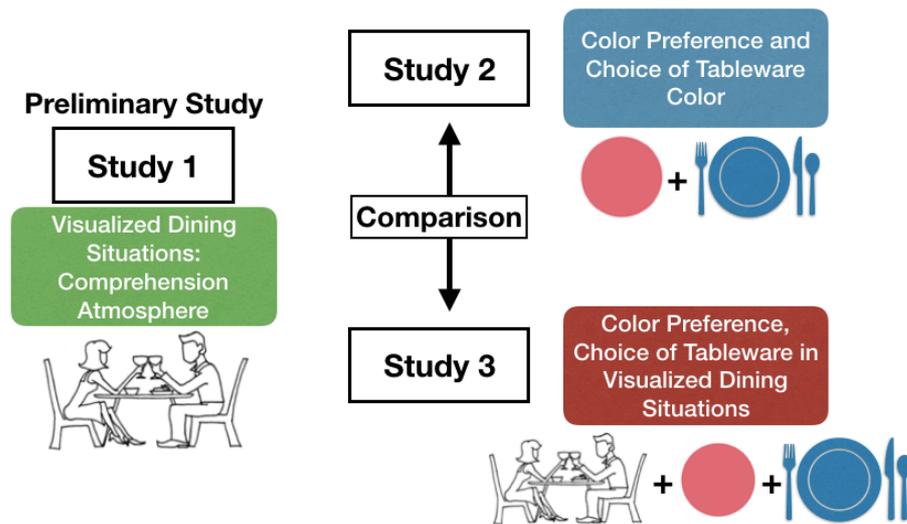


Figure 9: Framework of the three studies (a): Study 1 focuses on the visualized dining situations as a preliminary study; Study 2 and Study 3 focus on color preference and choice of tableware color, comparing the conditions with and without visualized dining situations.

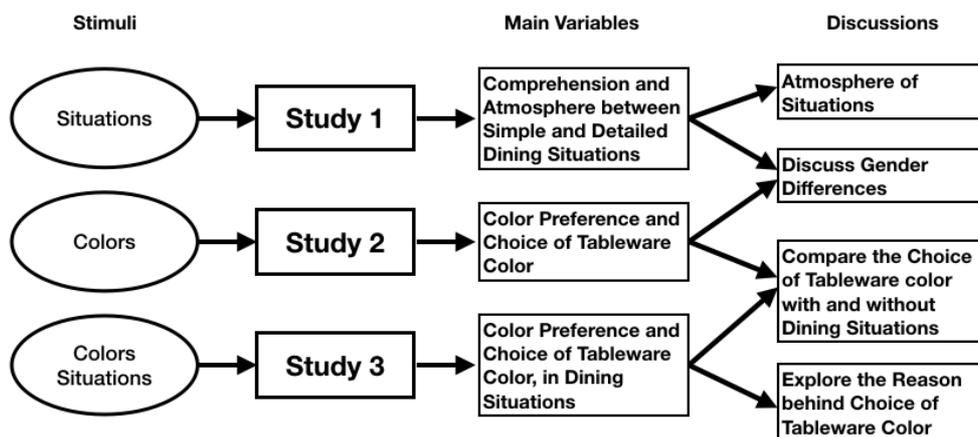


Figure 10: Framework of the three studies (b): stimuli, main variables and main discussions of the three studies.

# **Chapter 4: Study 1 - Comparing the Comprehension and Atmosphere Between Simple and Detailed Visualized Dining Situations**

## **4.1 Background**

Following the proposal of involving visualized situations in Kansei research, and the idea of visualized dining situations in the previous chapter, the first step is creating a group of situations using sketches, similarly with other studies (e.g., [40][39]). Therefore, before discussing about the color of tableware, Study 1 needs to create a set of visualized situation sketches to present dining situations.

There is one question about visualized situations. 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, however, few have discussed what art style and how simple should the situations be. It is not clear that whether the design/art style and the simplicity of the stimuli affect the perception of the people who are looking at them.

The situations are designed through a free style sketching procedure, based on brainstorming, descriptions, internet pictures and common knowledge. The lack of considerations on the details of the situations could have covered up many hidden factors.

In order to learn how to present visualized situations in the best way, we need to understand the effects of the details of visual elements

in the situations on our perception of atmosphere. Therefore, in this chapter, instead of focusing on the product (tableware), the situations are the target to be evaluated.

## **4.2 Objectives**

Towards a better understanding of visualized situations and the details, it was intended to compare the comprehension and atmosphere between situations with different design simplicity (simple /abstract design vs detailed/concrete design) in this chapter. The objective of this step was to understand more about whether detailed or simple visualized situations are better for the next step of the study, in terms of evoking responses towards atmosphere of situations.

**O1a:** To find out the differences of comprehension and atmosphere between simple and detailed dining situations.

**O1b:** To find out the differences of comprehension and atmosphere between male and female.

## **4.3 Hypotheses**

As a preliminary experiment, Study 1 explored the difference of comprehension and atmosphere of simple and detailed dining situations. It was predicted that the different amount of information would cause a gap between the comprehension and atmosphere. There were not enough evidence in the literatures about the gender effect in receiving the atmosphere from visualized dining situations. Thus it was predicted that male and female might not have a difference in receiving the atmosphere.

**H1a:** The detailed dining situations are stronger in atmosphere and more specific in comprehension.

**H1b:** Male and female are not different in understanding and reporting atmosphere from visualized dining situations.

## **4.4 Method**

This experiment was designed to compare the simple/abstract and detailed/concrete version of dining situations. Participants were presented with different versions of dining situations and asked about questions on both comprehension and atmosphere about the dining situations. Afterwards, statistical analyses were conducted to observe how participants' comprehension and atmosphere differ with or without different details in the situations.

## **4.5 Experiment**

### **4.5.1 Stimuli**

A list of situations was summarized based on brainstorming and combinations of different aspects from daily dining experience. Dining situations are relatively common in the world and different cultures can share a lot of similarities. On the other hand, a dining situation always include person(s), and common objects such as tableware and food.

After brainstorming and internet browsing, a list of dining activities was made based on combinations of various possible time, location, people relationship and social meaning. After eliminating similar and non-sense combinations (For example, one person having a date or a party; family members drinking alone, etc.), we concluded 6 typical dining situations, which are: 1. "Dinner dating with partner (lover)", 2. "Dinner with family members", 3. "Drinking alone at home", 4. "Breakfast at home", 5. "Picnic with family at park", 6. "Hot pot party with friends" (Table 2).

Table 2: Collected typical dining situations [179]

List of dining situations
1 Dinner dating with partner
2 Dinner with family members
3 Drinking alone at home
4 Breakfast at home
5 Picnic with family at park
6 Hot pot party with friends

Afterwards, internet pictures were collected by using these keywords. Based on the pictures, two versions of black-and-white sketches were designed representing the 6 dining situations by simplifying the elements in the pictures: version 1 with simple, abstract design (Figure 11) and version 2 with detailed, concrete design (Figure 12). Version 2 contains more information about the identity of the characters and details in the contents. The visualized situations were sketched by hand, and colors are abandoned to avoid unnecessary effects on comprehension and responses of emotion or mood of the atmosphere.



Figure 11: Situation version 1, visualized dining situations with simple and abstract art style design [179]



Figure 12: Situation version 2, visualized dining situations with detailed and concrete art style design [179]

#### 4.5.2 Participants

Participants are 48 adults with bachelor degree or higher education level, including 23 males and 25 females. The average age is between 27 and 28 years old ( $M = 27.50$ ,  $SD = 2.84$ ).

#### 4.5.3 Measurements

The purpose of the experiment is to evaluate the comprehension and atmosphere evaluation of participants on each dining situation. Therefore, a questionnaire was created, with the presentation of 6 situations and questions after each situation.

##### *Comprehension*

Comprehension in this study refers to the ability to understand the basic composition of situations. According to the principle of situation research, the basic composition of situations is defined as Cues [11]. Cues describe the environmental structures into psychological situations, and they represent physical present, scalable and (relatively)

objectively quantifiable stimuli [160][16]. Cues can be categorized into the following: (i) persons, relationships and social interactions; (ii) objects; (iii) events/activities; (iv) locations; and (v) time [11][17][18] [19]. Thus, cues address five easily answerable ‘W-questions’: *Who* is with you? *Which* objects are around you? *What* is happening? *Where* are you? *When* is this happening [11]?

Based on the review above, the questions for comprehension were designed as 5 questions that were similar to the 5 W-questions (Table 3). Basically, the participants could select multiple options in the answer. For instance, while answering the first question about the relationship of persons, if a participant thinks that the persons in the situation could be couples or family members on the same time, he/she could choose both couple and family as the answers. Some questions such as the events/activities in the situation, we indicate participants to answer in their own words in free comment text box.

Table 3: Questions on comprehension of the situations [179]

<b>Cues</b>	<b>Questions</b>	<b>Options or answers</b>
1 persons/ relationships	What do you think about the relationship between people in this situation?	couple/family/friends/co-workers/strangers
2 objects	What objects do you see in the situation?	free comments
3 events/ activities	Please briefly describe what is happening in the situation.	free comments
4 locations	What place do you think it is happening?	home/workplace/ restaurant/outdoor
5 time	What time do you think it is happening?	morning/noon/afternoon/ evening/latenight

### *Atmosphere*

The atmosphere of a situation is difficult to measure directly, very complicated and difficult to categorize. It is considered that the emotional responses tools (e.g. adjective words) should be designed according to the type/category of the situation, and the adjective words

could be used to describe the evoked emotions or moods from atmosphere. There are many tools for assessing emotions and they are proper to be used in different research targets and approach. In this study, situations were particularly designed related to dining activities. According to the extracted factors to evaluate the atmosphere in various dining situations from previous research [152], the atmosphere assessment adjective words are shown as Table 4.

Table 4: Adjective words for atmosphere assessment [179]

<b>List of adjective words</b>
1 Joyful 2 Lively 3 Happy 4 Peaceful 5 Warm 6 Cold 7 Refreshing 8 Weird 9 Free 10 Quiet 11 Boring 12 Lonely 13 Empty 14 Cramped 15 Being together

### *Preference, Familiarity and Association*

Familiarity, association (difficulty on picturing oneself to the situation) and overall preference were also recorded to understand the participants' perceptions on situations in a holistic way (Table 5).

Table 5: Questions on familiarity, association and preference [179]

<b>Keywords</b>	<b>Questions</b>	<b>Answer type</b>
1 Familiarity	Please rate how familiar you are with this situation.	1-5 stars rating
2 Association	Please rate how easy for you to picture yourself being in this situation.	1-5 stars rating
3 Overall preference	In overall, how much do you like the art style and character design of the dining situations?	1-5 stars rating, only asked once at the end of experiment

#### 4.5.4 Procedure

The assessment procedure followed a between-subject experiment design. Participants were randomly assigned with two groups. Group 1 was presented with situation version 1 and group 2 was presented with version 2. Each dining situation was presented at the beginning of each page, followed by questions 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 and their age & gender.

#### 4.5.5 Analysis

The scores of all items in the experiment were subjected to a two-way analysis of variance (ANOVA) having two levels of version (simple, detailed) and two levels of gender (male, female). All effects were considered statistically significant at the .05 significance level. Two-way ANOVA and post hoc test (independent sampled t-test) were conducted to determine whether there were significant differences in comprehension, atmosphere, familiarity, association and overall preference between the two versions of situations and two genders.

Among the questions about comprehension, there were two questions that allowed participants to answer with free comments in their own words. Firstly, the answers for objects in the situation were categorized into 5 types of answers: (1) furniture, e.g., tables and chairs, big objects in the surrounding environment; (2) holdings, i.e., the objects that being held in person's hand in the situation; (3) tableware, e.g., glasses, plates, bowls, etc., which are the target products that exist in all situations; (4) food, the object that usually co-exist with the target product in the theme; (5) cloth, i.e. the outfit or accessories attached or worn by person and (6) hidden, i.e. the objects that did not appear or could not be visually observed in the situation but reported by participants. Secondly, the answers for events/activities in the situation were categorized into 4 types: (1) primary activity, which is simply

eating food in dining situation; (2) secondary (extra) activity, e.g., watching TV, etc., is the activity which is not necessarily connected to the primary activity but observed in the situation; (3) specific actions, e.g., giving a toast, holding a beer and (4) mental activity, e.g. having fun with family, enjoying party, etc.

## 4.6 Results

### 4.6.1 Overall Preference

Firstly, the result of two-way ANOVA suggested that there was no significant main effect on overall preference for both versions of situations and genders, and there was no significant interaction.

### 4.6.2 Familiarity and Association

There was a significant main effect of version on association (difficulty on picturing oneself in the situation) in situation No.2,  $F(1,44) = 5.94$ ,  $p = 0.019$ , with post hoc test showing that version 1 ( $M = 4.63$ ,  $SD = 0.58$ ) received higher score than version 2 ( $M = 4.13$ ,  $SD = 0.90$ ),  $t(46) = 2.29$ ,  $p = 0.026$ . No interaction was found involving either familiarity or association with any other factors.

### 4.6.3 Comprehension

#### *Persons/Relationships*

The results showed significant differences among versions and genders. In terms of comprehension, there were more significant differences between two versions in (i)persons/relationships than other cues (Figure 13). This indicates that the design simplicity would cause

differences in understanding of the basic compositions in the situation, especially the perception on persons and relationships. With the same settings of characters, objects and environment, version 2 provided more details (e.g. hair, mouse, outfit and food) that identified the characters with specific gender, age, or social role in the group in the situation, narrowed down and limited the possibilities of different scenes in participants' prediction. Participants reportedly believed that the relationship was 'couple' in situation No.1 and 6, family in situation No. 2 and 5 when presented with version 2. On the other hand, when presented with version 1, participants tended to choose multiple options including 'couple' and other relationships (e.g. friends, co-workers or even strangers). For instance, there was a significant main effect of version on the item of 'couple' in situation No.1,  $F(1,44) = 4.62$ ,  $p = 0.037$ , with version 2 ( $M = 1$ ,  $SD = 0$ ) receiving higher score than version 1 ( $M = 0.83$ ,  $SD = 0.38$ ),  $t(46) = -2.15$ ,  $p = 0.037$ . There was no gender difference or interaction between gender and version in terms of persons/relationships.

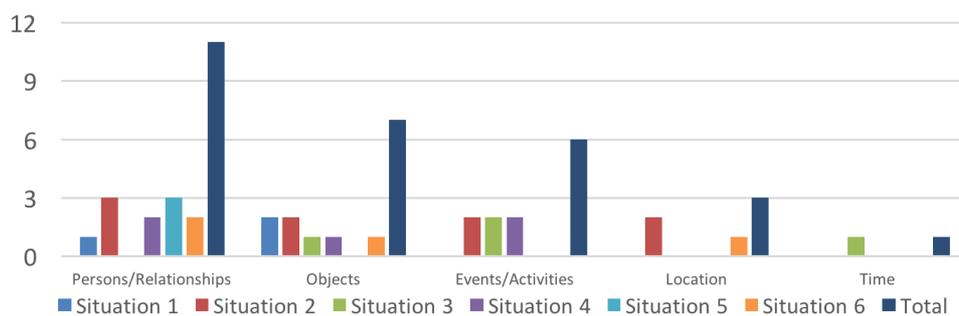


Figure 13: Amount of significant main effects of simplicity in comprehension cues [179]

### *Objects*

The participants noticed more objects in version 2 than version 1, such as cloth and food. This result is obviously predictable because version 2 has more details in terms of cloth and food. In situation No.6, only a significant main effect of gender was revealed on the item of 'food',  $F(1,44) = 7.47$ ,  $p = 0.009$ , with female ( $M = 0.64$ ,  $SD = 0.49$ )

receiving higher score than male ( $M = 0.26$ ,  $SD = 0.45$ ),  $t(46) = -2.79$ ,  $p = 0.008$ .

### *Events/Activities*

While asked to describe the events/activities in the situation, there was no significant difference in primary activity or mental activity, indicating that participants recognized the primary activity of 'eating food/having a meal' equally both in version 1 and 2, so as any mental activity statement such as 'having fun'. However, participants showed significant differences while describing secondary activity and specific actions. In the same situation, when 'secondary activity' received higher score in one version, 'specific action' always received higher score in the other version. For example, in situation No.2, two-way ANOVA yielded significant main effects of version on the item of 'secondary activity',  $F(1,44) = 5.68$ ,  $p = 0.022$ , with version 2 ( $M = 0.21$ ,  $SD = 0.41$ ) receiving higher score than version 1 ( $M = 0$ ,  $SD = 0$ ),  $t(46) = -2.46$ ,  $p = 0.018$ , and 'specific action',  $F(1,44) = 12.66$ ,  $p = 0.001$ , with version 1 ( $M = 0.67$ ,  $SD = 0.48$ ) receiving higher score than version 2 ( $M = 0.21$ ,  $SD = 0.41$ ),  $t(46) = 3.53$ ,  $p = 0.001$ . On the other hand, in situation No.3, version 1 was significantly higher on 'secondary activity', with version 2 receiving higher score on 'specific action'.

### *Locations*

There were significant main effects of version on 'restaurant' and 'home', indicating that version 1 tend to be perceived more like 'restaurant' than 'home', especially in situation No.2 and 6. For instance, in situation No.2, significant main effects of version were found on the item of 'home',  $F(1,44) = 16.14$ ,  $p < 0.001$ , with version 2 ( $M = 1$ ,  $SD = 0$ ) receiving higher score than version 1 ( $M = 0.63$ ,  $SD = 0.49$ ),  $t(46) = -3.72$ ,  $p = 0.001$ , and 'restaurant',  $F(1,44) =$ ,  $p < 0.001$ , with version 1 ( $M = 0.58$ ,  $SD = 0.50$ ) receiving higher score than version 2 ( $M = 0.08$ ,  $SD = 0.28$ ),  $t(46) = 4.24$ ,  $p < 0.001$ .

## *Time*

In situation No.3, there was a significant main effect of version on the item of 'late night',  $F(1,44) = 4.48$ ,  $p = 0.040$ , with version 2 ( $M = 0.96$ ,  $SD = 0.20$ ) receiving higher score than version 1 ( $M = 0.75$ ,  $SD = 0.44$ ),  $t(46) = -2.10$ ,  $p = 0.042$ .

### 4.6.4 Atmosphere

Gender effects were greater than version (simplicity) on atmosphere. Version effects were revealed in some situations. Version 2 received higher score than version 1 on all items of atmosphere. For example, In situation No.2, there were two significant main effects of version on the item of 'happy',  $F(1,44) = 15.87$ ,  $p < 0.001$ , 'warm',  $F(1,44) = 8.44$ ,  $p = 0.010$ , and on the item 'quiet and 'joyful' in situation No.4 and 5.

Gender effects were found in all situations. In situations with more than one characters, females tended to perceive more 'being together' feelings than male. For example, In situation No.1, there was a significant main effect of gender on the item of 'being together',  $F(1,44) = 7.99$ ,  $p = 0.007$ , with female ( $M = 0.88$ ,  $SD = 0.33$ ) receiving higher score than male ( $M = 0.52$ ,  $SD = 0.51$ ),  $t(46) = -2.91$ ,  $p = 0.006$ . The same main effects were also found with female receiving higher score than male in situation No.2, 4, 5 and 6. Female also received higher score than male on the item of other positive atmosphere such as 'joyful', 'free' and 'peaceful'. For example, in situation No.4, significant main effects of gender were revealed on the item of 'peaceful',  $F(1,44) = 6.58$ ,  $p = 0.014$ , with female ( $M = 0.56$ ,  $SD = 0.51$ ) receiving higher score than male ( $M = 0.22$ ,  $SD = 0.42$ ),  $t(46) = -2.53$ ,  $p = 0.015$ , and in situation No.5, female also received higher score on the item of 'joyful' and 'free'.

In situation No.3, there was an interaction of version and gender on the item of 'peaceful',  $F(1,44) = 4.19$ ,  $p = 0.047$ , showing that gender

effect was greater in version 2 than version 1. Male felt more peaceful in version 2, however, female felt more peaceful in version 1 relatively.

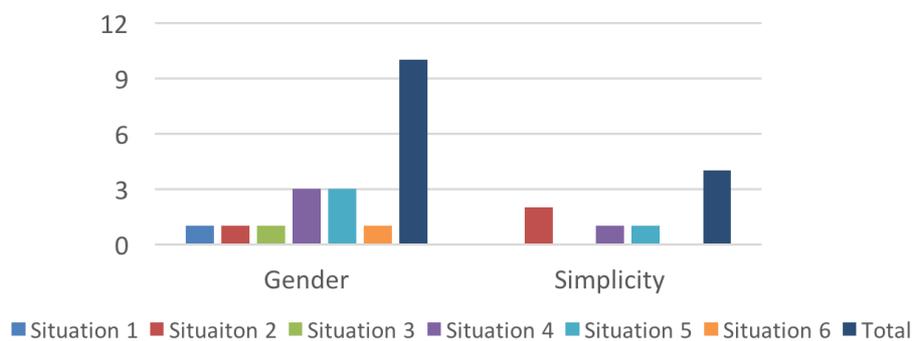


Figure 14: Amount of significant main effects of gender and design simplicity in atmosphere [179]

## 4.7 Discussion

### 4.7.1 Differences between Simple and Detailed Dining Situations

*H1a: The detailed dining situations are stronger in atmosphere and more specific in comprehension (Supported).*

The gap between two versions on the difficulty to associate the situation with own experience suggested that when a situation is too detailed, it is more difficult for participants to picture themselves and connect with their own experience. For instance, In situation No.2, the family members in version 2 could be typical but might not represent the same impression of a family for everybody.

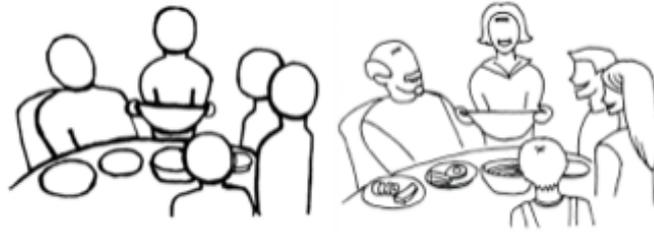
Among the cues of comprehension, it is found that concrete detailed design provided more information to help participants identify the characters in the situation. For example, by showing features such as hairs and outfit, participants tended to consider persons were couple or

family in certain situation, rather than giving more possibilities. The identification of characters influenced other cues such as location and time. In situation No.2, even though the environment settings were still the same with version 1, when the characters were considered more like ‘family’ in version 2, the ‘home’ was also selected more for location. In version 1, participants selected more ‘restaurant’ because the characters can also be friends or co-workers.

Specific objects could influence the identity of the character. In situation No.3, the character has a loosened shirt and a neck tie in version 2. This helped participants identify the character as a working man dressing a formal outfit. By narrowing down the identity, participants created a story in their mind for the character, who came back home from his company after a long day of work. When answering about the event/activity, participants in version 2 reported more ‘specific actions’, such as holding a drink, came back from work and sitting on the sofa. They also selected ‘late night’ more in version 2 than version 1. On the other hand, participants in version 1 reported more ‘secondary activities’, which is mostly ‘watching TV’ in this case. Although there was no TV in the situation, version 1 was perceived as a person with any identity who is watching TV.

The atmosphere scores suggested that when the situation is slightly different because of the certainly identified characters, the atmosphere participants felt also changes. For instance, in situation No.2 and 5, participants felt ‘happier’, ‘warmer’ and more ‘joyful’ when it looked like a family in version 2 rather than any other possibilities in version 1.

In overall, these observations supported H1a, showing that participants reported stronger responses of the atmosphere in overall in detailed dining situations, compared to the simple version. On the other hand, in terms of comprehension, detailed dining situations provided more specific understandings of the situation.



	Simple	Detailed
Comprehension	widely spread	more specific
Atmosphere	weaker	stronger

Figure 15: Summary of the results comparing the comprehension and atmosphere between simple/abstract and detailed/concrete dining situations.

#### 4.7.2 Differences in Males and Females

*H1b: Male and female are not different in understanding and reporting atmosphere from visualized dining situations (Partially rejected).*

There were few significant main effects of gender in comprehension, however, female participants received higher scores than male on the atmosphere items, which indicates that female perceive more and stronger atmospheres than male when presented with the situations. In situations with multiple characters, females selected the item ‘being together’ much more than males. Nevertheless, in specific cases, male could feel more or stronger atmospheres when they can associate themselves more. For example, in situation No.3, when the character was recognized as a man came back home from work, male participants felt more ‘peaceful’ than female participants.

Therefore, H1b was partially rejected. There was no gap between the comprehension in males and females. However, results showed that female and male are significantly different in responding to the

atmosphere of visualized dining situations. Females are more sensitive than males in feeling the atmosphere.



	male	female
Comprehension	-	-
Atmosphere	weaker	stronger

Figure 16: Summary of the results comparing comprehension and atmosphere between male and female participants.

#### 4.7.3 Selecting between Simple and Detailed Dining Situations

Basically, as the discussion above, when considering the simplicity of dining situation sketches, detailed dining situations provided more information that helped participants receive more oriented information. Participants more likely recognized the identification of characters in the situation, which are the most important cues in a situation. The simple version is good at letting participants associate themselves being into the situation. However, that does not necessarily cause a better and greater result in the atmosphere. On the contrary, detailed version evoked greater responses of the atmosphere than simple version. It is suggested that detailed version is better at creating atmosphere. Therefore, for future step of the study, detailed version of the dining situation sketches is more appropriate due to more specific and directed identification of the situation, and capability of creating stronger atmosphere.

On the other hand, female participants generally reported greater responses of the atmosphere. Future step of the study would consider female as a better target in terms of investigating atmosphere.

## **4.8 Summary**

In general, it is suggested that the design simplicity is very important in designing visualized situations. There is no certain threshold to determine whether simple design or detailed design is better. Images with more details and features could help us identify the character in the situation, narrow down the relationship, events/activities, location and time, lead us to a certain direction. However, in some cases a detailed design could make it difficult to associate, picture oneself being in the situation. Images with simple design could provide more possibilities and encourage more free imagination, help us associate ourselves with own experience. Situations with different design simplicity influence our comprehension, affect our understanding, and evoke different atmospheres. Gender effects should also be taken into consideration, especially when evaluating atmosphere. It should be discussed that whether the character's gender identity should be clarified or not when designing the situation.

Detailed version of dining situation sketches are considered to be more appropriate for future step of the study, considering the greater responses of atmosphere and more specific, directed recognition of the situations. Additionally, future step of the study should also focus on female participants considering the fact that in general, female participants were able to show stronger responses on the feelings of atmosphere.

# **Chapter 5: Exploring the Visualized Dining Situations: Towards a Better Understanding on the Specific Details and Atmosphere**

## **5.1 Background**

In Chapter 4, an experiment was conducted to see whether the simplicity of visualized dining situations affected participants comprehension and atmosphere. The results suggested that detailed dining situations provided more specific identification of characters, more informations, and led to stronger responses of atmosphere. We should consider design simplicity in the process of creating or applying visualized situations in practice or research, and in this study the detailed version is selected.

The difference of comprehension between the two versions (simple/abstract and detailed/concrete) might lead participants to a different direction on understanding the situations. Concrete detailed design provided more information to help participants identify the characters in the situation. For example, by showing features such as hairs and outfit, participants tend to consider persons are couple or family in certain situation, rather than giving more possibilities. The general differences between simple and detailed versions of dining situations were discussed, however, the specific details in the detailed version have not been explored yet. The analysis only suggested that detailed version received higher scores in atmosphere, but did not explain the reason why this happened. That being said, the analysis

process in this chapter intended to look deeper into the details, explore the relationship between specific details and atmosphere.

## **5.2 Objectives**

The objective of the analysis in this chapter is to understand the relationship between specific details and atmosphere in visualized dining situations.

**O1c:** To understand what specific visual details affected the atmosphere of the visualized dining situations.

## **5.3 Method**

### **5.3.1 General Method**

In this chapter, canonical correlation analysis was carried out to explore the relationship between visual elements in visualized dining situations and the atmosphere from the previous chapter. Furthermore, based on the result of canonical correlation analysis, several visual element factors and atmosphere's principle components were summarized, to reveal the specific effects of visual elements (details) on the evoked atmosphere.

### **5.3.2 Nonlinear Canonical Correlation Analysis (OVERALS)**

In studies in the field of Kansei science, Kansei engineering, design psychology, emotion research and customer studies, the necessity of examining the relations between data sets composed of categorical (nominal) variable groups is frequently and widely encountered.

Nonlinear canonical correlation analysis (OVERALS) method allows examination of relations among multiple number of categorical variable sets and structural similarities of the data set [161].

## 5.4 Analysis

### 5.4.1 Visual Elements in Dining Situations

After observing the 12 simple or detailed dining situations, visual element factors are listed as below:

1. *Person identity elements*
2. *Facial elements*
3. *Body parts elements*
4. *Object elements*

Moreover, the 4 general factors were divided into detailed factors, by creating questions as below:

1. *Person identity elements: is the character's gender shown clearly? Is the character an adult, a kid, or an elderly? How many people are in the situation?*
2. *Facial elements: does the face have mouth (smile, yawn), nose or ears?*
3. *Body parts elements: does the character have shoes, hands, or cloth?*
4. *Object elements: how many tableware are in the situation? How many cups, bins, and sharing bowls? How many tableware are being held by a person? Is there any food drawn in the tableware or not?*

Based on these questions, potential visual element factors were summarized as a list shown in Table 6. According to the meaning of the factors, a set of ordinal and nominal data could be calculated as the input of the visual element factors.

Table 6: Potential visual elements from 12 dining situations

<b>Factor</b>	<b>Meaning</b>	<b>Input</b>
Mouth/ NoseYN	Whether there are mouth and nose	Yes/No
Mouthsmile	Number of smile mouth	Number
Mouthyawn	Number of yawn mouth	Number
Nose	Number of nose	Number
Ears	Number of ears	Number
Shoes	Number of shoes	Number
Male	Number of males (with clear gender identity)	Number
Female	Number of females (with clear gender identity)	Number
HandsYN	Whether there are hands	Yes/No
Holdings	Number of holdings in hands	Number
ClothDetails	Number of cloth details	Number
People	Number of people	Number
ElderlyYN	Whether there are elderly	Yes/No
Elderly	Number of elderly	Number
KidsYN	Whether there are kids	Yes/No
Kids	Number of kids	Number
Tableware	Number of tableware in total	Number
Cups	Number of cups	Number
Bins	Number of bins	Number

Sharingbowls	Number of sharing bowls	Number
Platesbowls	Number of plates and bowls	Number
FoodYN	Whether there is food	Yes/No
Food	Number of food (1 plate with food count as 1)	Number

### 5.4.2 Correlation Analysis

First of all, a correlation analysis was carried out to observe and reveal the potential relationships between atmosphere and visual element factors. Visual element factors and atmosphere ratings of the 12 dining situations were collected into one data sheet and then the correlation analysis was conducted.

### 5.4.3 Nonlinear Canonical Correlation Analysis

Based on the result of correlation analysis, the visual element factors were simplified and adjusted, and a new set of the factors was concluded as set 1. Afterwards, the atmosphere ratings were used as set 2, in order to conduct a canonical correlation analysis. We used 15-dimensional solutions in this analysis at this point because there were 15 dependent variables.

## 5.5 Results

### 5.5.1 Correlation Analysis

Figure 17 shows part of the correlation matrix from correlation analysis, presenting the significant correlations between visual element factors and atmosphere.



## 5.5.2 Nonlinear Canonical Correlation Analysis

The Component loadings of the nonlinear canonical correlation analysis (OVERALS) are shown as Figure 18. Loadings with absolute value higher than 0.400 are highlighted with red or green colors. Red highlights the loadings with plus value and green highlights the loadings with minus value. Set 1 gathered the visual element factors defined in previous session (5.4.1 & Table 6). Set 2 is the group of atmosphere assessment. Figure 19 shows the eigenvalue of the dimensions.

		Component Loadings															
		Dimension															
Set		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
1	MouthNoseYNp1 <sup>a,b</sup>	-.107	.211	-.270	-.072	.405	-.390	-.032	-.173	.120	-.177	-.164	-.053	.089	-.076	-.057	
	Mouthsmilep1 <sup>a,b</sup>	-.369	-.148	-.128	.220	.294	-.293	.018	.091	.250	-.049	-.084	.000	.142	-.161	-.078	
	Mouthyawmp1 <sup>a,b</sup>	.222	.432	-.239	-.317	.250	-.230	-.062	-.327	-.092	-.188	-.136	-.071	-.023	.059	.002	
	Nosep1 <sup>a,b</sup>	-.118	.210	-.282	-.069	.409	-.394	-.033	-.179	.117	-.176	-.165	-.052	.088	-.079	-.057	
	Earsp1 <sup>a,b</sup>	.214	-.003	-.151	.033	.063	-.571	-.123	-.180	.170	-.205	-.107	.016	.126	-.115	-.005	
	Shoesp1 <sup>a,b</sup>	-.338	-.059	.482	-.189	-.159	.197	-.214	-.155	.017	-.008	-.223	.054	.129	-.033	.130	
	Malep1 <sup>a,b</sup>	-.284	-.052	-.068	-.179	.239	-.314	-.220	.202	-.138	-.236	.003	.204	-.102	-.102	-.001	
	Femalep1 <sup>a,b</sup>	-.555	-.238	.167	-.065	.126	-.046	-.193	-.057	.217	-.013	-.210	.037	.216	-.120	.020	
	HandsyNp1 <sup>a,b</sup>	.161	.097	.094	.113	-.004	-.518	-.090	-.179	.141	-.230	-.170	.029	.126	-.147	.046	
	Holdingsp1 <sup>a,b</sup>	.289	.689	.041	.301	.037	-.076	-.060	-.044	.032	.001	-.052	.037	.022	-.025	.007	
	ClothDetailsp1 <sup>a,b</sup>	-.009	-.020	.374	.142	-.184	-.324	-.139	-.149	.125	-.163	-.202	.074	.151	-.165	.112	
	Peoplep1 <sup>a,b</sup>	-.820	-.175	-.139	-.206	-.031	.046	.116	.046	.054	-.085	-.014	-.017	.007	.040	-.021	
	ElderlyNp1 <sup>a,b</sup>	-.378	-.151	-.135	.224	.296	-.295	.018	.089	.249	-.047	-.084	.001	.141	-.164	-.077	
	Elderlyp1 <sup>a,b</sup>	-.382	-.152	-.140	.226	.296	-.295	.017	.088	.248	-.046	-.084	.002	.140	-.165	-.077	
	KidsYNp1 <sup>a,b</sup>	-.602	-.387	.067	-.376	.129	-.105	-.007	.110	.090	.002	.043	-.048	.043	-.039	-.046	
	Kidsp1 <sup>a,b</sup>	-.566	-.390	.106	-.498	.042	-.016	-.016	.087	.008	.025	.080	-.052	-.004	.009	-.024	
	Tableware <sup>a,b</sup>	-.615	-.625	.076	.049	-.053	.033	.089	.025	-.004	-.053	.045	-.007	-.014	.072	-.004	
	Cupsp1 <sup>a,b</sup>	-.416	.687	.150	.137	.017	-.057	-.139	-.061	-.053	.080	.011	.030	-.021	-.018	.026	
	Binp1 <sup>a,b</sup>	.746	-.545	.019	.159	.028	-.004	-.015	-.004	-.026	.041	.009	-.007	.009	-.044	.003	
	Sharingbowsp1 <sup>a,b</sup>	-.453	-.172	-.371	.369	.040	-.034	.185	.006	.151	-.143	-.129	.029	.072	-.038	-.034	
	Platesbowsp1 <sup>a,b</sup>	-.673	-.414	-.066	-.366	-.045	.077	.091	.060	.010	-.048	.030	-.037	-.012	.049	-.016	
	FoodYNp1 <sup>a,b</sup>	.843	.107	-.262	-.148	-.078	.002	-.010	.017	.047	.024	-.077	-.019	.045	-.113	-.017	
	Foodp1 <sup>a,b</sup>	.469	-.048	-.106	.177	.359	-.135	.061	.064	.169	-.024	-.222	-.023	.137	-.267	-.031	
	Artstylep1 <sup>a,b</sup>	.038	.064	-.164	.124	.044	.371	.267	.266	-.169	.181	.239	-.048	-.204	.117	-.077	
	2	joyfulp1 <sup>a,b</sup>	-.844	-.236	.182	.015	-.180	-.017	-.279	-.071	-.293	-.024	-.099	-.062	.010	-.168	-.100
		livep1 <sup>a,b</sup>	-.758	-.457	-.475	-.084	.014	-.089	.203	-.078	-.026	.046	.010	.025	.071	.020	.045
		happyp1 <sup>a,b</sup>	-.590	-.128	.576	-.050	.191	-.369	.169	.007	.313	.119	-.029	-.038	-.054	-.036	.001
		peacefulp1 <sup>a,b</sup>	.077	-.127	.273	-.335	-.109	.430	-.175	.149	.399	-.290	.028	-.337	.139	.447	.073
		warmp1 <sup>a,b</sup>	-.630	-.122	-.110	.172	.253	-.125	-.487	.194	.264	-.058	.094	-.282	-.271	-.148	.134
		coldp1 <sup>a,b</sup>	.325	.182	-.147	-.184	.091	.083	.064	.063	.112	-.047	-.305	-.137	.252	-.508	-.318
refreshingp1 <sup>a,b</sup>		.059	.065	.154	-.487	-.149	-.030	.228	.136	-.204	-.076	.247	-.391	-.317	-.316	.164	
weirdp1 <sup>a,b</sup>		.142	.111	.014	.070	-.293	.117	.043	-.027	.330	-.384	.150	.635	-.243	-.273	-.020	
freep1 <sup>a,b</sup>		.074	-.226	.141	-.596	.160	.152	-.294	-.124	.104	.463	-.004	.313	-.089	.021	.157	
quietp1 <sup>a,b</sup>		.590	.212	-.043	-.204	.034	-.151	-.121	-.282	.117	-.372	-.206	.108	.091	.029	.308	
boringp1 <sup>a,b</sup>		.442	.107	-.112	-.173	-.022	-.120	-.073	-.150	.200	-.326	.127	.159	-.163	-.080	-.671	
lonelyp1 <sup>a,b</sup>		.699	-.477	.063	.118	-.107	-.150	-.121	.010	.046	.007	.187	-.025	.246	-.142	-.055	
emptyp1 <sup>a,b</sup>		.611	-.412	.049	.187	.152	.189	.107	-.164	-.006	-.233	-.073	.048	-.298	-.194	-.254	
crampedp1 <sup>a,b</sup>		.286	-.242	-.112	.158	-.498	-.195	.017	-.062	.199	.259	-.390	-.196	-.451	.062	-.315	
beingtogetherp1 <sup>a,b</sup>		-.548	.154	.152	.110	-.144	.081	.056	-.649	.241	.190	.299	-.243	-.052	-.227	.067	

a. Optimal Scaling Level: Single Nominal  
b. Projections of the Single Quantified Variables in the Object Space

Figure 18: Component loadings of OVERALS

		Summary of Analysis															
		Dimension															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Sum
Loss	Set 1	.052	.123	.195	.269	.324	.373	.469	.490	.546	.602	.587	.798	.784	.767	.916	7.293
	Set 2	.051	.121	.170	.250	.269	.285	.251	.255	.215	.196	.260	.103	.140	.170	.056	2.792
	Mean	.052	.122	.182	.259	.297	.329	.360	.373	.380	.399	.423	.450	.462	.468	.486	.486
Eigenvalue		.948	.878	.818	.741	.703	.671	.640	.627	.620	.601	.577	.550	.538	.532	.514	
Fit																	9.958

Figure 19: Eigenvalue of each dimension of OVERALS

Relationships and similarities among and within these 2 sets of variables, which were analyzed using OVERALS, are presented in Figure 18. Eigenvalue and fit value showing the similarities among sets are presented in Figure 19.

Eigenvalue indicates the level of relationship shown by each dimension. Maximum value of an eigenvalue is 1 with a minimum of 0 [161]. Eigenvalues are calculated using the squared canonical correlations. The largest eigenvalue is equal to largest squared correlation [162]. Eigenvalues obtained from the experiment were quite high (from 0.948 to 0.514).

Component loadings presented in Figure 18 give the correlations between object scores and optimal scaled variables. The coefficient of component loadings with absolute value higher than 0.400 are considered relatively high. In the figure, these coefficient are highlighted with red and green colors. In overall, there are multiple variables with colors (relatively high coefficient) shown in set 2 from dimension 1 to 15. However, for variables in set 1, only variables from dimension 1 to 6 are highlighted with colors, which are considered relatively high.

#### *Variables with Relatively High Coefficient in Each Dimension*

Dimension 1 (with highest eigenvalue of 0.948) showed most relationships from the variables both in set 1 and 2. In set 1, Cups(+), bins(+), foodYN(+), and food (+) indicated positive correlation. On the other hand, females(-), kidsYN(-), kids(-), people(-), tableware(-), sharing bowls(-) and plates/bowls(-) indicated negative correlations with dimension 1. In set 2, quiet(+), boring(+), lonely(+), empty(+), showed positive correlations and joyful(-), lively(-), happy(-), warm(-), being together(-) showed negative correlations with dimension 1. These variables are considered as the most effective variables in relationships among variable sets.

Dimension 2 revealed yawn mouth(+), holdings(+), cups(+), tableware(-), bin(-), plates/bowls(-) in set 1 and lively(-), lonely(-),

empty(-) in set 2 as the most effective variables in relationships among variable sets.

Dimension 3 only displayed shoes(+) with relatively high coefficient in set 1. Happy(+) and lovely(-) were displayed as most effective variables in set 2.

Dimension 4 also only indicated one variable, kids(+), as the most effective variable in set 1. On the other hand, refreshing(-) and free(-) were indicated in set 2.

Dimension 5 presented mouth/noseYN(+) and nose(+) in set 1, and cramped(-) in set 2 as the most effective variables to explain the relationship with the variable sets.

Dimension 6 showed ears(-) and hands(-) in set 1 and peaceful(+) in set 2 to define and explain the relationship in variable sets.

Warm(-), being together(-), free(+), weird(+), cramped(-), peaceful (+), cold(-), and boring(-) were also shown respectively in dimension 7, 8, 10, 12, 13, 14, 15. However, in these dimensions, there were no variables in set 1 showed relatively high coefficient.

## **5.6 Discussion**

### **5.6.1 Interpretation of Dimensions**

The adjective words used in the study could be interpreted by the participants in different, or multiple ways. In fact, when applying semantic assessment method, no matter how specific the word is, or how well the word is defined, one word would always be understood in different ways in different situations. Therefore, when interpreting and summarizing the meaning of dimensions, we should look at the correlated adjective words in a holistic way. Adjective word's

interpretation differs depending on the words they are correlated with in the same dimension. It is suggested that when interpreting the meaning of one adjective word, other correlated adjective words should be concerned to support the meaning of that word.

There are 15 meanings for the 15 dimensions to interpret and define [163]. However, in OVERALS, usually there are only 2 to 5 dimensions considered to be meaningful. First of all, as the result shown above, dimension 7 to 15 have only revealed relatively high coefficient in set 2. There is no variables in set 1 to show any relatively high coefficient. This indicates that we can define the meaning of dimension 7 to 15 based on the variables in set 2, however, since there are no correlated variables in set 1, we could not find any potential relations, similarities and links between visual element variables in set 1 and atmosphere variables in set 2. Therefore, the range of dimensions to be focused on was narrowed down to dimension 1 to 6.

Dimensions could be interpreted and defined by the variables with relatively high absolute value of coefficient in set 2, and the variables with relatively high absolute value of coefficient in set 1 would be considered more important as independent variables in the relations [163]. Based on this method, the meaning of the 6 dimensions are interpreted as below:

### *Dimension 1: Cheerfulness*

The first dimension is featured with adjective words like joyful, happy, lively, warm, being together on the negative pole and words of quiet, boring, lonely, empty on the positive pole. Adjective words like lively, warm and being together indicate that this dimension of atmosphere happens in situations in which people talk, celebrate, interact with each other. Lonely, empty and quiet represent the opposite of that. Joyful and happy indicate the feeling of enjoying the moment with positive atmosphere during the dining event, with boring being the opposite of this feeling. If we reverse the positive and negative, Basically, the meaning of this dimension could be interpreted as a feeling mixed by cheerful, bright, merry, festive and cheery. To

summarize, cheerfulness was picked up as the representation of this dimension.

### *Dimension 2: Social pressure, Alienation, Mentally Isolation*

Lively appeared in the relevant adjective words of Dimension 2 as well as Dimension 1, however, this time lonely and empty were also shown on the same side of lively. The atmosphere emerged in this dimension connected the feeling of lively but empty and lonely as well at the same time. In simple words, it is the feeling of loneliness even the person is not alone. It is a status that despite the surrounding is lively and noisy, the person is not alone, but he/she can still feel lonely and empty inside his/her mind. A person could be surrounded by people, yet feels uncomfortable to socialize, and alienated from the group. This kind of feeling is concluded as the feeling of social pressure, mentally isolated, alienated, and lack of fitting in the group in this study, to correlate and interpret the meaning of this dimension. Dining activities can always turn into a social event, and the pressure of socializing is a common aspect and important topic in recent years.

### *Dimension 3: Solo Unattended Happiness*

This dimension is featured by adjective word happy with positive correlation. Lively showed up again with negative correlation, which means the antonym of lively: calm, alone or muted. However, the similar synonym word quiet did not show obvious high coefficient, which means the adjective word lively in this dimension does not necessarily have to imply noisiness, it could indicate that the person felt not alone and surrounded by people. Therefore, we could sum up this dimension as the solo unattended happiness. Different from the cheerful, merry happiness in Dimension 1, this is the happiness a person feels when he/she is alone and unattended to any group, enjoying himself/herself.

#### *Dimension 4: Refreshment and Freedom*

Dimension 4 revealed refreshing and free as the highly correlated adjective words. These two words did not appear in any other dimensions except this one. Thus it is clear to conclude this dimension as the only one to represent the feeling of refreshing and free.

#### *Dimension 5: Cramp and Crowdedness*

This dimension suggested only one word as relatively high correlation: cramped. In addition, the word cramped did not appear in other dimensions' relevant list. Accordingly, Dimension 5 is translated as the feeling of crowded and cramped.

#### *Dimension 6: Peacefulness*

Similarly, peaceful is the only relevant adjective word in this dimension and did not appear as relevant adjective word in other dimensions. Hence Dimension 6 is defined as peacefulness.

### 5.6.2 Relevant Visual Element Variables in Each Dimension

After reversing and adjusting the dimensions, the list of dimensions and the relevant visual element variables was concluded as below: (“+” means positive effect to the dimension, and “-” means negative effect to the dimension. “\*” shows the elements with lower coefficient but close to 0.400 that are mentionable)

1st Dimension: Cheerful

(+)People, Females, Kids, Tableware

(-)food

2nd Dimension: Isolation

(+)Tableware

(-)holdings (cups)

3rd Dimension: Solo unattended happiness

(+)Shoes, Cloth\*

4th Dimension: Refreshing freedom

(+)Kids

5th Dimension: Cramped and crowded

(-)Mouth, Nose

6th Dimension: Peacefulness

(-)Ears, Hands

### 5.6.3 Relations between Visual Element Details and Atmosphere

#### *Composition of People and Atmosphere*

According to the results above, the number of people and the composition of the members in dining activity (for example, whether there are kids or females in the situation) are noticeably strong factors in the effect of atmosphere in dining situations. For instance, we can see a trend that if there are kids in the situation, the feeling of freedom and cheerfulness will be enhanced.

#### *Tableware, Holdings, Food and Atmosphere*

Tableware is also a strong factor in the effect of atmosphere. It is indicated that the more tableware in the sketch, the more participants feel cheerful. On the other hand, participants might also feel lively but lonely (i. e. isolated) in the same situation. However, if people are holding something (e. g., a cup) in the sketch, such feelings might be

weakened. More food did not improve any atmosphere, on the contrary, food is also found as a negative variable to the feeling of cheerfulness. This suggests that tableware played a more important role than food in the atmosphere in dining situations.

### *Facial Features, Body Parts of Persons and Atmosphere*

There are several facial features (e. g. mouth, nose, ears) and body parts (e. g. hands) of persons in the sketches revealed as effective variables that influence the atmosphere. Mouth and nose on the persons in the sketch might reduce the feeling of cramped and crowded, and drawing ears and hands might weaken the feeling of peacefulness. However, these effects are only found in the 5th and 6th dimensions, which is relatively weak and less convincing compared to others. Therefore, facial features and body parts are weak variables that only have potential effects in dining situations.

### *Clothing of Persons and Atmosphere*

Clothes and shoes were revealed as predictors to atmosphere, in the sense of 3rd dimension: solo unattended happiness. Although, clothes were relatively weak. This indicates that the outfit on the persons in a visualized dining situation might have potential effects on the atmosphere, make participants feel more happy and self focused.

## **5.7 Summary**

In this chapter, correlation analysis and nonlinear canonical correlation analysis (OVERALS) were conducted. The results were discussed in order to explore and scrutinize the potential relations and connections between visual elements and atmosphere. The relations and connections between these variables are not clear and yet have not been discussed very much by any other research.

Results have shown that in the visualized dining situation sketches, the composition of people (how many people, females and kids), tableware, holdings (cups, etc.) and food affected the atmosphere. People's facial features, body parts details and clothing are also potential factors to atmosphere. This partially explained the reason why detailed version of dining situations evoked more and stronger atmosphere, and proved that specific details have their specific effects on atmosphere in visualized dining situations.

Designers and researchers should be aware of these effects in the visualized situations. The results in this chapter enlightened us that the small details in the visual stimuli, such as the facial features of the characters, or whether the character is holding something or not, might influence people's impression of the whole illustration.

# Chapter 6: Study 2 - Color Preference and Choice of Tableware Color

## 6.1 Background

Study 1 has discussed people's understanding and responses of atmosphere from visualized dining situations, and explored the specific effects of visual element details on the atmosphere in addition.

In Study 2, color preference and the choice of tableware color are the main target that need to be discussed. Literatures have suggested that the pure color preference could be the best predictor to choice of product (Kareklas, Brunel and Coulter, 2014, [86]). On the other hand, other studies have argued that pure color preference (preference of a color when shown on the color chart) might be quite different from product color preference (preference of a color when the color is shown on a product) (Saito and Wada, 2009, [88]), or pure (universal) color association/impression (the impression and association of a color) is different from contextual color association/impression (the impression and association of a color when shown on a product) (Amsteus et al., 2015, [89]). These studies either only considered very limited types of colors, or could not filter out the other visual factors of the product such as shape or size. The relationship between pure color preference and product choice needs to be understood in a better way.

Study 2 intended to investigate the pure color preference of 8 colors extracted from real tableware product, and then understand how people select among these colors for tableware.

## 6.2 Objectives

First of all, the main objective of Study 2 is to clarify whether pure color preference is a significant predictor to choice for tableware color. Secondly, based on the observation of gender differences in Study 1, it is considered important to check the gender effect in this experiment as well.

**O2a:** Determine the gender effect in terms of pure color preference and choice for tableware color.

**O2b:** Clarify whether pure color preference is a significant predictor to choice for tableware color.

## 6.3 Hypotheses

In the literature, although it was suggested that pure color preference could be a significant predictor to choice of product, the study which gave this conclusion, only considered black and white. Other studies involving more colors have debated and suggested that pure preference or impression of a color might not be the same with the preference or impression when the color is presented on a product. We might consider that when selecting tableware color, there are many factors other than just the preference that affect the choice. Therefore, it is considered that in the case of tableware, when participants select the color for tableware, their initial, pure preference of the color might not be the primary factor that affect their decision.

In the study about color preference of cellphone, it was indicated that females were more open to various different colors as options for cellphone. In contrast, males only liked or accepted very limited options for cellphone colors (Saito and Wada, 2009, [88]). Therefore, it was predicted that in the case of tableware, similar tendency could be found that females might be more open to different options of tableware color compared to males.

**H2a:** Females have a wider range of interests in various colors than males when selecting tableware colors.

**H2b:** Pure color preference is not a significant predictor of choice of tableware color.

## **6.4 Method**

The basic method of this study was first evaluating the pure color preference of several colors, then observing how people select among these colors for tableware. Pure color preference would be assessed by 5-point Likert scale. ANOVA or Friedman analysis (depending on the result of normality test) would be carried out to determine the differences of pure preference between each color.

Choice of tableware color would be recorded and the reason of choosing the color would be asked to participants. Choice of tableware would be analyzed using test for change in binary data (Cochran's Q test for multiple samples and McNemar's test for 2 samples as post hoc pairwise comparison test). Logistic regression analysis would be conducted to determine whether the pure color preference, or the words of describing reasons are significant predictors of choice of tableware color.

## **6.5 Experiment**

### **6.5.1 Stimuli**

#### *Color*

In the literatures regarding tableware color, only limited number of colors were usually included in the experiment. For example, in the

study on tableware color and the effect on flavor by Harrar and Piqueras-Fiszman (2011), blue, green and red were chosen as the target color of tableware in comparison with white [59]. Other studies focused on color preference and colors on product also included two colors typically (e.g., black and white [86]; blue and black [89]). In this study, instead of using only 2 colors, more colors are used intending to expand the color hue range in order to obtain a better and more complete observation on colors and tableware. However, how to select colors is an important question.

If a research simply studies the perception of colors, the color samples could be extracted from the color chart, using the primary colors and bold colors. However, if the research considers the color of a specific product, the color should not be the primary colors from color chart, because in the real market, we might not be able to find the product with a primary color. For example, it can be assumed that we want to learn about how people react against color red on a car. We can pick up color red from the color chart, as the color sample. However, when we see a red car in real life, the red color on the car is always specifically adjusted by the designer of the car, with slightly pastel tone and low saturation for instance. It is difficult to study on color of product by only picking basic, primary colors from color chart, because in real life the product's color is always different.

On the other hand, it is difficult to involve all possible hues of colors, considering that some product might have different shades, tones and saturations. Attempting to involve all possible colors (with variations in different tones) for tableware would greatly increase the scale of the experiment, create too much stress and burden on the participants during the experiment.

Usually, white color is seen very commonly as the color for tableware, being the most common plate color in our daily life. However, in this study, white color is excluded. Considering people's level of familiarity of white plates being much higher than other colors, including white color in the samples might affect the balance of participants' choice of tableware.

Therefore, it was considered that the colors should be extracted from real tableware product in the market, with limited number of colors but as much variations as possible, excluding color white. A Japanese household goods brand called CORAZYS, who has with the most color variations on the market, provided their tableware product for this research [164]. Below is a simple introduction about part of the procedure of how the brand designed the colors for tableware:

At first, a group of designers were presented with pictures and real product of colored tableware for reference. After brainstorming and discussing on the meaning and association of colors considering various aspects such as lifestyle, seasons and culture, the designers selected 4 colors: pink, green, orange and blue.

In previous study on colors and emotions, it was found that the saturation of color evidenced strong and consistent effects on emotions [69]. Therefore, in addition, to understand the effect of not only the hue of color, but also the saturation of color, two versions of the 4 colors were included: light and dark (low and high saturation). In total, 8 colors were selected as the colors of tableware (and also other household goods). The color codes were decided by designers, considering the process of making colored tableware with these colors and how they actually look like on a real product. The color codes were recorded for reproducing and re-printing in the future study (Figure 20). The codes of the 8 colors in Munsell Color System are: C1 light pink: 10.0P 8.00/4.0; C2 dark pink: 2.5R 6.00/10.0; C3 light green: 10.0GY 8.00/4.0; C4 dark green: 10.0GY 6.00/6.0; C5 light orange: 5.0YR 6.00/8.0; C6 dark orange: 9.0R 5.00/11.0; C7 light blue: 10.0B 8.00/5.0; C8 dark blue: 6.0PB 3.00/8.0.

As a result, the 8 tableware colors from this brand are considered as the best options to fit the objectives of this research. In overall, 8 colors are not too much for participants to interact with. The 8 colors could be approximately categorized into 4 major color hues, with low and high saturation, which are expected to have different impressions, cultural elements or associations. All these 8 colors are from the same

brand, which indicates that the producing procedure is consistent among all colors. Figure 20 shows the 8 color samples of the tableware.

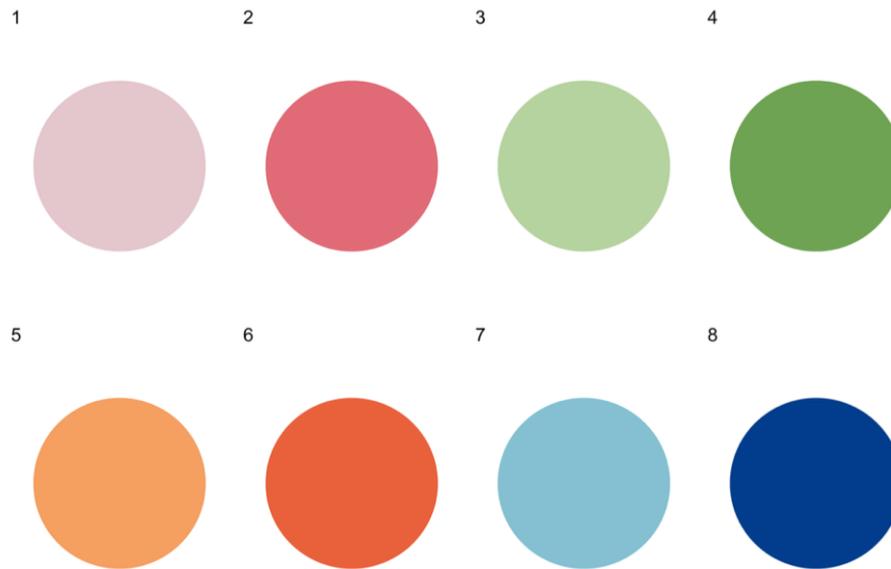


Figure 20: Color samples

### 6.5.2 Participant

50 Participants ( $M = 30.50$  years old,  $SD = 8.90$ ) attended the experiment and submitted answers. Among them, there were 23 males and 27 females. All participants passed color vision test using Ishihara PseudoIsochromatic Plates [165].

### 6.5.3 Measurement

The pure color preference was measured using 5-point rating Likert scale, ranged from 0 to 4. 0 stands for “dislike the color very much”; 1 means “dislike the color a little”; 2 is neutral; 3 means “like it a little” and 4 represents “like it very much”.

Choice of tableware color was recorded by asking participants to select freely among the 8 colors, and then write down the color numbers.

Open-ended free comments were also used as the last question for participants to explain the reason why they selected certain colors in their own words.

#### 6.5.4 Experimental Settings

##### *Color Presentation Materials*

In previous research, it was argued that the design of the product such as shape of the cellphone might have caused the gap between pure color preference and product color preference. Considering the effects of shapes and textures of tableware being the outside factors aside from colors, instead of showing participants real products, the color samples were presented to participants in a geometric round circle on printed materials.

To provide good quality printing for color stimuli, photo papers were used instead of normal printing papers. Usually, glossy and matte are the two common types of photo papers. However, neither glossy nor matte is perfect to present the color for the original plates, because that these colors were extracted from plates and participants were indicated to associate mainly plates or bowls as target tableware. Therefore, semi-glossy (silky) photo paper was chosen for printing the colors. Each color stimulus was printed on a semi-glossy paper in A4 size (210 x 297 mm), in a circle with diameter of 15.5 cm (shown as Appendix A).

##### *Experimental Environment*

The experiment was set up in a small room located in the building of Advanced Research Laboratories of University of Tsukuba, on the fourth floor. The room is approximately 11.5 m<sup>2</sup>, usually used for academic seminar, students' group activity or personal works. Inside the

room, apart from the white board on the wall, there are only white colored desk and several black colored chairs for participants to conduct the experiment and answer the questionnaire. The windows of the room are all covered by using grey curtains no matter what time period during the day. The lightings of the room are regular 45 Watt LED white light tubes. In general, the height of regular dining table is considered around 30 inches, which is 76 cm. The chair is around 18 inches, which is 45 cm. The desks and chairs in the experiment room basically match the regular sizes of dining table and chair, with the height of 71 cm and 45 cm.

Therefore, the experimental environment settings are designed to reproduce the real life dining experience in terms of the size of stimuli and height of the furnitures. On the other hand, it was also intended to avoid effects of other factors by making the environment as simple as possible and controlling the lighting conditions.

### 6.5.5 Procedure

Firstly, participants were presented with the 8 colors in random orders. Each color has a number on the left top of the paper. The colors were presented in a geometric round circle. After observing each color sample, participants were indicated to rate their preference of the color using the 5-point Likert scale.

Secondly, after rating their pure preference of the colors, participants were told that these colors were tableware colors. They were asked to answer the colors (single or multiple) they would like to use as tableware in their daily life. Participants were indicated to consider tableware basically as the plates or bowls. In previous research, it was argued that the design of the product such as shape of the cellphone might have caused the gap between pure color preference and product color preference. Therefore, in order to eliminate this effect, the colors were presented in a geometric round circle, in stead of real tableware product images. At this phase of the experiment, participants

were informed that the colors were for tableware, but no tableware visual stimuli was presented to them. They chose the colors based on what they see in the color samples.

Finally, following the choice of tableware color, the questionnaire asked participants to write down the reason why they chose certain colors in their own words.

### 6.5.6 Analysis

#### *ANOVA or Friedman Test*

Test for normality (Kolmogorove-Smirnov method) was carried out to determine whether the data of pure color preference ratings was normally distributed. Afterwards, based on the result, either ANOVA or Friedman analysis would be conducted to determine whether there were significant differences between the pure color preference among the 8 colors, in terms of males and females.

#### *Logistic Regression Analysis*

The dependent variable in this study, is the choice of tableware color. In both Study 2 and Study 3, the choice of tableware color was a very free and open procedure for the participants. Participants were indicated to select one or multiple colors from the 8 options. The recording of this data would be a binary categorical data, which is either 1 or 0, representing whether a participant selected or did not select a specific color. For example, if a participant chose C1 (light pink), then the binary value of light pick is  $C1 = 1$ . If he/she also chose C2 (dark pink), then for dark pink it is  $C2 = 1$ . If he/she did not select C3 (light green), the binary value of light green is  $C3 = 0$ .

Usually when it comes to analyzing the effects of multiple independent variables on a dependent variable, and exploring which of them have a bigger effect, multiple regression analysis would be carried out. However, in this case, the dependent variable is categorical data.

Discriminant analysis could be considered as a relevant tool, but it requires the independent variables to be normally distributed.

Logistic regression analysis extends the techniques of multiple regression analysis to research in which the outcome is categorical [166]. It measures the relationship between categorical dependent variable and one or more independent variables by estimating probabilities using a logistics function, which is the cumulative logistic function [167]. Logistic regression analysis is an alternative to linear discriminant analysis [168], however, it does not require the multivariate normal assumption of discriminant analysis [169]. If the result of normality test suggests that the variables of atmosphere are not normally distributed, then logistic regression analysis should be chosen as the analysis method, to determine the relationship between the binary dependent variable, a.k.a. choice of tableware color, and preference, atmosphere, etc.

Due to the result of normality test (which would be shown in results section), logistic regression analysis was conducted to determine whether the pure color preference affected choice of tableware color. For each color, the pure color preference ratings using Likert scale were set as the independent variables, and whether they chose or did not choose the color was set as the dependent variable (selected = 1, did not select = 0).

### *Open-ended Questions and Word Usage*

For open-ended free comments, the phrases and sentences participants used to describe the reasons why they chose the colors were categorized into single vocabulary words. Only noun, verb and adjective words were extracted from the sentences. For example, a participant described the reason as “because this color is warm, and it compliments the food”, the word “warm”, “compliment” and “food” were extracted. All words were collected to build a database of “words to describe reasons”. Logistic regression analysis was conducted again to see whether there are tendencies for participants to use similar words to describe the reason why they chose a certain color. In this case, whether

they chose or did not choose the color (word usage) was the dependent variable (selected = 1, did not select = 0), and the independent variables are whether the participant used the words in the database of “word usage” (used the word = 1, did not use the word = 0). For instance, if the participant’s extracted words are “warm”, “compliment” and “food”, then the score of this participant case is “warm = 1”, “compliment = 1” and “food = 1”, and for all the other words in the database that did not appear in this participant’s answer, the score would be 0.

## 6.6 Results

### 6.6.1 Pure Color Preference

First of all, test of normality using Kolmogorove-Smirnov method showed that most of the pure color preference rating scores distributions were non-parametric ( $p < 0.05$ ). Therefore, Friedman test was conducted to determine whether there were significant differences between the pure preference of color samples.

#### *Male*

Among the male participants, C8 (dark blue) was their favorite color ( $M = 3.30$ ,  $SD = 1.02$ ), with an average rating of 3.30 (max = 4). C1 (light pink) and C3 (light green) were their least favorite colors, with C1 (light pink) rated 2.09 out of 4 ( $M = 2.09$ ,  $SD = 1.00$ ), and C3 (light green) rated 1.83 ( $M = 1.83$ ,  $SD = 1.19$ ). In general, the 8 colors were rated positive in terms of preference. Apart from the least favorite color being rated as slightly negative (C3 = 1.83), all the other colors were all rated likable ( $M > 2$ ).

Friedman test yielded a significant difference ( $p < 0.001$ ) that indicated there were significant differences between the scores of pure color preference in males.

Following up the Friedman test, post-hoc analysis using Wilcoxon signed-rank test was carried out (Figure 21). The pure color preference rating score of C1 (light pink) was rated significantly lower than 5 colors: C2 (dark pink) ( $\Delta = 1.63$ ,  $p = 0.024$ ), C4 (dark green) ( $\Delta = 2.02$ ,  $p = 0.005$ ), C6 (dark orange) ( $\Delta = 1.96$ ,  $p = 0.007$ ), C7 (light blue) ( $\Delta = 1.65$ ,  $p = 0.022$ ) and C8 (dark blue) ( $\Delta = 2.72$ ,  $p < 0.001$ ). The second relatively less preferred color is C3 (light green), which was rated significantly lower than 5 colors: C2 (dark pink) ( $\Delta = 1.83$ ,  $p = 0.011$ ), C4 (dark green) ( $\Delta = 2.22$ ,  $p = 0.002$ ), C6 (dark orange) ( $\Delta = 2.15$ ,  $p = 0.003$ ), C7 (light blue) ( $\Delta = 1.85$ ,  $p = 0.011$ ) and C8 (dark blue) ( $\Delta = 2.91$ ,  $p < 0.001$ ). C5 (light orange) was also rated significantly lower than C8 (dark blue) ( $\Delta = 1.72$ ,  $p = 0.017$ ) (see Figure 21).

The results showed that in general, male participants specifically preferred dark blue, light blue, dark orange, dark green and dark pink. Light green and light pink are the least favorite, followed by light orange. There is a tendency that male participants liked blue colors pretty much, and have obvious preference on dark colors over light colors.

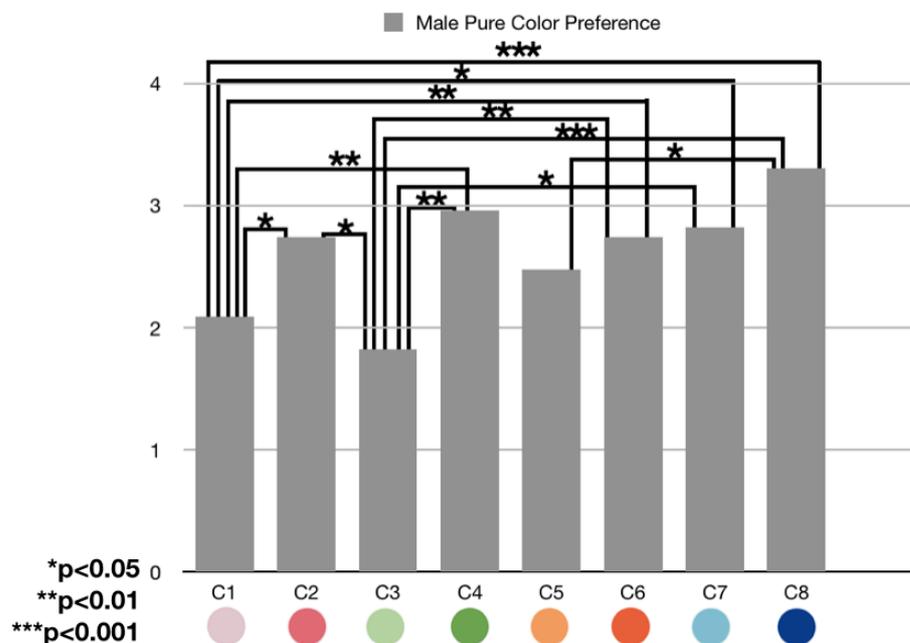


Figure 21: Pure color preference by male

## *Female*

Among the female participants, C7 (light blue) was their favorite color ( $M = 2.96$ ,  $SD = 1.02$ ), and C4 (dark green) was their least favorite color ( $M = 2.11$ ,  $SD = 1.28$ ).

Friedman test yielded a significant difference ( $p = 0.43$ ) that indicated there were significant differences between the scores of pure color preference in females.

Following up the Friedman test, post-hoc analysis using Wilcoxon signed-rank test was carried out (Figure 22). The pure color preference rating score of C4 (dark green) was rated significantly lower than 2 colors: C7 (light blue) ( $\Delta = 1.70$ ,  $p = 0.011$ ), and C8 (dark blue) ( $\Delta = 1.57$ ,  $p = 0.018$ ). The second relatively less preferred color is C6 (dark orange), which was rated significantly lower than C7 (light blue) ( $\Delta = 1.61$ ,  $p = 0.016$ ), and C8 (dark blue) ( $\Delta = 1.48$ ,  $p = 0.026$ ) (see Figure 22).

Female participants did not showed as much of differences in the pure color preference among the 8 colors as male participants. For females, blue colors were they favorite, and in contrast to males taking dark green as the second favorite color, females reported dark green as their least favorite color. Compared to males, females' pure color preference did not show many gaps among the colors.

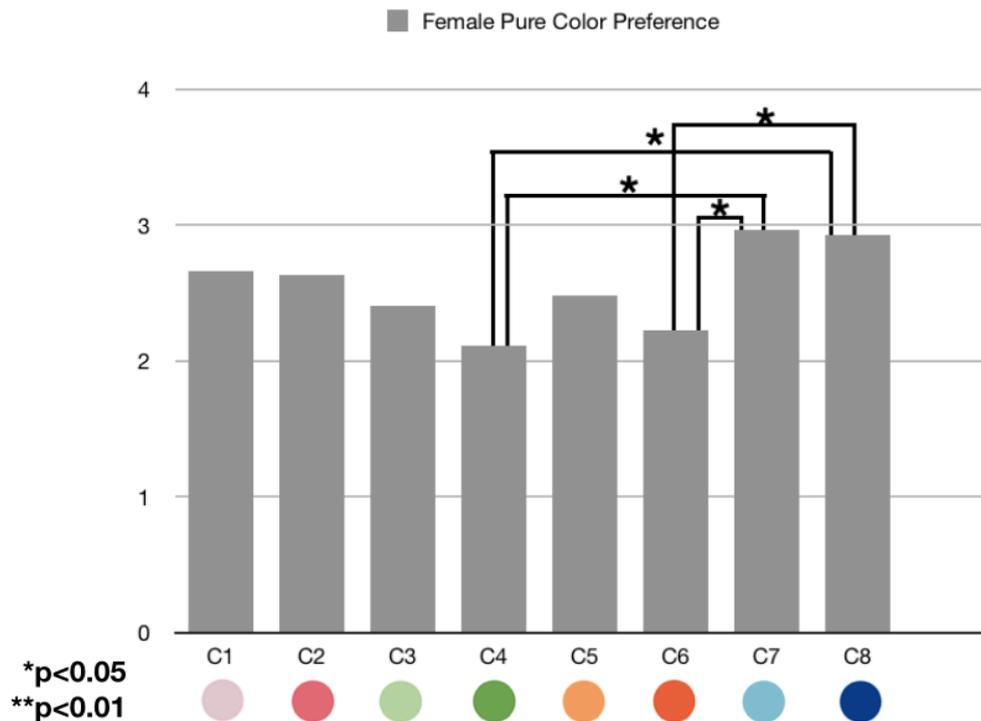


Figure 22: Pure color preference by female

### 6.6.2 Choice of Tableware Color

The choice of tableware color was a question allowing participants select multiple colors as much as they want. The average rate of participant choosing each color was evaluated as how popular the color is among participants. Therefore, 0 is the minimum value of the chosen rate, indicates no participants selected the color; 1 is the maximum value, indicates all participants selected the color. Since the data type is binary, tests for change in binary data (Cochran's Q test for multiple samples and McNemar's test for 2 samples as post hoc pairwise comparison test) were conducted.

#### *Male*

First of all, male participants selected 2.09 colors on average. Colors have an average rate of 0.26 for being selected. Figure 23 shows the result of choice of tableware color by males. As shown in the figure,

C8 (dark blue) was the favorite color among males, with the highest chosen rate of 0.56, suggesting that more than half of the male participants selected dark blue as their favorite tableware color or one of their favorite tableware colors. The second most chosen colors were C4 (dark green), C5 (light orange) and C7 (light blue), with a chosen rate of 0.26, indicating that 26% participants selected dark green, light orange or light blue. C1 (like pink) was the least chosen color, with a chosen rate of only 0.08.

Test for change in binary data using Cochran's Q method revealed a significant difference among the distributions of the choice of 8 colors ( $p = 0.046$ ). Pairwise comparisons revealed significant differences among the choice of all 8 colors (see Figure 23).

Apparently, C8 (dark blue) was the most chosen color for tableware among male participants. Pairwise comparisons showed that C8 (dark blue) was chosen significantly more than all the other 7 colors: C1 (light pink) ( $p < 0.001$ ), C2 (dark pink) ( $p = 0.009$ ), C3 (light green) ( $p = 0.009$ ), C4 (dark green) ( $p = 0.023$ ), C5 (light orange) (0.023), C6 (dark orange) ( $p = 0.009$ ) and C7 (light blue) (0.023). There was no significant difference among the other 7 colors, which indicates that apart from dark blue, all the other colors were chosen equally frequently.

In overall, male participants specifically preferred dark blue as their tableware color, more than half of the participants selected dark blue, and significantly more than any other colors. The differences among the other 7 colors were not found. In contrast to the results of pure color preference, which showed a lot significant differences in-between different colors, choice of tableware color did not show any significant differences among the colors except dark blue.

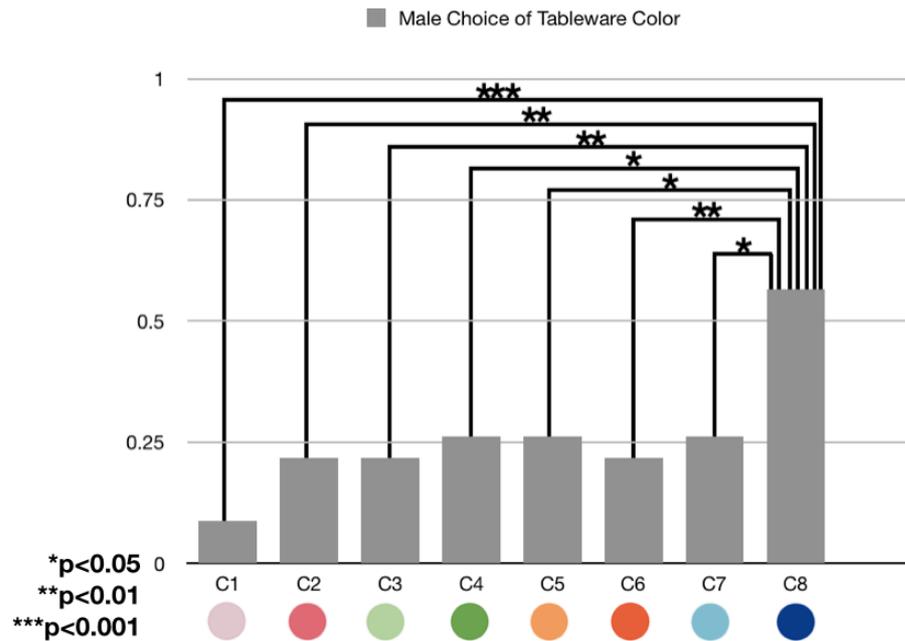


Figure 23: Choice of tableware color by male

### Female

First of all, female participants selected 2.56 colors on average. Colors have an average rate of 0.32 for being selected. Figure 24 shows the result of the choice of tableware color by female. C1 (light pink) and C7 (light blue) were their favorite colors as tableware, with chosen rate more than 0.5 (C1 = 0.52, C7 = 0.56). However, C3 (light green) and C5 (light orange) were also chosen by many participants (C3 = 0.48, C5 = 0.41). The chosen rate of all of these 4 colors were higher than 0.40, and they all belong to different color hues (pink, green, orange, and blue). However, it is notable that between light color and dark color in the same color hue, female participants selected light color more than the dark version of the color.

Test for change in binary data using Cochran's Q method revealed a significant difference among the distributions of the choice of 8 colors ( $p < 0.001$ ). Pairwise comparisons revealed significant differences among the choice of all 8 colors (see Figure 24). Being the most popular color among females, choice of C7 (light blue) was significantly higher than the 4 dark colors: choice of C2 (dark pink) ( $p = 0.009$ ), C4 (dark green) ( $p < 0.001$ ), C6 (dark orange) ( $p < 0.001$ ) and C8 (dark blue) ( $p =$

0.004). Choice of C1 (light pink) was also significantly higher than the same 4 dark colors: choice of C2 (dark pink) ( $p = 0.020$ ), C4 (dark green) ( $p < 0.001$ ), C6 (dark orange) ( $p \leq 0.001$ ) and C8 (dark blue) ( $p = 0.009$ ). Similarly, choice of C3 (light green) was also significantly higher than the same 4 dark colors: choice of C2 (dark pink) ( $p = 0.041$ ), C4 (dark green) ( $p = 0.001$ ), C6 (dark orange) ( $p = 0.004$ ) and C8 (dark blue) ( $p = 0.020$ ). Finally, choice of C5 (light orange) was significantly higher than choice of C4 (dark green) ( $p = 0.009$ ) and C6 (dark orange) ( $p = 0.020$ ).

Clearly, the results suggest that female participants preferred light (pale) colors to dark colors when choosing colors for tableware. There were not significant differences within the dark colors, or the light colors, however, the choices of all 4 light colors were almost significantly higher than choices of all dark colors. All 4 light colors showed a chosen rate close to 0.5, and all 4 dark colors were chosen with a lower rate than 0.25.

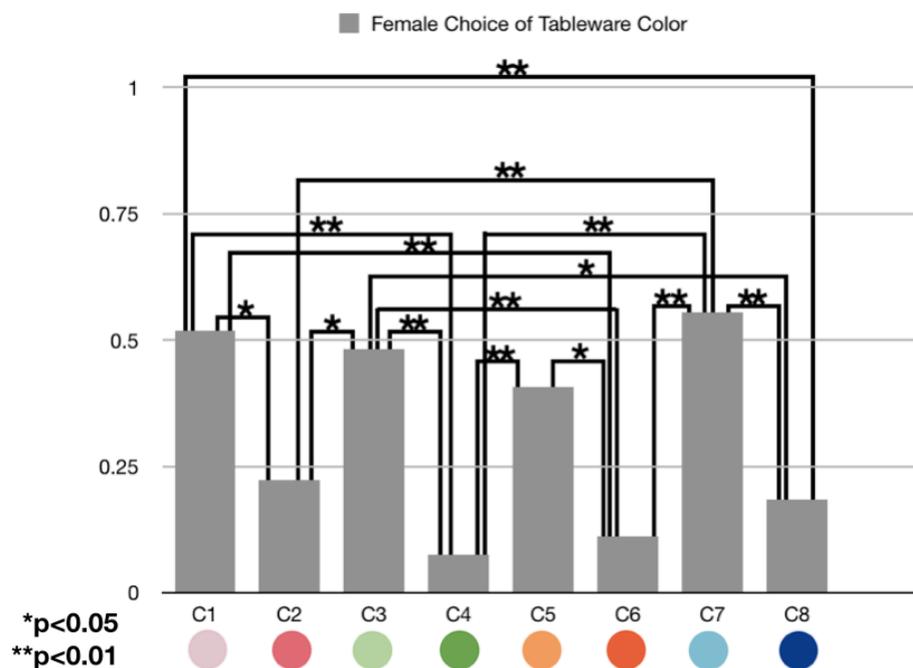


Figure 24: Choice of tableware color by female

The results suggest that female participants were more open to different color hues as their options for tableware colors, compared to

male participants. 2.56 colors were selected on average by each female participant, compared to 2.09 colors by each male participant. Male participants specifically selected dark blue a lot, and all the other colors were chosen at a similarly low frequency (lower than 0.27) among males. On the other hand, female participants showed a wider range of interests in various tableware colors, by choosing light pink, light green, light orange and light blue a lot. However, female participants showed a tendency that they preferred light colors to dark colors in terms of tableware color.

### 6.6.3 Logistic Regression Analysis on Pure Color Preference and Choice of Tableware Color

A series of binary logistic regression analysis were conducted to test the effects of pure color preference on choice of tableware colors (see Table 7, Table 8).

For male participants, no significant predictors were found in the pure color preference of each color in the effect on choice of tableware color. Pure color preference could not contribute to building a model to predict choice of tableware color.

For female participants, pure color preference was found as significant predictor of choice of tableware color in the case of some colors. The pure color preference of C1 (light pink) ( $B = 1.177$ ) was significant predictor of choice of light pink as tableware color (Table 7). The pure color preference of C3 (light green) ( $B = 1.023$ ) was significant predictor of choice of light green as tableware color (Table 8). Pure color preference was not found as significant predictor of choice of tableware color in the case of the other 6 colors.

Table 7: Binary logistic regression analysis result C1 (light pink), female, pure color preference

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
Pure color preference of C1 (light pink)	1.177	0.487	5.835	3.244	0.016*
Constant	-3.088	1.411	4.791	0.029	0.046*

Table 8: Binary logistic regression analysis result C3 (light green), female, pure color preference

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
Pure color preference of C3 (light green)	1.177	0.402	6.478	2.783	0.011*
Constant	-2.634	1.147	5.275	0.072	0.022*

In overall, pure color preference was not a significant predictor of choice of tableware color. In males, there was no effects found. On the other hand, in females, only 2 out of the 8 colors were found with specific effect of pure color preference on choice of tableware color. Only for females, when they choose light pink and light green as their tableware color, their pure preference of the color might have impact on their decision making.

	male	female
		C1: B=1.17 p=0.016 *
		C3: B=1.02 p=0.011 *

Figure 25: Using pure color preference to predict choice of tableware color: in 16 trials, only 2 colors in females have shown significant relationship between pure color preference and choice of tableware color.

#### 6.6.4 Logistic Regression Analysis on Word Usage in Describing the Reasons and Choice of Tableware Color

A series of binary logistic regression analysis (method: forward step) were conducted to test the effects of word usage in describing the reason of choosing colors on the actual choice of tableware color (see Table 9, Table 10).

For male participants, no significant predictors were found in the word usage for each color in the effect on choice of tableware color. Word usage could not contribute to building a model to predict choice of tableware color.

For female participants, word usage was found as significant predictor of choice of tableware color in the case of some colors. In C4 (dark green), the word “bold” (B = 3.481, p = 0.028) was significant predictor of choice of dark green as tableware color (Table 9). When female participants select dark green as their tableware color, they significantly used the word “bold” to describe the reason. On the other hand, in C5 (light orange), the word “light” (B = 1.910, p = 0.029) significantly predicted choice of light orange as tableware color (Table

10). When selecting light orange as tableware color, female participants significantly used the word “light” to describe the color light orange as one of the reasons of why they selected color light orange. In the case of the other 6 colors, there were no significant effects of the word they used to describe the reasons on the actual choice of tableware color.

Table 9: Binary logistic regression analysis result C4 (dark green), female, word usage in describing reasons

<b>Criterion variable: Choice of tableware color</b>					
<b>Predictor variable(s)</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>Exp(B)</b>	<b>Sig.</b>
bold(color)	3.481	1.586	4.818	32.500	0.028*
Constant	-4.174	1.008	17.161	0.015	0.000***

Table 10: Binary logistic regression analysis result C5 (light orange), female, word usage in describing reasons

<b>Criterion variable: Choice of tableware color</b>					
<b>Predictor variable(s)</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>Exp(B)</b>	<b>Sig.</b>
light(color)	1.910	0.877	4.745	6.750	0.029*
Constant	-2.197	0.430	26.070	0.111	0.000***

Similarly as the effect of pure color preference on the choice of tableware color, the word usage in open-ended free comments showed very little tendencies on the choice of tableware color. There were no significant predictors found in males’ results, and only 2 colors showed significant predictors in females’ results.

Females had a clear preference on light colors over dark colors in the choice of tableware color. An additional analysis was carried out to explore the reason. Logistic regression analysis was conducted, using participant’s words usage from open-ended free comments as the independent variables, and whether participants selected light colors or

dark colors and the dependent variable (light colors = 1, dark colors = 0). Table 11 shows the result of logistic regression analysis on the effect of word usage on whether light colors were chosen or dark colors were chosen. In the predictor model, we can see that participant specifically used the word “bold” ( $B = -2.569$ ,  $p = 0.002$ ) to describe the reason why they chose dark colors. Therefore, we can only say that participants significantly used “bold” to describe the dark colors when they choose the dark colors as tableware colors.

Table 11: Binary logistic regression analysis result light/dark colors, all participants, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
bold(color)	-2.569	0.833	9.513	0.077	0.002**
Constant	1.183	0.262	20.343	3.263	0.000***

Afterwards, in order to see why female participants selected light colors much more than the dark colors, the same logistic regression analysis was carried out by only using female participants’ responses. Table 12 shows female participants tendencies of word usage on selecting light colors or dark colors. As shown in the table, in the predictor model, female participants particularly used the word “relaxing” and “powerful” to describe the reason why they chose dark colors. However, only “relaxing” was significant ( $B = -2.120$ ,  $p = 0.031$ ), and “powerful” showed a tendency to be significant ( $B = -2.408$ ,  $p = 0.059$ ). Therefore, female participants significantly used the word “relaxing” to describe the reason why they chose dark colors. There were no significantly used words that explained why female participants select light colors.

Table 12: Binary logistic regression analysis result light/dark colors, female participants, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
relaxing (color)	-2.120	0.982	4.611	0.120	0.031*
powerful (color)	-2.408	1.277	3.555	0.090	0.059
Constant	1.715	0.362	22.428	5.556	0.000***

## 6.7 Discussion

### 6.7.1 Differences between Male and Female in Pure Color Preference and Choice of Tableware Color

*H2a: Females have a wider range of interests in various colors than males when selecting tableware colors (Supported).*

First of all, the results of pure color preference suggest that among the 8 colors, males have shown a lot differences among the pure color preferences. On the other hand, females showed less significant differences among the pure color preferences. Different from males, the pure color preferences of 8 colors were all rated between 2 (neutral) to 3 (like it a little), with smaller gaps. Therefore, females generally liked the 8 colors and did not show great differences in the ratings of pure color preference compared to males.

The results of choice of tableware color also suggest that males obviously preferred dark blue over other colors, and there were no differences among the other colors. On the other hand, female showed interests in all 4 color hues (pink, green, orange and blue), by selecting the 4 light colors a lot. Males selected 2.09 colors on average, while females selected 2.56 colors on average. Colors have an average chosen

rate of 0.26 by males, on the other hand, they have an average chosen rate of 0.32 by females. The results suggest that females do have a wider interest in various colors compared to males when selecting tableware colors. It agrees with previous research in which it was stated that females have wider interests in different colors on cellphone compared to males. However, the tendency of females' preference on light colors over dark colors should be noticed.

It is shown that when observing the colors without any information about the context, females have smaller gaps among the 8 colors compared to males, in terms of pure color preference. However, when they were told that the colors were for tableware, females showed a clear tendency of the preference on light colors over dark colors for tableware, but they still accepted different color hues among pink, green, orange and blue. On the other hand, males preferred dark blue as tableware color, but the other colors appeared to be the same as tableware colors in terms of choice.

Following literatures, the results of this study showed evidence that females actually accepted more various color options in general, in the case of tableware colors. Males showed tendency that they had strong preferences among colors, and only preferred dark blue specifically for tableware. In the tableware market, the strategy of increasing different color hues might work well with female customers, but might not work well with male customers. It is predictable that there will be a tendency for females to buy different colors and combinations for tableware, specifically with light colors, but on the other hand males might only buy dark blue as their tableware.

### 6.7.2 Why Females Prefer Light Colors for Tableware

An additional finding is that when considered the colors for tableware product, females significantly preferred the light colors to dark colors, with clear gaps between them (see Figure 24).

The reason why light colors are more preferable for tableware products could be considered as several possible reasons. One explanation is that it might simply because lighter colors are closer to white, which is the most common color for tableware. White or low saturated, light colored tableware will highlight the food well, but dark colors might stand out too much. Tableware should play a supporting role for the food.

Another explanation is supported by the literature. Schloss, Strauss, and Palmer (2013) have studied on color preference of 32 different colors and colored objects including walls, trim, couches, throw pillows, dress shirts/blouses, ties/scarves, and T-shirts [170]. In their results, saturated colors were generally the most preferred colors for context-free squares of color, but they were actually the least preferred colors for all of the objects tested in the study. It has been suggested that for pure colors, saturated colors are preferred, however, low saturated colors tend to be more popular on various objects. The researchers also pointed out that not only for context-free colors that males prefer saturated colors while females prefer muted colors, when put on objects, the trend is still the same [170]. On the other hand, Palmer, S.E. and Schloss, K.B. (2011) suggested that in general, males like saturated colors more than women do, whereas women tend to like muted colors more than men do [171].

The third observation is that colors with low saturation or grey tone might be perceived as colors with better taste in society. According to Global Automobile 2016 Color Popularity Report, 77% people prefer white, black and grey colors [172]. More and more products designed with low saturation color or mixed with grey tone are perceived as more expensive and refined, refer to the traditional colors of Japan (e.g., the traditional color of kimono in Japan) [173]. Unlike products in primary colors that often seen in cheap product retailers, those with grey tone colors are more sophisticated, well arranged in the societies, especially in Japanese society. The beloved traditional Japanese colors which are a collection of colors with grey tone, are recognized and used widely in fashion design, product design and culture from prehistoric time to present day [173].

This tendency is only found strongly in females, suggesting that it might be because females are more sensitive to the taste of colors when considering tableware products. However, the results only revealed the usage of words such as “relaxing”, as a common word females chose to describe the reason why they select dark colors, but no common words were found in their descriptions about light colors. It seems that although females have a strong tendency to select light colors, the words they used to describe the reason are very subjective and individually different.

### 6.7.3 Effect of Pure Color Preference on Choice of Tableware Color

*H2b: Pure color preference is not a significant predictor of choice for tableware color (Supported).*

It is suggested that pure color preference was not a significant predictor of choice of tableware color. The study could not highlight consumers' pure color preference of the presented 8 colors, on the effects on choice of tableware color.

Males preferred dark blue when they saw the colors, and when they knew the colors were for tableware, dark blue was the most chosen color for tableware. However, no significant relationships were found. Although dark blue was the most popular color for males, in terms of both pure color preference and choice of tableware color, we can't say that because people liked dark blue itself, and they chose dark blue as their favorite color for tableware. The results only suggested that males liked dark blue significantly more than light pink and light green. They also liked the other colors apart from these three colors. There are a significant number of males who preferred other colors, but they still chose dark blue as the color for tableware. Therefore, we cannot predict the choice of tableware color simply based on the pure color preference in males.

In the case of females, H2a is still supported, because among 8 colors, only 2 of them were significantly predicted by pure color preference. When females like light pink or light green, there is a high change that they might select light pink or light green for tableware. Females might choose a few colors for tableware simply because they liked the color, but for most of the colors, females choose them as tableware colors despite they like the color or not.

In general, we cannot predict a person's choice of tableware color, simply based on their pure color preference. In the process development and marketing strategies, designers and marketers often investigate consumer's preference of colors. It is important to be aware that the pure color preference might not be the primary reason of making the decision for choosing the tableware in that color. Researchers, designers and marketers should take deeper consideration and investigation into the reasons of decision making of tableware colors.

#### 6.7.4 Effect of Words Usage in Describing Reasons on Choice of Tableware Color

In general, no significant relationship between the words of describing reasons and choice of tableware color were found in male participants, and only two words for two colors in female participants were found. This suggests that participants did not use the same words to describe the reasons why they chose the same colors. Only when females selected dark green and light orange, there were tendencies of them choosing the same words to describe the reason.

This might indicate that in general, people have their individual differences in describing the reasons, even when they selected the same colors for tableware. When people select the same color for tableware, observing from how they describe the reasons, people all have different reasons of selecting the color for their tableware.

## 6.8 Summary

This chapter introduced Study 2, which investigated the pure color preference of 8 different colors with 4 color hues, in light and dark versions. Afterwards, the study observed how people select among these 8 colors as their favorite colors for tableware, and recorded the reasons described by them. It is found that compared to females, males had stronger likes or dislikes among the 8 colors. Females liked the colors more equally. When they were informed that the colors were for tableware, females still accepted more color options, showed more interests in choosing colors in different hues for tableware, but specifically for colors with a lower saturation (light, pale colors). However, males specifically preferred dark blue for tableware, and the strong preference of the other colors become weaker. The pure color preference is not a significant predictor of choice of tableware color, how much people like a color or not is not a primary reason of making the decision of choosing the color for tableware. In the end, it is shown that even when people chose the same color, they used different words to describe the reasons.

In the process of tableware related product development and marketing strategies, researchers, designers and marketers should consider how consumers think about the color on the tableware, instead of just consider about the evaluation on the color itself. Consumers might like or dislike a color when see the color itself, however, it might have little impact on the decision making of buying the product. It is also suggested that when targeting female consumers, tableware with various color options might be successful, but the colors should be in lower saturation. When targeting male consumers, dark blue would be the best option. The subjectivity of reasoning in choice of tableware color suggests that people have different reasons when selecting the same tableware color.

# **Chapter 7: Study 3(i) - Choosing Tableware Color in Different Dining Situations**

## **7.1 Background**

### **7.1.1 Implications from Study 1 and Study 2**

Factors like mood, emotional responses, and atmosphere, which are not being paid attention on fairly, could be as important as flavor or appetite in the modern dining experience. In Study 1, the sets of visualized dining situation sketches have been designed and discussed. As a result, the detailed version of dining situation sketches were selected as the set of stimuli of dining situation sketches, due to a greater responses in atmosphere of the situations. On the other hand, by knowing that gender effects influenced color preference and atmosphere, females were found more sensitive to the atmosphere of visualized dining situations.

Study 2 investigated the pure color preference of 8 different colors, observed how people selected among these 8 colors as their favorite colors for tableware, and recorded the reasons described by them. It was found that compared to males, females showed smaller gaps in the pure color preferences. When they were informed that the colors were for tableware, females accepted more color options, showed more interests in choosing different colors for tableware, but clearly preferred light colors to dark colors. The pure color preference was not a significant predictor of choice of tableware color. How much people like

a color or not is not a primary reason of making the decision of choosing the color for tableware. In the end, it was shown that even when people choose the same color, they use different words to describe the reasons.

### 7.1.2 Choosing Detailed Dining Situations and Females for Study 3

One of the objectives of the whole research is to determine whether the atmosphere of visualized dining situations would have an impact on choice of tableware color. For this specific topic, after comparing simple and detailed visualized dining situations, it is suggested that detailed dining situations are better at creating atmosphere, and people understand more specifically what the situations are about. Thus, detailed version of the dining situations was selected for Study 3.

After comparing males and females, it was found that females were more sensitive on feeling the atmosphere from visualized dining situations. On the other hand, females showed more interests in various different colors for tableware, they were more open to the different options to choose as their tableware color. Besides, females showed smaller gaps in pure color preference before choosing the color for tableware. Therefore, it is considered that female participants might be more suitable for testing the effect of atmosphere of dining situations on choice of tableware color. The process of decision making on tableware color in males would also be intriguing, however, this study would rather focus on the effect of atmosphere of visualized dining situations. As a result, Study 3 would be focusing on female participants.

Study 3 intended to put the result from Study 1 and Study 2 together, then test the pure color preference, atmosphere of visualized dining situations, and the effect of them on the choice of tableware color, when participants select colors for tableware in different dining situations. In this chapter, the experiment of Study 3 would be introduced, and simple analysis would be carried out to observe the

tendency of color preference, choice of tableware color and the relationship between choice of tableware color and atmosphere in each dining situation.

## **7.2 Objectives**

Study 3 intended to understand the reason of choice of tableware color, including the effects of atmosphere of dining situations, pure color preference, other factors like color impression and so on. The experiment intended to investigate again on the pure color preference, in addition with color impressions, and the atmosphere of dining situations. Afterwards, the study explored the role these factors in the decision making process of choice of tableware color.

**O3a:** To observe how females select tableware colors in different visualized dining situations.

**O3b:** To understand the role of color preference in the process of decision making of tableware color.

**O3c:** To understand the effect of atmosphere of dining situations and pure color impressions on the choice of tableware color.

**O3d:** To explore the reasons behind the choice of specific tableware color.

## **7.3 Hypotheses**

Study 2 suggested that pure color preference was not a significant predictor of choice of tableware color. When added visualized dining situations, it is considered that pure color preference will not be a significant predictor, either.

**H3a:** Pure color preference is not a significant predictor of choice of tableware color in visualized dining situations.

Color preference, in this study in general, is considered that includes pure color preference, product color preference and situational product color preference. Referring to the terminological definitions in Chapter 3, pure color preference is how much a person like a color when the color is shown to the person visually, but without any other context. It is the attitude purely on the color itself. Product Color Preference is the preference of the color when it is on a product. The preference is still about the attitude towards color itself, however, at this point the respondent already knows the color is on a specific product. Situational product color preference is product color preference is a specific usage situation. Following H3a, it is predicted that color preference in general is not significant predictor in the decision making of choice of tableware color.

**H3b:** Color preference in general is not significant predictor in the decision making of choice of tableware color in visualized dining situations.

Study 3 was aimed to determine the effect of atmosphere of visualized dining situations (usage situations of tableware) on choice of tableware color. Literatures stated that the usage situations are impactful on behavioral choice of product. On the other hand, atmosphere is considered an important part of a situation in terms of affecting people's behavior and emotional responses. Therefore, the atmosphere of visualized dining situations are predicted to have impact on the choice of tableware color.

The pure color impression is defined as It is the impression (feelings or emotional responses) a person have on a color purely on the color itself, when the color is shown to the person visually, but without any other context. Since the pure color preference did not impact the choice of tableware colors for most of the colors in Study 2, it is considered that the pure color impression might have some effects.

**H3c:** Pure color impression is significant predictor of choice of tableware color in visualized dining situations.

**H3d:** Atmosphere of visualized dining situations is significant predictor of choice of tableware color in visualized dining situations.

## **7.4 Method**

In this chapter, the experimental procedure, results of pure color preference and choice of tableware color in different dining situations are introduced. The experimental procedure combined the elements and variables in Study 1 and Study 2. After collecting the ratings of the pure color preference of the same 8 colors, and the atmosphere rating of the 6 detailed dining situations, participants were informed that these colors were for tableware, and asked to choose whichever colors they would like to use on tableware in the 6 different dining situations.

Friedman test and Wilcoxon signed-rank test were carried out to determine whether there were significant difference among the pure color preference. Afterwards, simple analysis such as correlation analysis was conducted to observe the potential relationship between atmosphere and choice of tableware color.

Further detailed analysis would be introduced in the next chapter.

## **7.5 Experiment**

### **7.5.1 Participants**

30 females were invited, with the average age of 24.6 ( $M = 24.6$ ,  $SD = 2.96$ ). All participants passed color vision test using Ishihara PseudoIsochromatic Plates [165].

## 7.5.2 Stimuli

### *Color*

Following Study 2, the same 8 color samples were used as the color stimuli (Figure 26). They were printed on semi-glossy photo paper in A4 size in the same way with Study 2.

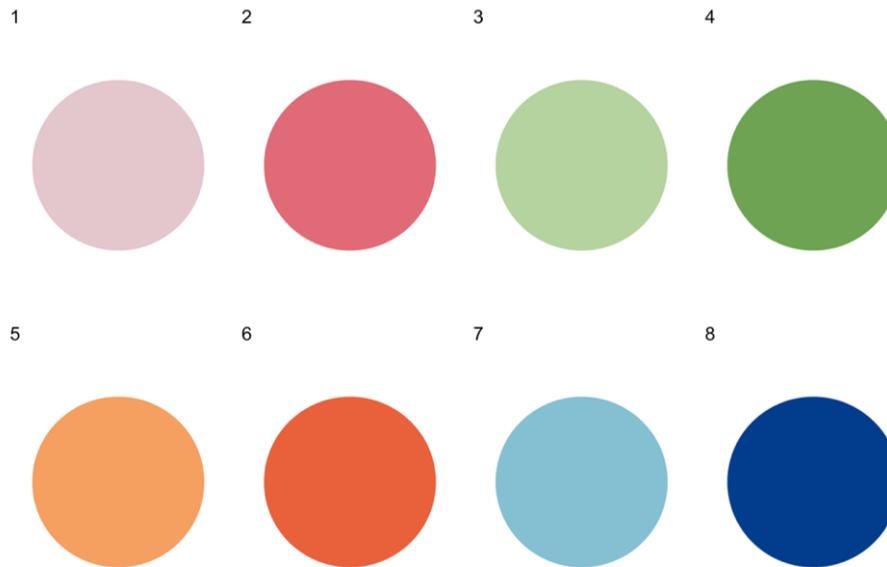


Figure 26: Color samples [180]

### *Dining Situations*

The dining situation sketches in this experiment are the detailed version of dining situation sketches screened out in previous experiment in Study 1. The set of dining situation sketches are shown as Figure 27: 1. “dinner dating with partner (lover)”, 2. “Dinner with family members”, 3. “Drinking alone at home”, 4. “Breakfast at home”, 5. “Picnic with family at park”, 6. “Hot pot party with friends”.

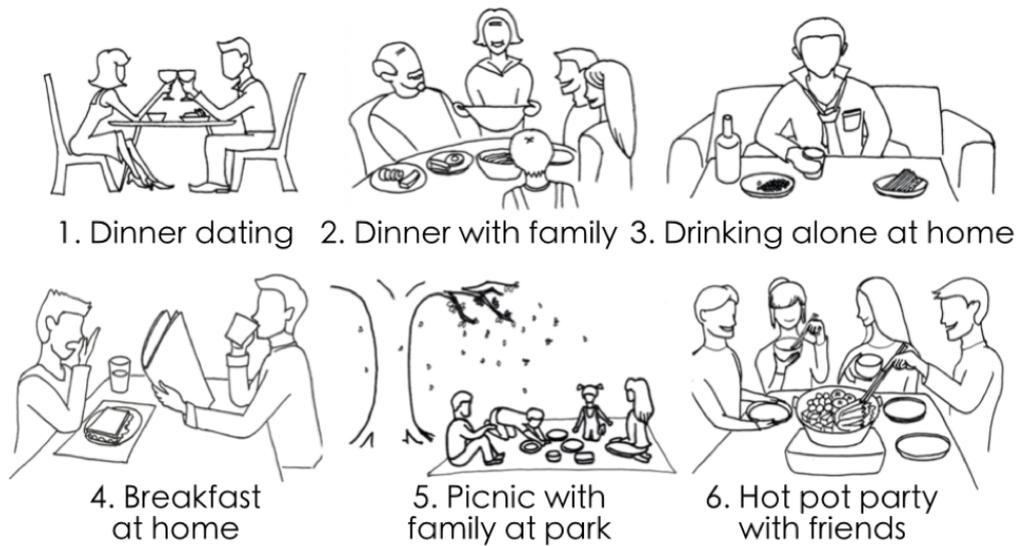


Figure 27: Dining situation samples [180]

### 7.5.3 Measurement

The pure color preference was measured using 5-point rating Likert scale, ranged from 0 to 4. 0 stands for “dislike the color very much”; 1 means “dislike the color a little”; 2 is neutral; 3 means “like it a little” and 4 represents “like it very much”.

The atmosphere of a dining situation were assessed using the same method in Study 1, including 15 adjective words according to the extracted factors to evaluate the atmosphere in various dining situations from previous research [152]. This time, the adjective words were rated using 5-point Likert scale, ranged from 0 to 4, representing the intensity of how much they feel about the atmosphere described by adjective words. In addition, the same adjective words were used to assess the pure color impression of the 8 colors.

Choice of tableware color was recorded by asking participants to select freely among the 8 colors, and then write down the color numbers on the answer sheet respectively for each visualized dining situation.

Open-ended free comments were also conducted as the last question for participants to write down the reason why they selected certain colors for each dining situations in their own words.

#### 7.5.4 Experimental Settings

The experimental settings are identical to Study 2, in the same room with approximately 11.5 m<sup>2</sup>, on the same table (71 cm tall) and chair (45 cm tall). All the settings of environment are the same with Study 2, with the same lightings (45 Watt white LED light tubes) and grey curtains covering the windows.

#### 7.5.5 Procedure

Firstly, the 8 color samples were presented to participants in random order. After gazing at each color stimulus as indicated, participants were handed over a questionnaire to rate their preference of the colors, and rate the 15 adjective words their impressions of the colors.

Afterwards, all dining situation sketches were presented in random order too. Questionnaires assessing the atmosphere of dining situations were handed to participants to fill in.

Finally, participants were informed that the 8 colors were all for tableware (basically plates and bowls). Then they were required to select their favorite colors for tableware (plates or bowls) as many as they want for each dining situation. Participants were also indicated to describe the reason why they chose certain colors for the dining situations using free comments.

## 7.5.6 Analysis

Firstly, Friedman tests were needed to determine whether there were significant differences between the pure color preference of 8 colors. Afterwards, the choice of tableware color under different dining situations was listed to observe the tendency of participants' choice of color in dining situations. Finally, correlation analysis was conducted to explore the relationship between mood assessment and choice of tableware color of each dining situation.

## 7.6 Results

### 7.6.1 Pure Color Preference

In general, all colors were rated higher than neutral ( $M > 2.00$ ), suggesting that all 8 colors were rated positively in preference. Test of normality using Kolmogorove-Smirnov method showed that the preference rating scores data sets were non-parametric ( $p < 0.05$ ). Therefore, Friedman tests were conducted to determine if there were significant differences between the preference of color samples. Friedman test yielded a significant difference ( $p = 0.001$ ) that indicated there were significant difference between preference of color samples.

Following up the Friedman test, post-hoc analysis was carried out using Wilcoxon signed-rank test. The preference rating score of C1 (light pink) was rated significantly lower than most of the other colors: C2 (dark pink) ( $\Delta = 0.80$ ,  $p = 0.001$ ), C3 (light green) ( $\Delta = 0.67$ ,  $p = 0.012$ ), C5 (light orange) ( $\Delta = 0.60$ ,  $p = 0.034$ ), C7 (light blue) ( $\Delta = 1.14$ ,  $p = 0.001$ ) and C8 (dark blue) ( $\Delta = 0.57$ ,  $p = 0.019$ ). The second relatively less preferred color was C6 (dark orange), which was rated significantly lower than C2 (dark pink) ( $\Delta = 0.53$ ,  $p = 0.002$ ) and C7 (light blue) ( $\Delta = 0.87$ ,  $p = 0.002$ ). C7 (light blue) was rated as the most preferred color in the chart, showing significant differences from all the

other color samples except C2 (dark pink) ( $\Delta = 0.34$ ,  $p = 0.082$ ) (Figure 28).

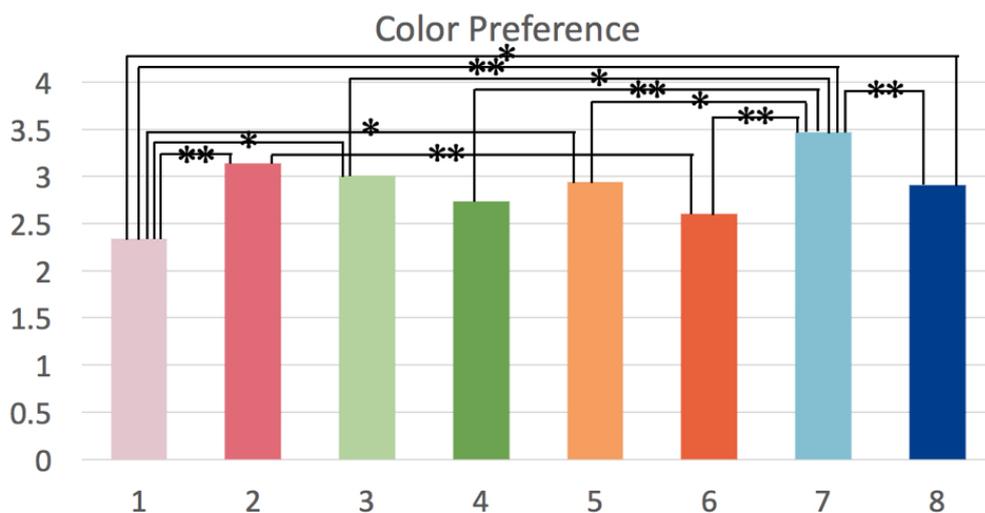


Figure 28: Pure color preference ratings (the ‘\*’ mark represents that the p value between two groups is lower than 0.05 but higher than 0.01. The ‘\*\*’ mark means that the p value is lower than 0.01.) [180]

### 7.6.2 Choice of Tableware Color in Different Dining Situations

Figure 29 shows the number of selected colors by the participants in each dining situation. The length of horizontal columns represents the total number of selected colors in the dining situations. The number in different colors shows the number of people who selected that color.

Dining situation No. 1 “dinner dating with partner” shows a very balanced choice of tableware color result with majority of pink (light pink with 10 & dark pink with 9 participants) and blue colors (light blue with 9 & dark blue with 10 participants) being selected. In dining situation No.2 “dinner with family members”, light orange was apparently the favorite color with 15 out of 30 participants selected, followed by light green. Dining situation No. 3 “drinking alone at home” has the least overall number of selected colors (40), and 18 out of 30 participants chose dark blue as their favorite color in this situation.

No. 4 “breakfast at home” also has the least overall number of selected colors (40), and light green was the most preferred color (with 14 participants selected) in this situation alongside light blue (with 14 participants selected). No. 5 “picnic with family at park” has the most selected number of colors (66), with dark blue being the only color that was not chosen in this situation. Dark pink was the most liked color (with 18 participants selected), followed by light green (with 11 participants selected) and light pink (with 10 participants selected). Orange dominated dining situation No. 6 “hot pot party with friends” with 21 out of 30 participants selecting light orange and 13 participants selecting dark orange.

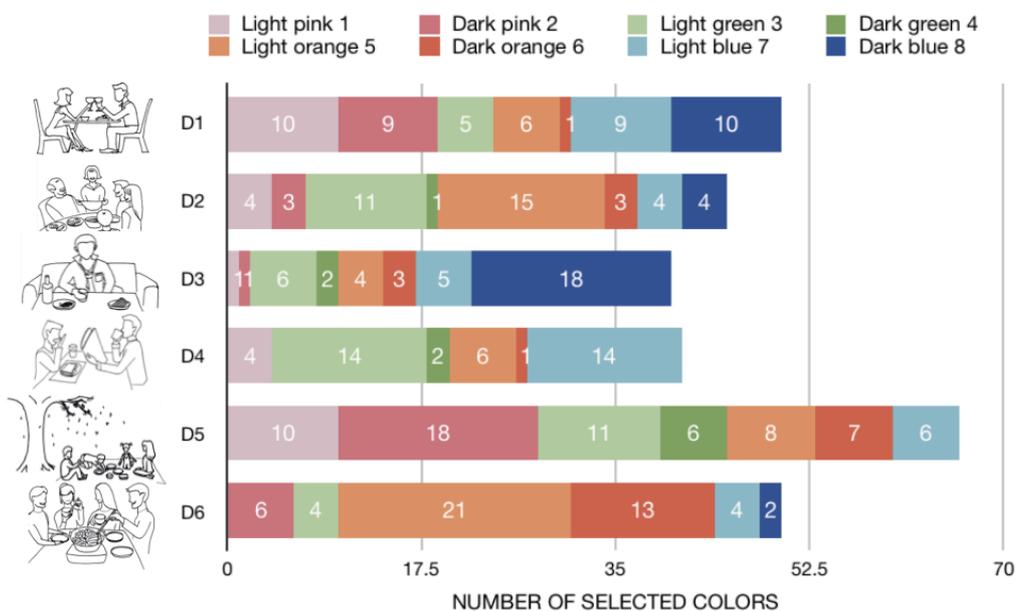


Figure 29: Choice of tableware colors in different dining situations. The numbers in each color bar represent the number of selected colors by participants. For example, in dining situation No.1, the number 10 in light pink indicates that there were 10 people selected light pink [180].

### 7.6.3 Correlation between Choice of Tableware Color and Atmosphere in Different Dining Situations

Based on adjective words rating scale, participants’ atmosphere assessment was collected in different dining situations. Following choice of tableware color’s result, correlation analysis was conducted to

explore the relationship between mood assessment and choice of tableware color.

Tables 13 to 18 show the correlation strength and direction between atmosphere assessment words and choice of tableware color in each dining situation. In dining situation No. 1 “dinner dating with partner”, the result shows that the Pearson correlation between selection of light pink and the mood of feeling empty was moderate positive (Pearson  $r = 0.446$ ,  $p = 0.014$ ). The relationship between feeling of refreshing was also moderate positive with dark orange (Pearson  $r = 0.488$ ,  $p = 0.013$ ). On the other hand, the feeling of quiet and selection of dark pink showed moderate negative relationship (Table 13).

Table 13: Correlations between atmosphere assessment and choice of tableware colors in dining situation No.1 (dinner dating with partner) [180]

<b>Mood assessment</b>	<b>Choice of tableware color</b>	<b>Pearson r</b>	<b>P value</b>
Feeling empty	Light pink	0.446	0.014
Feeling quiet	Dark pink	-0.377	0.040
Refreshing	Dark orange	0.488	0.013

In dining situation No. 2 “dinner with family members”, there were 4 pairs of moderate positive relationships: feeling of cramped with dark pink (Pearson  $r = 0.394$ ,  $p = 0.031$ ), peaceful with light green (Pearson  $r = 0.410$ ,  $p = 0.024$ ), boring with light blue (Pearson  $r = 0.402$ ,  $p = 0.027$ ) and lonely with dark blue (Pearson  $r = 0.489$ ,  $p = 0.006$ ). On the other hand, the result revealed 3 pairs with moderate negative relationships: joyful with light pink (Pearson  $r = -0.402$ ,  $p = 0.027$ ), feeling of warm with light pink (Pearson  $r = -0.363$ ,  $p = 0.049$ ), and feeling of peaceful with dark green (Pearson  $r = -0.362$ ,  $p = 0.049$ ) (Table 14).

Table 14: Correlations between atmosphere assessment and choice of tableware colors in dining situation No.2 (dinner with family members) [180]

<b>Mood assessment</b>	<b>Choice of tableware color</b>	<b>Pearson r</b>	<b>P value</b>
Joyful	Light pink	-0.402	0.027
Warm	Light pink	-0.363	0.049
Feeling cramped	Dark pink	0.394	0.031
Peaceful	Light green	0.410	0.024
Peaceful	Dark green	-0.362	0.049
Boring	Light blue	0.402	0.027
Lonely	Dark blue	0.489	0.006

In the dining situation No.3 “drinking alone at home”, there were only 2 pairs of significant correlation relationships. The feeling of weird and selection of dark pink showed moderate positive relationship (Pearson  $r = 0.364$ ,  $p = 0.048$ ), and joyful was significantly correlated with selection of light green with a moderate negative relationship (Pearson  $r = -0.379$ ,  $p = 0.039$ ) (Table 15).

Table 15: Correlations between atmosphere assessment and choice of tableware colors in dining situation No.3 (drinking alone at home) [180]

<b>Mood assessment</b>	<b>Choice of tableware color</b>	<b>Pearson r</b>	<b>P value</b>
Feeling weird	Dark pink	0.364	0.048
Joyful	Light green	-0.379	0.039

In the dining situation No. 4 “breakfast at home”, there were only positive relationships between choice of tableware colors and mood adjective words, and all words were only correlated to the choice of tableware color of dark orange. The mood assessment adjective words are: feeling cold (Pearson  $r=0.371$ ,  $p=0.043$ ), feeling weird (Pearson  $r =$

0.615,  $p = 0.001$ ), boring (Pearson  $r = 0.399$ ,  $p = 0.029$ ), lonely (Pearson  $r = 0.494$ ,  $p = 0.006$ ) and feeling cramped (Pearson  $r = 0.576$ ,  $p = 0.001$ ) (Table 16).

Table 16: Correlations between atmosphere assessment and choice of tableware colors in dining situation No.4 (breakfast at home) [180]

<b>Mood assessment</b>	<b>Choice of tableware color</b>	<b>Pearson r</b>	<b>P value</b>
Feeling cold	Dark orange	0.371	0.043
Feeling weird	Dark orange	0.615	0.001
Boring	Dark orange	0.399	0.029
Lonely	Dark orange	0.494	0.006
Feeling cramped	Dark orange	0.576	0.001

In dining situation No. 5 “picnic with family at park”, the tendency of choice of tableware color of dark green showed positive relationships with 3 mood assessment adjective words: feeling weird (Pearson  $r = 0.421$ ,  $p = 0.020$ ), feeling quiet (Pearson  $r = 0.464$ ,  $p = 0.010$ ) and feeling empty (Pearson  $r = 0.417$ ,  $p = 0.022$ ). For negative relationships, dark pink and light green respectively correlated with feeling cramped (Pearson  $r = -0.468$ ,  $p = 0.009$ ) and feeling quiet (Pearson  $r = -0.475$ ,  $p = 0.008$ ) (Table 17).

Table 17: Correlations between atmosphere assessment and choice of tableware colors in dining situation No.5 (picnic with family at park) [180]

<b>Mood assessment</b>	<b>Choice of tableware color</b>	<b>Pearson r</b>	<b>P value</b>
Feeling cramped	Dark pink	-0.468	0.009
Feeling quiet	Light green	-0.475	0.008
Feeling weird	Dark green	0.421	0.020
Feeling quiet	Dark green	0.464	0.010
Feeling empty	Dark green	0.417	0.022

In dining situation No. 6 “hot pot party with friends”, dark orange showed the only positive relationships with feeling cramped (Pearson  $r = 0.462$ ,  $p = 0.010$ ). Light orange showed 3 negative relationships respectively with boring (Pearson  $r = -0.385$ ,  $p = 0.036$ ), feeling empty (Pearson  $r = -0.385$ ,  $p = 0.036$ ) and feeling cramped (Pearson  $r = -0.485$ ,  $p = 0.007$ ). Light green also revealed negative relationship with feeling of being together (Pearson  $r = -0.429$ ,  $p = 0.018$ ) (Table 18).

Table 18: Correlations between atmosphere assessment and choice of tableware colors in dining situation No.6 (hot pot party with friends) [180]

<b>Mood assessment</b>	<b>Choice of tableware color</b>	<b>Pearson r</b>	<b>P value</b>
Feeling being together	Light green	-0.429	0.018
Boring	Light orange	-0.385	0.036
Feeling empty	Light orange	-0.385	0.036
Feeling cramped	Light orange	-0.485	0.007
Feeling cramped	Dark orange	0.462	0.010

## 7.7 Discussion

### 7.7.1 Pure Color Preference

The results showed that in general, when comparing the light version and dark version in the same color hue (e.g., comparing light blue with dark blue), there was a tendency that light colors were rated higher in preference than dark colors. Pink was the only color that showed lower preference for light pink than dark pink.

The pure color preference test revealed participants’ taste that when presented by colors with high saturation (dark color) and low

saturation (light color), participants tend to prefer colors with low saturation. The dark colors used in this experiment are relatively close to primary colors, and the light colors are faded colors with low saturation or mixed with grey color, which made the colors appeared to be more pastel and pale.

However, regardless of the observed tendency above, pink was the only color showing lower preference for light color than dark color. Considering all the participants are female, and the fact that females are biologically programmed to prefer color pink, or redder shades of color than males [174], the color of pink or other redder shades of colors might make exception from the observation that low saturation colors are better accepted. Nevertheless, In Study 2, such tendency was not found.

### 7.7.2 Choice of Tableware Color in Different Dining Situations

Despite being the least preferred colors in all 8 colors, light pink and dark orange were chosen by many participants in some dining situations. For example, when participants imagine that they are having a diner date, they obviously prefer pink and blue as the color of their tableware in this situation, despite light pink was the least liked color. According to the descriptive answer of participants on why they chose the color, it was likely because that in this situation, more than half of participants considered pink and blue as the appropriate colors to represent male and female.

Light pink was also chosen by 33% of the participants in the situation of “picnic at park with family”. In Japanese culture, “picnic at park” is always associated with “Hanami”, which is the traditional custom of enjoying the transient beauty of the bloom of cherry blossom. As the color of cherry blossom, pink is the key color to every event and festival related to cherry blossom and spring season. Therefore, it makes sense that people would like to choose pink to match the beautiful color

of the nature. This explains the reason why green was selected by many participants in the same dining situation as well. This dining situation has the most total amount of chosen colors, which means that participants prefer multiple colors to make the event more colorful.

13 out of 30 participants selected dark orange in the dining situation of “hot pot party with friends”. Similarly with light pink, although dark orange was not the liked color, participants tended to choose it because it matched the vibe of the event. According to participants’ comments at the end of the experiment, many participants responded that the reason of choosing orange was because orange matched the feeling and vibe of “hot” and “crowd”. 21 out of 30 participants made their decision to choose light orange in this dining situation. The dominance of orange (light and dark combined) showed that the vibe in this dining situation matched orange much better than other colors. “Having a party with friends” was associated with words such as “lively”, “loud” and “crowded” according to correlation analysis, and “hot pot party” also created the feeling of “hot”, which is always associated with orange or red. Similarly, light orange was also the most chosen color in the dining situation of “dinner with family at home”, which indicates that light orange is a color associated with the feelings of warm and happy, suitable for both situations. However, “dinner with family” was considered as an event with a more peaceful mood, dark orange is not popular in this situation.

Dark blue clearly matched the situation of drinking alone at home and people tended to use less color in this situation. According to the descriptive answers in the free comments, dark blue was a perfect color for a quiet “home alone moment” for more than half of the participants. In contrast to “picnic with family at park”, “drinking alone at home” and “breakfast at home” had the least total amount of chosen colors. This indicates that participants’ preferred colors were more limited in this situation from the given color samples.

The selected colors in dining situation “breakfast at home” were all light colors (except for only one participant selected dark orange). Furthermore, light green and light blue dominated the selection.

According to the answer in the interview, participants tend to seek for a refreshing feeling in the morning and light green or light blue are their best answer to provide a clean and refreshing ambient environment.

### 7.7.3 Correlation between Choice of Tableware Color and Atmosphere in Different Dining Situations

The correlation analysis revealed some insights and implications to help us understand the reason behind the choice of tableware colors and the Kansei of the participants on colors. For instance, in dining situation No. 2 “dinner with family”, the selection of light green (11 out of 30) was much more than dark green (1 out of 30). Light green and dark green both showed relationships with the adjective word “peaceful”, however, light green presented a moderate positive relationship (Pearson  $r=0.410$ ,  $p=0.024$ ) but dark green presented a moderate negative relationship (Pearson  $r = -0.362$ ,  $p = 0.049$ ). This indicates that as the rating of mood assessment adjective word “peaceful” increases, the selection of light green increases but the selection of dark green decreases. The situation of having a dinner with family clearly gives participants a peaceful mood and led to a gap between the amount of the selection of two colors. This also suggests that light green might have an implicit meaning of “peaceful” rather than dark green in this situation.

In the situation of “breakfast at home”, the selection of dark orange showed correlations with multiple atmosphere assessment words, however, there are two correlations showed greater strength than others: “feeling weird” (Pearson  $r = 0.615$ ,  $p = 0.001$ ) and “feeling cramped” (Pearson  $r = 0.576$ ,  $p = 0.001$ ). Since dark orange was only selected by 1 participant, the possible connection here based on the result is that the color dark orange is associated with “feeling cramped”, and “feeling weird” in this dining situation, therefore most people don’t consider this color as a fit. Most users would not choose tableware with dark orange because it gives them a feeling of “weird” or “cramped”.

For the last dining situation “hot pot party with friends”, as the most selected color, light orange showed 3 negative relationships respectively with boring (Pearson  $r = -0.385$ ,  $p = 0.036$ ), feeling empty (Pearson  $r = -0.385$ ,  $p = 0.036$ ) and feeling cramped (Pearson  $r = -0.485$ ,  $p = 0.007$ ). This indicates that situation of a hot pot party with friends are unlikely to connect to negative feelings such as “boring”, “empty” or “cramped”, and light orange is the perfect color to decorate in this situation. As the observation above, orange dominated the selection, however, dark orange (13 out of 30) was less selected than light orange (21 out of 30). Different from light orange, dark orange revealed a positive relationship with “feeling cramped” (Pearson  $r = 0.462$ ,  $p = 0.010$ ). This might explain the reason why dark orange was selected less than light orange: dark orange was likely associated with a negative feeling of “cramped” or “crowded”, therefore we could suggest that when designers or users decide to deliver the feeling of “lively”, “hot”, “joyful” and so on, light orange is a more acceptable better choice because of the negative implications from dark orange such as “cramped” in specific situations.

## **7.8 Summary**

In this chapter, the experiment of Study 3 was introduced. This experiment targeted on female participants. The pure color preference of female participants was evaluated again similarly to Study 2, and the atmosphere of visualized dining situations was evaluated similarly to Study 1. The final procedure required female participants select favorite colors for tableware in each visualized dining situations.

Simple analysis was carried out and the results were discussed. The choice of tableware color in different dining situations revealed that the color selection patterns are quite different and unique in different dining situations. Depending on the dining situations, some of the lower rated colors in preference could still be chosen over the others with higher preference rating. This indicates that the visualized dining

situations could have obvious impacts on the decision making of choosing tableware color for females.

Additionally, correlation analysis was conducted to test the potential relationship between atmosphere of dining situations and choice of tableware color. The result revealed some correlations in each dining situation, and provided implications that the atmosphere of dining situations might have an effect on the decision making of choice of tableware color for female. Further, deeper analysis is needed to prove the effects.

In the next chapter, in order to verify the hypotheses of Study 3, further analysis would be carried out and discussed.

# **Chapter 8: Study 3(ii) - Relationship between Color Preference, Atmosphere in Visualized Dining Situations and Choice of Tableware Color**

## **8.1 Background**

In Chapter 7, the experiment was conducted to explore the pure color preference, choice of tableware color in different dining situations, and the correlation with atmosphere in those dining situations among female participants.

The simple analysis in chapter 7 observed the tendency of participants' pure color preference among tableware colors, and the overall tendency of tableware choice of tableware colors. Results suggested that even though females had their initial pure preference among a group of colors, when being navigated to a specific dining situation, they tended to re-think and re-value a color based on that situation. It is assumed that the atmospheres in that certain situation are correlated with female's choice of tableware colors in different dining situations.

For instance, in Figure 28 of Chapter 7, it showed that there was no significant difference among the preference of light green, dark green, light orange and dark orange. However, according to the choice of tableware colors in particular situations (Figure 29), there were clear gaps between the choice of tableware color of light green and dark green, as well as light orange and dark orange. The different patterns of choice of tableware colors were shown in Figure 24, suggesting that

dining situations have big potential to change females' choice of tableware colors. Accordingly, we checked the correlation between the choice of tableware color and atmosphere evaluation on the situations. Multiple correlations were revealed and the color of light green and dark green were respectively connected to different atmosphere, so as light orange and dark orange. As a result, when the situation evoked the atmosphere of peaceful, and peaceful were connected to light green rather than dark green, participants would select light green instead of dark green as the color for tableware.

However, the correlations between choice of tableware color and atmosphere could not explain the results of all colors, and the results were just the tendencies in specific dining situations. Deeper analysis needed to be conducted to find out the relationship between every color and the atmosphere. If some of the colors were not able to build relationships with atmosphere, the decision making of the selection might rely on different factors. Therefore, pure color impression was evaluated. On the other hand, free comments were collected to explore the other key factors in the reason why participants select certain color.

## **8.2 Objectives**

The objective of this chapter is to gather additional information and deeply analyze the result, in order to better understand the relationship between atmosphere and choice of tableware color of tableware in visualized dining situations. The objectives of the analysis follow the objectives of the experiment of Study 3, stated in Chapter 7:

**O3a:** To observe how females select tableware colors in different visualized dining situations.

**O3b:** To understand the role of color preference in the process of decision making of tableware color.

**O3c:** To understand the effect of atmosphere of dining situations and pure color impressions on the choice of tableware color.

**O3d:** To explore the reasons behind the choice of specific tableware color.

### **8.3 Hypotheses**

The 4 hypotheses of Study 3 were stated in Chapter 7. In Chapter 7, only visual observations and simple analysis using correlation analysis were carried out to provide implications and insights. In this chapter, the hypotheses would be deeply discussed.

**H3a:** Pure color preference is not a significant predictor of choice of tableware color in visualized dining situations.

**H3b:** Color preference in general is not significant predictor in the decision making of choice of tableware color in visualized dining situations.

**H3c:** Pure color impression is significant predictor of choice of tableware color in visualized dining situations.

**H3d:** Atmosphere of visualized dining situations is significant predictor of choice of tableware color in visualized dining situations.

### **8.4 Method**

First of all, logistic regression analysis was used as the main analysis method to test the effect of pure color preference and choice of tableware color in visualized dining situations. Afterwards, logistic regression analysis was again carried out to test the effects of pure color

impression and atmosphere of dining situations on choice of tableware color in dining situations.

The pure color impression assessment applied the same adjective words as atmosphere of dining situations, to see if the pure impression of colors had potential effects on the choice of tableware colors. In Study 2, it was found that pure color preference could not affect much on the choice of tableware color. Therefore in this study, pure color impression was involved to see if the initial, pure impression of the colors was playing a bigger factor in choice of tableware. However, as the assessment of impression of colors differs among studies, depending on the purpose of the study and the kind of situations or place, in the case of this study, the impression of colors were evaluated using the same adjective words for atmosphere of dining situations, due to the reason that emotions or moods might be related.

Afterwards, open-ended free comments were collected and categorized by specific rules introduced in Study 2, to extract word usage in describing the reasons why selecting certain colors. Logistic regression analysis was carried out again, to see the relationship between choice of tableware color and the word usage in descriptions of reasons.

## **8.5 Results**

### **8.5.1 Pure Color Preference and Choice of Tableware Color**

Logistic regression analysis was carried out to evaluate the relationship between choice of tableware color and pure color preference ratings in each color. Logistic regression analysis suggested that none of the pure color preference of the 8 color could significantly predict choice of tableware color: C1 (light pink,  $p = 0.344$ ), C2 (dark pink,  $p = 0.769$ ), C3 (light green,  $p = 0.775$ ), C4 (dark green,  $p = 0.981$ ),

C5 (light orange,  $p = 0.459$ ), C6 (dark orange,  $p = 0.674$ ), C7 (light blue,  $p = 0.406$ ) and C8 (dark blue,  $p = 0.900$ ).

In summary, in each choice of tableware colors, no pure color preference rating score was significant as a predictor of choice of tableware color. This result agrees with the result in Study 2, and the observation in Chapter 7, indicating that pure color preference did not affect the choice of tableware colors in this experimental settings. Participants selected different colors according to different dining situations, regardless of how much they like the color. The effects of the variables in the dining situations might be greater than the simple preference of the color. The change in units of choice of tableware color of light pink could not be significantly observed due to the change of pure preference of the color.

### 8.5.2 Pure Color Impression and Choice of Tableware Color

Pure color impressions were applied to logistic regression analysis to test the effects on choice of tableware color. Binary logistic regression analysis was conducted for each color choice. As a result, no assessment items for pure color impression were found as significant predictors of choice of tableware colors ( $p > 0.05$ ). There was no model that could be created from pure color impression assessment to significantly predict the choice of tableware color.

This result suggests that similarly with pure color preference, the pure color impression did not show an effect on the choice of tableware color.

### 8.5.3 Atmosphere of Dining Situations and Choice of Tableware Color

The result and observation from simple correlation analysis in Chapter 7 only suggested several correlations between choice of

tableware color and atmosphere in specific dining situations, but the simple analysis is far from enough to explain the relationship between choice of tableware color and specific atmosphere for all dining situations. Logistic regression analysis was carried out to evaluate the relationship between choice of tableware color and atmosphere of dining situations. The atmosphere contains multiple variables, therefore stepwise method was used to enter the variables into the equation.

### *Color 1: light pink*

Result from logistic regression analysis in C1 (light pink) indicated that no significant predictors was found ( $p > 0.05$ ). All the independent variables could not be included into the equation to predict choice of tableware color. The change in units of choice of tableware color of light pink could not be significantly observed due to the change of any items in the atmosphere.

### *Color 2: dark pink*

Table 19 shows the key result from logistic regression analysis in C2 (dark pink). As shown in the result, “Joyful” and “Refreshing” were found as significant predictors to choice of tableware color of C2 (dark pink). When holding all other variables constant, for a unit change of “Joyful” in atmosphere, the odds of selecting C2: dark pink are expected to change by a factor of 1.911 (Exp = 1.911,  $p = 0.002$ ). For a unit change of “Refreshing” in atmosphere, the odds of selecting C2: dark pink are expected to change by a factor of 1.394 (Exp = 1.394,  $p = 0.028$ ).

Both of the odds ratios of the atmosphere in dining situations are greater than one, therefore the effects are positive. The increases of both atmospheres of “Joyful” and “Refreshing” are considered to increase the possibility of selecting dark pink.

Table 19: Binary logistic regression analysis result C2 (dark pink), female, atmosphere of visualized dining situations

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
Joyful	0.648	0.210	9.526	1.911	0.002**
Refreshing	0.332	0.151	4.816	1.394	0.028*
Constant	-3.916	0.716	26.459	0.020	0.000***

*Color 3: light green*

Result from logistic regression analysis in C3 (light green) suggests that no significant predictors was found ( $p > 0.05$ ). All the independent variables could not be included into the equation to predict choice of tableware color. The change in units of choice of tableware color of light green could not be significantly observed due to the change of any items in the atmosphere.

*Color 4: dark green*

Result from logistic regression analysis in C4 (dark green) suggests that no significant predictors was found ( $p > 0.05$ ). All the independent variables could not be included into the equation to predict choice of tableware color. The change in units of choice of tableware color of dark green could not be significantly observed due to the change of any items in the atmosphere.

*Color 5: light orange*

Table 20 shows the key results from logistic regression analysis in C5 (light orange). As shown in the result, “Lively” and “Boring” were found as significant predictors to choice of tableware color of C5 (light orange). When holding all other variables constant, for a unit change of “Lively” in atmosphere, the odds of selecting C5 (light orange) are expected to change by a factor of 1.419 ( $\text{Exp} = 1.419$ ,  $p = 0.005$ ), and

for a unit change of “Boring” in atmosphere, the odds of selecting C2: dark pink are expected to change by a factor of 0.590 (Exp = 0.590, p = 0.018).

The odds ratio of “Lively” is greater than one, therefore the effect is positive, which means that the increase of the atmosphere of “Lively” is considered to increase the possibility of selecting light orange. On the other hand, the odds ratio of “Boring” is between 0 and 1, therefore the effect is negative, which means that the increase of atmosphere of “Boring” might decrease the possibility of selecting light orange.

Table 20: Binary logistic regression analysis result C5 (light orange), female, atmosphere of visualized dining situations

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
Lively	0.350	0.124	7.935	1.419	0.005**
Boring	-0.528	0.223	5.604	0.590	0.018*
Constant	-1.274	0.434	8.618	0.280	0.003**

### *Color 6: dark orange*

Table 21 shows the key result from logistic regression analysis in C6 (dark orange). As shown in the result, “Lively” was found as significant predictor to choice of tableware color of C6 (dark orange). When holding all other variables constant, for a unit change of “Lively” in atmosphere, the odds of selecting C6 (dark orange) are expected to change by a factor of 1.498 (Exp = 1.498, p = 0.008). The odds ratio of “Lively” is greater than one, therefore the effect is positive, which means that the increase of the atmosphere of “Lively” is considered to increase the possibility of selecting dark orange.

Table 21: Binary logistic regression analysis result C6 (dark orange), female, atmosphere of visualized dining situations

<b>Criterion variable: Choice of tableware color</b>					
<b>Predictor variable(s)</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>Exp(B)</b>	<b>Sig.</b>
Lively	0.404	0.151	7.117	1.498	0.008**
Constant	-2.784	0.506	30.308	0.062	0.000***

*Color 7: light blue*

Table 21 shows the key result from logistic regression analysis in C7 (light blue). As shown in the result, “Peaceful” was found as significant predictor to choice of tableware color of C7 (light blue). When holding all other variables constant, for a unit change of “Peaceful” in atmosphere, the odds of selecting C7 (light blue) are expected to change by a factor of 0.659 (Exp = 0.659, p = 0.007). The odds ratio of “Peaceful” is between 0 and 1, therefore the effect is negative, which means that the increase of atmosphere of “Peaceful” might decrease the possibility of selecting light blue.

Table 22: Binary logistic regression analysis result C7 (light blue), female, atmosphere of visualized dining situations

<b>Criterion variable: Choice of tableware color</b>					
<b>Predictor variable(s)</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>Exp(B)</b>	<b>Sig.</b>
Peace	-0.417	0.154	7.354	0.659	0.007**
Constant	-0.045	0.442	0.010	0.956	0.918

*Color 8: dark blue*

Table 23 shows the key result from logistic regression analysis in C8 (dark blue). As shown in the result, “Quiet” was found as significant predictor to choice of tableware color of C8 (dark blue). When holding all other variables constant, for a unit change of “Quiet” in atmosphere, the odds of selecting C8 (dark blue) are expected to change by a factor

of 1.800 ( $\text{Exp} = 1.800$ ,  $p < 0.001$ ). The odds ratio of “Quiet” is greater than one, therefore the effect is positive, which means that the increase of the atmosphere of “Quiet” is considered to increase the possibility of selecting dark blue.

Table 23: Binary logistic regression analysis result C8 (dark blue), female, atmosphere of visualized dining situations

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
Quiet	0.588	0.140	17.741	1.800	0.000***
Constant	-2.470	0.353	49.060	0.085	0.000***

### *Summary*

In summary, 5 of the 8 colors were found to be related to atmosphere in general. For these 5 colors (C2: dark pink, C5: light orange, C6: dark orange, C7: light blue, and C8: dark blue), there were one or two atmospheres that were considered to be affecting the choice of tableware color results.

No significant predictors was shown in the result of logistic regression analysis in the other 3 of the 8 colors. For these 3 colors, atmosphere in the dining situation were not predictors to choice of tableware colors. Further analysis on free comments is needed to explore other potential predictors.

In total, there were 7 items in atmosphere that considered to be effective variables to choice of tableware color. This indicates that measuring the atmosphere of colors might not be an effective way to predict the choice of tableware color, compared to measuring the atmosphere of the dining situations.

### 8.5.4 Word Usage of Color Preference in Describing Reasons

Among all cases of choice of tableware colors, in the descriptions of reasons, females mentioned the preference of the color as one of the reasons why they chose specific colors in 19% cases in Study 2. While in Study 3, females barely mentioned that the preference of the color was one of the reasons why they selected the color.

To compare the difference word usage of color preference related words (e.g., like the color; prefer the color; love the color on tableware, etc.) in the descriptions of reasons among different dining situations, and without any dining situation, the word usage of color preference in Study 2 was set as control group, representing how often females used color preference to explain why they chose the colors. On the other hand, the word usage of color preference in Study 3 was set as treatment group, with the treatment of 6 different visualized dining situations. Test for change in binary data using Cochran's Q test was carried out to determine the differences. Figure 30 shows the result.

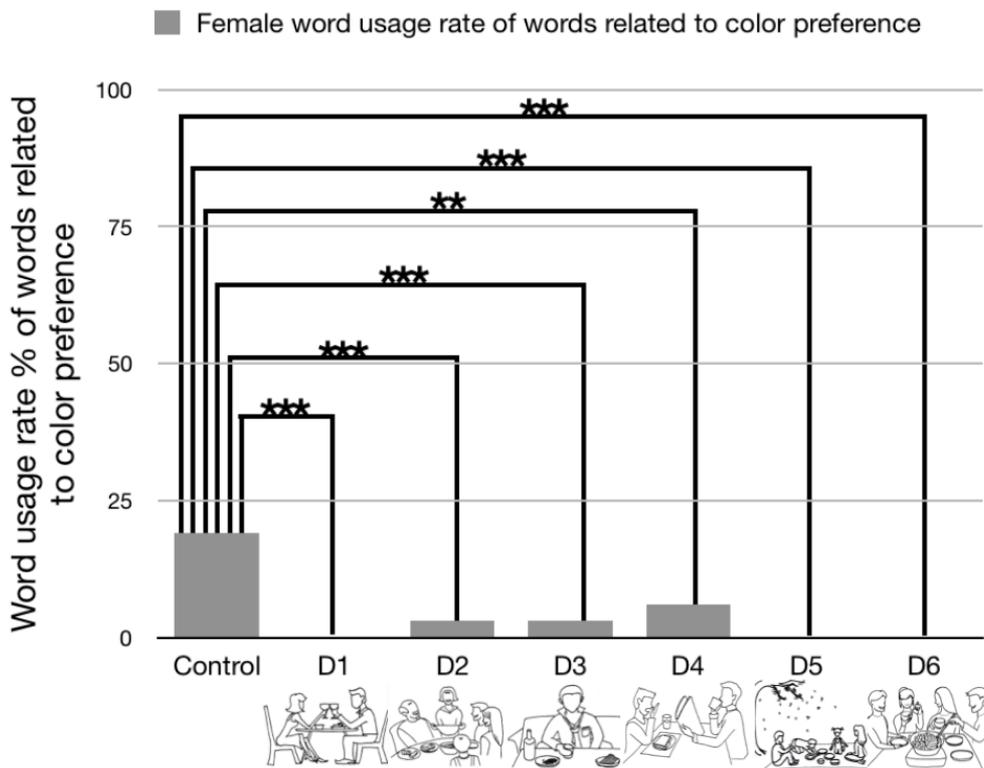


Figure 30: Word usage of color preference related words, and the difference between control group and groups with visualized dining situations.

Cochran's Q test yielded a significant difference between the word usage of color preference among the groups ( $p < 0.001$ ). Pairwise comparison revealed the significant differences between control group and the treatment groups with presentation of visualized dining situations. The word usage of color preference related words in control group is significantly higher than dining situation No. 1 "dinner dating with partner" ( $p < 0.001$ ), No.2 "dinner with family members" ( $p < 0.001$ ), No. 3 "drinking alone at home" ( $p < 0.001$ ), No. 4 "breakfast at home" ( $p = 0.003$ ), No. 5 "picnic with family at park" ( $p < 0.001$ ), and No. 6 "hot pot party with friends" ( $p < 0.001$ ).

In summary, it is suggested that when female participants were asked to choose tableware colors, 19% of the choice could be explained that they liked the color being on the tableware. However, when presented with visualized dining situations, the rate of preference of color significantly dropped down in the reasons of choice of tableware color.

### 8.5.5 Word Usage in Describing Reasons and Choice of Tableware Color

A series of binary logistic regression analysis (method: forward step) were conducted to test the effects of word usage in describing the reason of choosing colors on the actual choice of tableware color in different dining situations.

As results show, word usage was found as significant predictor of choice of tableware color in choice all colors. Table 24 to Table 31 show the results of binary logistic regression analysis.

#### *Color 1: light pink*

Table 24 shows the result from logistic regression analysis in C1 (light pink). The word "happy(color)" ( $B = 3.470$ ,  $p = 0.006$ ) was significant predictor of choice of light pink as tableware color. When

female participants selected light pink as their tableware color, they significantly used the word “happy” to describe light pink, as the reason why they chose the color. On the other hand, the predictor model also included the word “flower” (B = 2.777, p < 0.001). “Flower” appeared to be a significant reason why participant selected light pink as tableware color. The model also included word “carefree”, “cool”, and “night”, however, these words did not reveal a significant effect that with p value lower than 0.05, although “carefree” (p = 0.054) and “night” (p = 0.051) showed a tendency to be significant predictors.

Table 24: Binary logistic regression analysis result C1 (light pink), female, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
happy (color)	3.470	1.253	7.665	32.133	0.006**
flower	2.777	0.756	13.508	16.067	0.000***
carefree	2.777	1.439	3.723	16.067	0.054
cool	2.084	1.253	2.764	8.033	0.096
night	1.678	0.859	3.819	5.356	0.051
Constant	-3.916	0.716	26.459	0.020	0.000***

### *Color 2: dark pink*

Table 25 shows the result from logistic regression analysis in C2 (dark pink). In the predictor model, the word “joyful” (B = 1.162, p = 0.030), “gorgeous(color)” (B = 3.205, p < 0.001), and “picnic” (B = 1.952, p = 0.002) were significant predictors of choice of dark pink as tableware color. The model also included the word “relaxing(color)”, “romantic” and “instergramable”, however, these words did not reveal a significant effect. “Relaxing(color)” (p = 0.054) and “instergramable” (p = 0.057) showed tendencies to be a significant predictor. When female participants selected dark pink as their tableware color, they significantly used the word “joyful” and “picnic” to describe

the dining situation, and “gorgeous” to describe the color dark pink, as the reason why they chose the color.

Table 25: Binary logistic regression analysis result C2 (dark pink), female, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
joyful	1.162	0.536	4.710	3.198	0.030*
gorgeous (color)	3.205	0.907	12.490	24.661	0.000***
picnic	1.952	0.631	9.555	7.039	0.002**
relaxing (color)	-2.239	1.164	3.702	0.107	0.054
romantic	2.422	1.440	2.828	11.263	0.093
instergram able	1.728	0.908	3.627	5.631	0.057
Constant	-2.422	0.271	79.707	0.089	0.000***

### *Color 3: light green*

Table 26 shows the result from logistic regression analysis in C3 (light green). In the predictor model, the word “refreshing(color)” (B = 1.328, p = 0.017), “relaxing(color)” (B = 1.356, p = 0.002), “gentle(color)” (B = 2.256, p < 0.001), “pastel(color)” (B = 1.744, p = 0.010), “safe(color)” (B = 2.523, p = 0.015), “grass” (B = 2.856, p = 0.027) and “morning” (B = 1.037, p = 0.044) were significant predictors of choice of light green as tableware color. When female participants selected light green as their tableware color, they significantly used the word “refreshing”, “relaxing”, “gentle”, “pastel”, and “safe” to describe the color light green. They also significantly used “grass” and “morning” to describe the dining situation, as the reason why they chose the color.

Table 26: Binary logistic regression analysis result C3 (light green), female, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
refreshing (color)	1.328	0.555	5.719	3.772	0.017*
relaxing (color)	1.356	0.439	9.531	3.881	0.002**
gentle (color)	2.256	0.620	13.233	9.548	0.000***
pastel (color)	1.744	0.679	6.588	5.719	0.010*
safe(color)	2.532	1.039	5.935	12.578	0.015*
grass	2.856	1.294	4.875	17.399	0.027*
morning	1.037	0.515	4.063	2.821	0.044*
Constant	-3.916	0.716	26.459	0.020	0.000***

#### *Color 4: dark green*

Table 27 shows the result from logistic regression analysis in C4 (dark green). In the predictor model, the word “refreshing” (B = 2.379, p = 0.046), “novel(color)” (B = 3.072, p = 0.017), “nature” (B = 3.072, p = 0.001) and “grass” (B = 3.072, p = 0.017) were significant predictors of choice of dark green as tableware color. When female participants selected dark green as their tableware color, they significantly used the word “refreshing”, “nature” and “grass” to describe the dining situation, and “novel” to describe the color dark green, as the reason why they chose the color.

Table 27: Binary logistic regression analysis result C4 (dark green), female, word usage in describing reasons

<b>Criterion variable: Choice of tableware color</b>					
<b>Predictor variable(s)</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>Exp(B)</b>	<b>Sig.</b>
refreshing	2.379	1.192	3.983	10.792	0.046*
novel (color)	3.072	1.292	5.649	21.583	0.017*
nature	3.072	0.959	10.251	21.583	0.001**
grass	3.072	1.292	5.649	21.583	0.017*
Constant	-3.765	0.413	83.129	0.023	0.000***

*Color 5: light orange*

Table 28 shows the result from logistic regression analysis in C5 (light orange). In the predictor model, the word “warm(color)” (B = 1.453, p < 0.001), “lively” (B = 1.352, p = 0.017), “bright(color)” (B = 1.584, p = 0.003), “energetic(color)” (B = 1.585, p = 0.014), and “delicious(color)” (B = 1.258, p = 0.025) were significant predictors of choice of light orange as tableware color. The model also included the word “relaxing(color)” and “date”, however, these words did not reveal a significant effect. “Relaxing(color)” (p = 0.054) showed tendencies to be a significant predictor. When female participants selected light orange as their tableware color, they significantly used the word “lively” to describe the dining situation, along with “warm”, “bright”, “energetic” and “delicious” to describe the color light orange, as the reason why they chose the color.

Table 28: Binary logistic regression analysis result C5 (light orange), female, word usage in describing reasons

<b>Criterion variable: Choice of tableware color</b>					
<b>Predictor variable(s)</b>	<b>B</b>	<b>S.E.</b>	<b>Wald</b>	<b>Exp(B)</b>	<b>Sig.</b>
warm (color)	1.453	0.416	12.185	4.278	0.000***

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
lively	1.352	0.569	5.647	3.864	0.017*
bright (color)	1.584	0.541	8.564	4.875	0.003**
energetic (color)	1.585	0.645	6.044	4.877	0.014*
delicious (color)	1.258	0.561	5.034	3.517	0.025*
relaxing (color)	-1.525	0.791	3.715	0.218	0.054
date	2.811	1.575	3.186	16.632	0.074
Constant	-2.049	0.252	66.109	0.129	0.000***

*Color 6: dark orange*

Table 29 shows the result from logistic regression analysis in C6 (dark orange). In the predictor model, the word “warm(color)” (B = 1.535, p = 0.002), and “lively(color)” (B = 2.297, p < 0.001) were significant predictors of choice of dark orange as tableware color. The model also included the word “novel(color)”, however, the word did not reveal a significant effect. When female participants selected dark orange as their tableware color, they significantly used the word “warm” and “lively” to describe the color dark orange, as the reason why they chose the color.

Table 29: Binary logistic regression analysis result C6 (dark orange), female, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
warm (color)	1.535	0.500	9.435	4.639	0.002**
lively (color)	2.297	0.596	14.844	9.946	0.000***

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
novel (color)	2.213	1.260	3.083	9.145	0.079
Constant	-2.906	0.298	95.402	0.055	0.000***

### *Color 7: light blue*

Table 30 shows the result from logistic regression analysis in C7 (light blue). In the predictor model, the word “refreshing(color)” (B = 2.228,  $p < 0.001$ ), and “relaxing” (B = 1.366,  $p = 0.020$ ) were significant predictors of choice of light blue as tableware color. When female participants selected light blue as their tableware color, they significantly used the word “relaxing” to describe the dining situation, and “refreshing” to describe the color light blue, as the reason why they chose the color.

Table 30: Binary logistic regression analysis result C7 (light blue), female, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
refreshing (color)	2.228	0.449	24.638	9.282	0.000***
relaxing	1.366	0.587	5.420	3.918	0.020*
Constant	-2.154	0.231	87.303	0.116	0.000***

### *Color 8: dark blue*

Table 31 shows the result from logistic regression analysis in C8 (dark blue). In the predictor model, the word “quiet” (B = 2.170,  $p = 0.043$ ), “lonely” (B = 3.432,  $p < 0.001$ ), “relaxing(color)” (B = 2.514,  $p < 0.001$ ), and “steady(color)” (B = 3.794,  $p = 0.011$ ) were significant predictors of choice of dark blue as tableware color. When female participants selected dark blue as their tableware color, they

significantly used the word “quiet” and “lonely” to describe the dining situation. They also significantly used “relaxing” and “steady” to describe the color dark blue, as the reason why they chose the color.

Table 31: Binary logistic regression analysis result C8 (dark blue), female, word usage in describing reasons

Predictor variable(s)	Criterion variable: Choice of tableware color				
	B	S.E.	Wald	Exp(B)	Sig.
quiet	2.170	1.074	4.077	8.754	0.043*
lonely	3.432	0.769	19.942	30.936	0.000***
relaxing (color)	2.514	0.587	18.369	12.360	0.000***
steady (color)	3.794	1.486	6.522	44.442	0.011*
Constant	-3.794	0.455	69.509	0.023	0.000***

### *Summary*

In summary, all 8 colors revealed multiple significant word usage in describing the reason of choice of tableware color. The result suggests that when female participants selected colors for tableware, while shown visualized dining situations, they tended to use many common words to describe the reason of their choice.

Compared to the results in Study 2, which showed little significant effect of word usage on choice of tableware color, the word usage analysis in Study 3 revealed multiple significant effects of word usage in all 8 colors.

## 8.6 Discussion

### 8.6.1 Pure Color Preference and Choice of Tableware Color in Visualized Dining Situations

*H3a: Pure color preference is not a significant predictor of choice of tableware color in visualized dining situations (Supported).*

In Study 2, H2a hypothesized that pure color preference is not a significant predictor of choice of tableware color, and it was supported. In Study 3, the effect of pure color preference on choice of tableware color was tested again, with the addition of 6 different visualized dining situations. The result revealed no significant effects. Therefore, with the presentation of visualized dining situation, pure color preference still could not affect the choice of tableware color.

Therefore, this research suggests that the initial, pure preference of a color without any context, could not be a predictor to choice of tableware color. When one simply likes a color, it doesn't mean that the person will choose a tableware in that color over the others. In a consumer's mind of making a decision on choosing tableware, the initial, universal, pure reference of the color itself might not be the primary factor to influence the decision. There are other more important factors.

### 8.6.2 The Role of Color Preference in Decision Making of Choosing Tableware Color

*H3b: Color preference in general is not significant predictor in the decision making of choice of tableware color in visualized dining situations (supported).*

Following H3a, it was predicted that color preference, which includes pure color preference, product color preference and situational

color preference, in general is not significant predictor in the decision making of choice of tableware color. It has been proven that pure color preference plays a very small role in the decision making of choosing tableware color in Study 2 and Study 3. The studies did not directly evaluate product color preference and situational product color preference. However, we could see the importance of these color preference in the open-ended free comments of participants.

By comparing the word usage of color preference related words in Study 2 and Study 3, it was found that in Study 2, color preference related words (e.g., like the color; prefer the color; love the color on tableware, etc.) appeared in only 19% answers in the descriptions of reasons. The usage of these color preference related words could not be found as a significant predictor of choice of tableware color. Therefore, it is suggested that the product color preference does not play an important role in decision making of choosing tableware color.

On the other hand, in Study 3, with the presentation of different visualized dining situations, female participants used even less color preference related words in their descriptions of reasons. The word usage of color preference related words in all 6 dining situations were found significantly less than the control group. This suggests that situational product color preference played even less role than product color preference, in the decision making of choosing tableware color.

In summary, non of the preference of the color itself, the preference of the color when it is on the product, and the preference of the color on the product in specific situation, played important role in female's decision making process of choosing tableware color. In general, when choosing tableware color, the preference of the color might not be the most important factor that we need to focus on.

### 8.6.3 Pure Color Impression and Choice of Tableware Color in Visualized Dining Situations

*H3c: Pure color impression is significant predictor of choice of tableware color in visualized dining situations (Rejected).*

Since the pure color preference did not affect choice of tableware colors, it was assumed that the impression of the colors might influence the choice of tableware color. However, Study 3 found no significant effects of the impression of the colors before selection on the choice of tableware color. The initial, pure impression of the colors without any context, could not affect the choice of tableware color. H3c is rejected.

This indicates that along with pure color preference, the pure color impression has little impact on the choice of tableware in visualized dining situation, either. The pure preference and impression of the color did not influence the choice of tableware color. It should be considered that it was the visualized dining situation which affected the choice of tableware more than the colors.

### 8.6.4 Atmosphere of Visualized Dining Situation and Choice of Tableware Color

*H3d: Atmosphere of visualized dining situations is significant predictor of choice of tableware color in visualized dining situations (Supported in most of the colors).*

In the result of logistic regression analysis, 5 out of 8 colors showed significant effects of atmosphere of dining situations on the choice of tableware color. This indicates that for most of the colors, there was a certain atmosphere of dining situation that influenced the choice of tableware color. For example, for light orange and dark orange, no matter what dining situations are presented, if the dining situation created an atmosphere of “lively”, females might tend to select

either light orange or dark orange, or both colors for the tableware in that dining situation.

Compared to pure color preference and pure color impression, atmosphere of visualized dining situation plays a much bigger role in the female's decision making of choosing tableware colors (see Figure 31).

	Pure Color Preference	Atmosphere of Situation
●		
●		Joyful (B=0.648, p=0.002**) Refreshing (B=0.332, p=0.028*)
●		
●		Lively (B=0.350, p=0.005**) Boring (B=-0.528, p=0.018*)
●		Lively (B=0.404, p=0.008**)
●		Peaceful (B=-0.417, p=0.007**)
●		Quiet (B=0.588, p<0.001***)

\*p<0.05  
\*\*p<0.01  
\*\*\*p<0.001

Figure 31: Results of logistic regression analysis on choice of tableware color. The atmosphere of situation was able to be used to predict choice of tableware color for most of the colors. On the other hand, no significant relationships were found between pure color preference and choice of tableware color.

Interestingly, even though the adjective words for emotional responses in the pure color impression ratings were the same with atmosphere of dining situations, pure color impression did not show any impact. For example, there was no significant effect of impression of “quiet” for dark blue, when participants selected dark blue for tableware. However, there was significant effect of the atmosphere of “quiet” in dining situations, when participant selected dark blue for tableware. These observations suggest that the atmosphere of the dining situation is more important than the initial, prior, pure impression of the color. The colors are used for matching the atmosphere of dining situations.

### 8.6.5 Word Usage in Describing Reasons and Choice of Tableware Color in Visualized Dining Situations

An additional finding is that females significantly used more common words to describe the reason why they chose certain colors in dining situations, compared to control group without dining situations.

Figure 32 shows the number of significant word usage in describing reasons in Study 2. Figure 33 shows the number of significant word usage in describing reasons in Study 3.

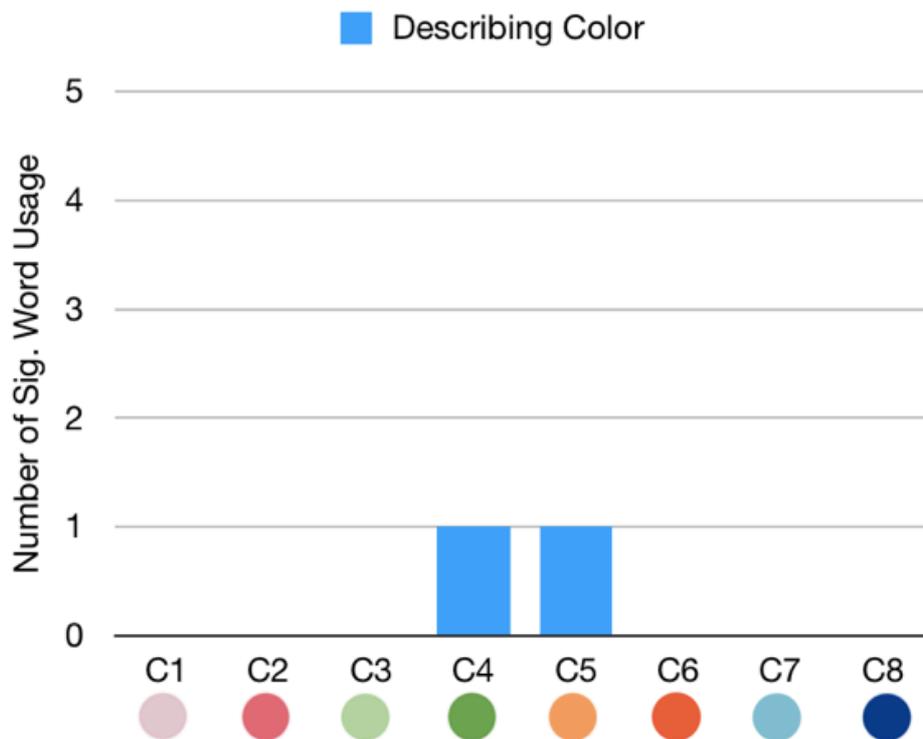


Figure 32: Number of significant word usage in describing reasons in Study 2, choosing tableware colors without presentation of any dining situations.

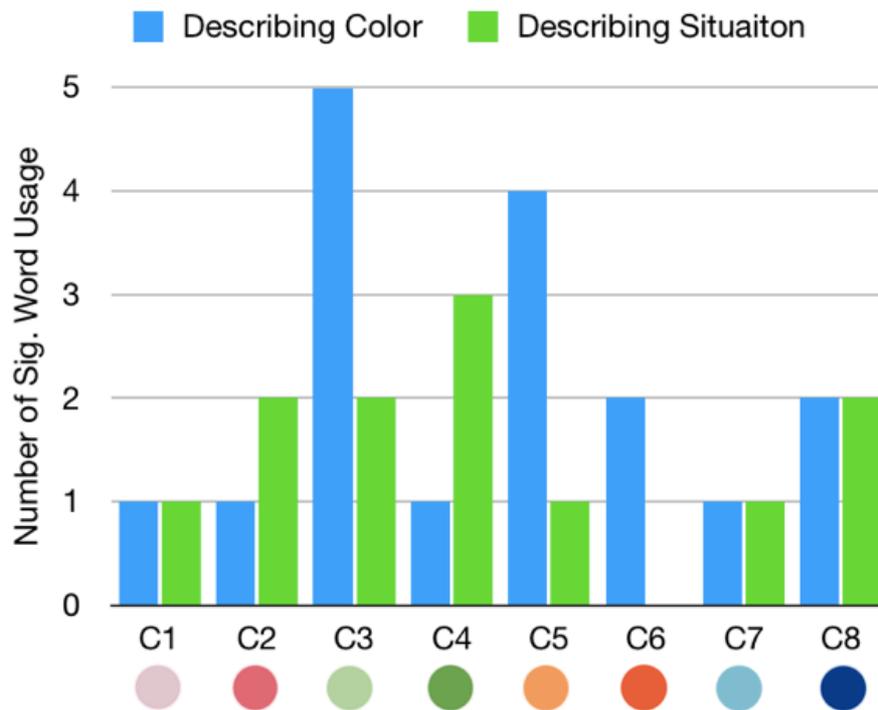


Figure 33: Number of significant word usage in describing reasons in Study 3, choosing tableware colors with presentations of 6 different dining situations.

This result indicates that the words participants used to describe the reasons of choosing tableware color are very subjective and individually different. However, when presented with visualized dining situations, female participants tended to use a lot of same words to explain why choosing certain tableware color, and the words they used to explain the reasons were not only describing the situations they saw, but also the color itself. Although females used just 2 words in common to describe the colors when explaining the reasons, when shown different dining situations, they used 17 words in common in total, to describe all 8 colors when explaining.

The presentation of visualized dining situations might influenced the decision making process of choosing tableware colors for females, made them think in a more similar way. On the other hand, more word usage in common suggests that the way females saw the 8 colors became more similar. In general, visualized dining situations reduced the subjectivity of the Kansei of choosing tableware colors.

## 8.7 Summary

In this chapter, deeper analysis using logistic regression analysis and test for change in binary data, etc., were carried out to verify the 4 hypotheses of Study 3.

H3a and H3b were supported, suggesting that pure color preference is not a significant predictor of choice of tableware color, and color preference in general (including product color preference, situational product color preference) does not play an important role in choice of tableware color. Afterwards, the rejection of H3c indicates that pure color impressions are not significant predictors, either. On the other hand, H3d was supported, indicating that atmosphere of visualized dining situations could influence the choice of tableware in most of the colors.

The analysis on word usage in describing reasons proved that females used many common words to describe the reason why they chose certain colors when resented with visualized dining situations, compared to when dining situations were not presented to them. On the other hand, the amount of words in common describing colors indicates that the way females described and explained the colors became more similar, less individually different, with the presentation of visualized dining situations.

# Chapter 9: General Discussion

## 9.1 Choice of Product Color cannot be Simply Predicted by Color Preference

Literatures have suggested that the behavioral choice of a product should be best predicted by color preference. However, It is argued that the role of color preference in the behavioral choice of product color might be smaller in this study. In this study, color preference in general did not have effects on the choice of tableware. It is suggested that people’s initial, prior preference of a color does exist, however, it was not the primary factor to affect people’s choice of a product in that color (see Figure 34).

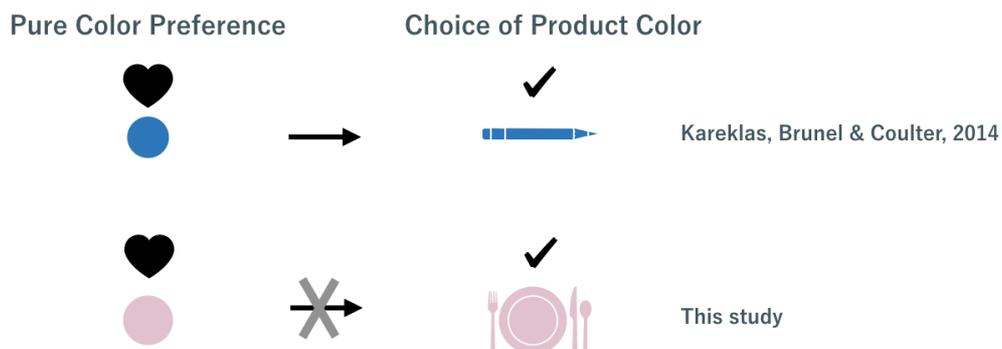


Figure 34: Pure color preference and choice of product color: how much a person likes a color, was a predictor of choice of the color on a product in the study by Kareklas et al., but could not be a predictor in this study.

To understand the different results between this study and the preceding study existing in the literature, the differences between experimental settings are reviewed as bellow. The preceding research

which suggested the significant effects of pure color preference on choice of product color only considered 2 colors: black and white, and used pen as the target product. Meanwhile, this study involved 8 different colors, including 4 color hues (pink, orange, green and blue) with 2 versions of saturation (light and black), and the target product was tableware (see Table 32).

Table 32: Pure color preference and choice of product color, differences between preceding study and this study

	<b>Preceding Study by Kareklas, et al (2014)</b>	<b>This Study</b>
<b>Colors</b>	2 colors (black and white)	8 colors(4 color hues x 2 saturation condition)
<b>Product</b>	pen	tableware
<b>Conclusion</b>	Choice of product <u>can</u> be predicted by color preference	Choice of product <u>cannot</u> be predicted by color preference

### *Number of Colors*

As shown in Table 32, the first difference between the preceding study and this study is the number of colors involved in the study. The preceding study only compared 2 colors, with black and white, whereas this study showed participants more colors to rate the color preference. The review by Palmer and Schloss (2015) on color preference research have suggested that there are different ways of rating color preference, however, there are few suggestions exploring how and why people perceive and react differently when seeing different number of colors and making decision on choosing colors for product [175]. The intention of adding more colors in this study was to supplement previous studies, like most of the other studies that expanded the range of colors did. So far, there are not enough implications from literature or analysis results in this study, to discuss whether the number of colors could have an effect on how people make their decision based on color preference.

### *The Category of Product*

The second difference is the product category in these two studies. The preceding study by Kareklas, et al. (2014) used pen as the target product, and in this study tableware was taken into consideration. Both pen and tableware are very common products in our daily lives. However, the results of these two studies have revealed different observations. In the case of pen in Kareklas's study, people chose pen color based on their pure color preference; in the case of tableware in this study, people did not choose tableware color based on their pure color preference. Therefore, the category of target product might be one of the biggest reasons why people's color preference showed different effects in these two studies.

Holmes and Buchanan (1984) have suggested that people's product color preference are different when the color is on different types of products [176]. In their study, automobile, cloth, sofa, etc., were used as the target products. People's product color preference is different among these different types of products, thus their preference of a color would not be the same when the color is on different types of products. Therefore, for some product categories (e.g., pen), people might choose the product simply based on their pure preference of the color; for other product categories (e.g., tableware), people's decision making process might be more complex.

How do we distinguish what types of product's decision making of colors are more affected by pure color preference? Before comparing pen and tableware, we could take a look at the literature. Holmes and Buchanan (1984) have conducted experiment to investigate male and female's overall color preference, color preference on different product categories, involving multiple types of products and approximately 50 types of colors [176]. The findings of the study suggested that when given the freedom to choose their favorite colors from around 50 types of colors for each product category, participants showed completely different color preference among different product categories. However, even though the authors suggested that product color preference are different among product categories, they did not carry out deeper

analysis to explain why. Therefore, using the result of color preference ratings on overall color preference and product color preference of different product categories, we carried out linear regression analysis to see which types of product's color preference could be predicted by overall color preference (see Table 33 and Table 34).

Table 33: Predicting product color preference using pure (overall) color preference (males)

<b>Product Category</b>	<b>Coefficient</b>	<b>Sig.</b>
Automobile	0.28	0.020*
Shirt	0.604	0.000***
Slack	0.602	0.000***
Suit	0.239	0.092
Carpet	0.142	0.121
Sofa	-0.007	0.923
Chair	-0.033	0.377
Walls	0.014	0.945

Table 34: Predicting product color preference using pure (overall) color preference (females)

<b>Product Category</b>	<b>Coefficient</b>	<b>Sig.</b>
Automobile	0.345	0.065
Blouse	0.294	0.028*
Skirt	0.612	0.001**
Dress	0.503	0.000***
Carpet	-0.009	0.954
Sofa	0.006	0.978
Chair	-0.096	0.741
Walls	0.191	0.440

From these results, we can see that basically, for both males and females, the color preference of product categories related to clothing and outfits are significantly predictable by pure color preference. There is a clear tendency that when males and females like a color, they would also like to dress the color. On the other hand, the color preference of product categories related to furnitures could not be predicted by pure color preference. How people like a color on furnitures, are completely different from how they like the color in general. The exception is “suit” for males. In the product color preference, it is found that males prefer suit in grey color. This might because in general, the color variation of suit is limited, and usually designed with social meaning. Automobile showed difference between genders. Males tend to prefer the same color they generally like for automobile, but females did not show such tendency (see Figure 35).

Male			Female		
Product Category	Coefficient	Sig.	Product Category	Coefficient	Sig.
Automobile	0.28	0.020*	Automobile	0.345	0.065
Shirt	0.604	0.000***	Blouse	0.294	0.028*
Slack	0.602	0.000***	Skirt	0.612	0.001**
Suit	0.239	0.092	Dress	0.503	0.000***
Carpet	0.142	0.121	Carpet	-0.009	0.954
Sofa	-0.007	0.923	Sofa	0.006	0.978
Chair	-0.033	0.377	Chair	-0.096	0.741
Wall	0.014	0.945	Wall	0.191	0.440

Figure 35: Highlighting the significant relationships between pure color preference and product color preference in males and females.

We could consider the difference between these product categories is whether it is **attached to human**, or **attached to the environment**. Here we could define these two types of products as **personal product**, or **ambient product**. Personal product that is usually attached to the user, is the product that the user would like other people to see on him/her, to express himself/herself; and ambient product that is usually attached to the environment, is the product that the user wants to see and be around in the same space.

For example, when being used as a product, shirt, slack, suit, blouse, skirt and dress are always attached to the user. On the other hand, carpet, sofa, chair and walls are always attached to the surroundings of the user. Color preference of automobiles was found significantly predictable by overall color preference in males, but showed tendency to be significant ( $p = 0.065$ ) in females. Few evidence could be found in literatures to explain how males and females attitude against automobile differently. There are reports that suggest males are more likely to own an automobile, while females travel more but tend to use other transportations rather than automobile [177][178]. There might be a tendency that females treat automobile more like an ambient product, like a house or furniture; on the other hand, males might be more likely to think they own the car, and a car is a personal product that attached to the owner (see Figure 37).

Now if we look back at the comparison between pen and tableware, we could clearly see that pen is more of a personal product that attached to the user; when we use a pen, we hold it in hands in public, put it into our pocket or bags on travel. On the other hand, tableware is more of an ambient product that attached to the table; we use tableware with food on it and put in on the table. As Saito and Wada (2009) mentioned, products like cellphones that we keep attached to our body, wear or keep them on travel, are more likely to express our preference and taste [88]. Therefore, we consider that one of the biggest reasons that cause the different weight of color preference on choice of product color is the product category.

### *Shape of the Product?*

Some might debate that it could be the shape or form of the product that influenced people's Kansei and then lead to different decision. For example, Saito and Wada (2009) have discussed that the shape of the cellphone might influenced people's impression of the color. However, in Holmes and Buchanan's (1984) study, researchers only wrote the name of the products on the sheet of paper for participants to evaluate; in this study, in order to eliminate the effect of

shapes or forms of the product, participants were only informed about the tableware orally. Therefore, the shape of the product might have effects, but not in the cases of this study.

## **9.2 Atmosphere of Dining Situations Affects Choice of Tableware Color**

Choice of colors for ambient products (attached to the environment) could not be predicted by color preference. Then, what is playing more important role in the Kansei process of decision making of these types of product?

In the study, it was found that even when people selected the same color, their explanations were very different among individuals. This is the challenge of Kansei research, that the way people describe their perceptions are too subjective, which makes it difficult to measure Kansei. As a proposal and attempt, this study involved visualized situations. Situation is found potentially very important in Kansei studies in the literature review.

On the other hand, since ambient products are always attached to the environment, it makes sense that ambient products might be more related to the surroundings, situations and the atmosphere of the situations.

Literatures have treated atmosphere of dining experience as the lighting conditions, olfactory cues or auditory stimuli. This study takes a different approach of atmosphere, by defining atmosphere as the psychological vibe, simply created by the basic cues of situation.

Based on the result of the study, among all the predictors, neither pure color preference nor pure color impressions were able to be the predictor of choice of tableware color. Only the atmosphere of dining situations could be used to predict most of the choice of tableware color. The atmosphere of the dining situation surely played a more important

role in the decision making of choosing tableware colors. The atmosphere of dining situations might enhance the impression of the colors, then lead them to use the color to match the atmosphere of the dining situation.

Putting these implications together with the result of the study, it was found that the choice of tableware color was better predicted by atmosphere of dining situations. This result enlightens us that the atmosphere of the usage situation might play a more important role in the decision making process of ambient products such as tableware.

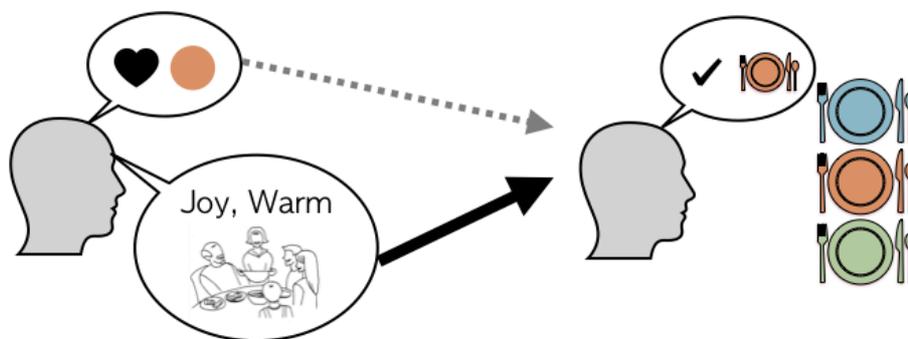


Figure 36: Compared to pure color preference, the atmosphere of the dining situations plays a much bigger role in the decision making process of choosing tableware color.

Figure 37 shows the observation of this study, suggesting that products could be categorized into 2 types: personal product and ambient product. Personal products are always attached to the user, expressing the taste of user and preference, and the choice of colors on personal products is more likely to be influenced by pure color preference. Ambient products are always attached to the environment, creating the surroundings of the user together with other environmental cues, and the choice of colors on ambient products is more likely to be influenced by the atmosphere of the product's usage situation (see Figure 37).

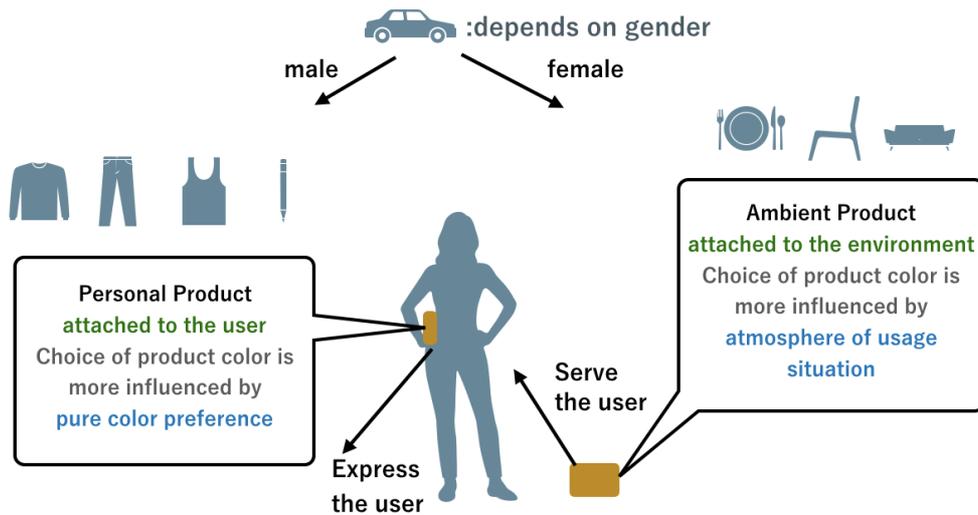


Figure 37: Personal product and ambient product

### 9.3 Gender Differences in Product Colors

Literatures suggested that females have a wider range of acceptance of colors than males in terms of product colors. The results of this study agreed with this indication.

An interesting finding is that even though males showed many significant difference in the preference of the 8 colors, when asked to choose a color for tableware, they tended to choose only one color (dark blue) more than the others. The other 7 colors did not show any significant differences. This suggests that males had several colors they like and several colors they don't like, but they tended to choose only dark blue for tableware. On the other hand, females specifically liked all the light colors for tableware more than all the dark colors.

#### *Females Prefer Light Colors, Males Only Like Dark Blue for Tableware*

Why do females prefer light colored tableware? Why males only like dark blue for tableware? Literatures have suggested that males prefer saturated colors, whereas females prefer muted colors [171].

Females are also indicated to have a wider range of interests in various colors for product (cellphone) [88]. Literatures have also pointed out that not only for context-free colors that males prefer saturated colors while females prefer muted colors, when put on objects, the trend is still the same [170].

All of these observations from the literature could support and explain the result of this study that males prefer single saturated color (dark blue) for tableware, whereas females prefer more options but all light colors for tableware. There is no disagreement with literatures.

As an implication and suggestion to tableware marketing strategy, the combination of various light colors might work well with female consumers; and dark blue would be the most popular choice of male consumers.

#### *Female's Preference on Tableware Colors Could be Changed by Usage Situations*

Females prefer all light colors over the dark ones for tableware. However, this tendency could be affected by presenting usage situations of tableware. When females were presented with different dining situations, they tended to choose different colors including the dark colors. The dark version of the same color could be chosen the same times with the light version (e.g. in dining situation No.1 “dinner dating”, light and dark pink were chosen around the same times; light and dark blue were chosen around the same times). In some dining situations, the dark colors were even chosen more than the light version of the color (e.g., in dining situation No.2 “picnic with family at park”, dark pink was chosen more than light pink; in dining situation No. 3 “drinking alone at home”, dark blue was the most popular choice). This suggests that presenting different dining situations could make females consider to choose dark colors as well. The effects of atmosphere of dining situations on the choice of tableware colors were already stated above.

As a suggestion for marketing strategy, marketers are recommended that when high saturated colors are not selling well in females, considering presenting the usage situation to customers might be a good idea. When female customers see the usage situation that matches the dark colors, the chance of them choosing the dark colored product might increase.

#### *Insights for Male's Obvious Preference on Dark Blue Tableware*

Another intriguing finding is that when presented with dining situation No. 3 “drinking alone at home”, females selected dark blue more than all the other colors, giving the same selection pattern with males' choice of tableware color without any dining situations. Apparently, dark blue is suitable with the atmosphere “quiet”, and it was the best color for “drinking alone at home”, even for females. When males were asked to choose tableware color without any presentation of dining situations, were males unconsciously associated the situation of drinking alone at home?

Future studies are needed to find out if visualized dining situations could have impact on males' choice of tableware colors. Since males only prefer dark blue as their tableware color, it is needed to find out what could affect them to expand their options.

### **9.4 Usage Situations Reduce the Subjectivity of Describing Perceptions, Make it Easier to Measure Kansei in Decision Making on Product**

The whole research was motivated by the goal of understanding and reducing the subjectivity of Kansei in Kansei research. According to literatures, in Kansei process of intuitional cognition, the subjectivity of Kansei in individuals sets the different directions of understanding Gosei, then causes the differences in our way of describing the perception, then finally lead us to different decision making (Yamanaka, 2012, [10], see Figure 2).

After investigating in literatures, the notion of “situation” was found to be potentially very important in human’s Kansei. By further extending the possibilities, the usage situation of a product was considered to have the potential to reduce the subjectivity of Kansei in Kansei process. Therefore, this research conducted experiments of evaluating and choosing tableware colors, with presenting the usage situations of dining scenes.

It is often said that Kansei is difficult to measure directly. In the model of Kansei process, we measure the Kansei of human by measuring their Gosei, how they describe their perception. Thus, the criteria in this study to measure Kansei, is the word usage in describing the reasons of choosing tableware color. As a result, in Study 2, without the presentation of dining situations, participants showed very little significantly word usage in common. On the other hand, in Study 3, with the presentation of dining situations, participants were able to use many words in common that both describing the colors and the situations to explain the reason why they choose certain colors. Although 6 different dining situations were applied in the experiment, participants still showed much more similarities in describing the reasons. Applying the model of Kansei process by Yamanaka (2012), it is considered that the Gosei in tableware color selection process is the part when participants explain the reasons why they chose certain colors using their own words. It is obvious that when participants made the same decision and used more words in common to describe their perceptions, we would be able to see a clearer tendency in Gosei, which means the measurement of Kansei would be clearer.

Therefore, based on the model of Kansei process by Yamanaka (2012, [10]), this study found that by inputting the usage situation of the product (tableware), we could get the output that participants could show much less individual differences in describing the perception (see Figure 38).

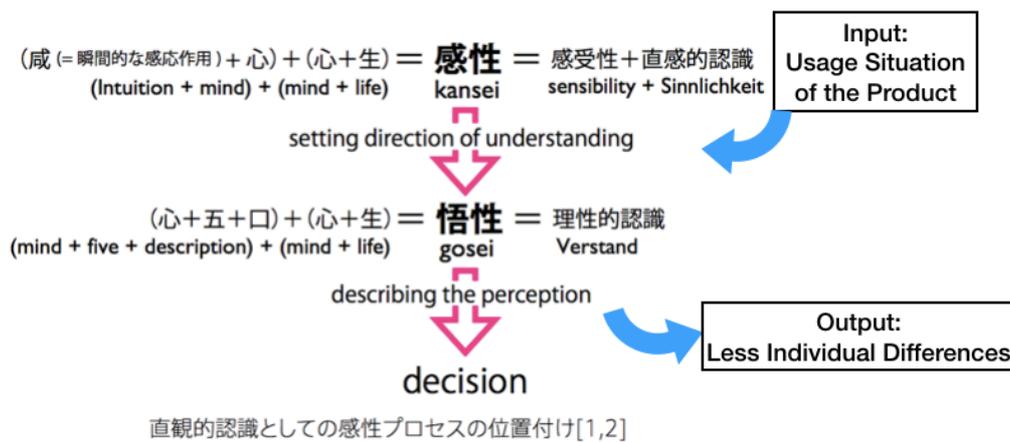


Figure 38: Kansei process, from intuitive cognition to decision making (Yamanaka, 2012 [10]), and suggestion from this study: The input of usage situations of a product could reduce the individual differences in describing the perception, thus it will be easier to measure Kansei

This addition to the model of Kansei process, could enlighten new ways of reducing the subjectivity of describing Kansei. The subjectivity of Kansei causes different direction of understanding, then leads to more different ways of describing the perceptions. When people make the same decision in the end, if the way they describe their perception is too subjective, it would be too difficult to measure Kansei in their mind process. By adding the usage situations to the process, the way people describe their perception become much clearer. Kansei would be better measured and people's mind process of decision making on a product would be better observed.

In Kansei research which involve development and marketing of products, it is suggested that researchers, designers or marketers should consider involving the visualized usage situations as additional stimuli in the research, in order to reduce the individual differences in the responses, thus collect a clearer result of how people perceive, understand and interact with the product.

# Chapter 10: Conclusion, Limitation and Future Study

## 10.1 Conclusion

Color plays an important role in culture, society and our daily life. Color preference is always a factor that continues changing through different time, place, culture and personality, and that is the reason why our behavioral choice of a product might not be simply explained by our initial preference of the color. However, it is found that people do not choose color for products simply based on their preference of the color. In this study, it is suggested that product category might be one of the main reasons that affect our decision making on product colors. For personal products that attached to the users, the user's pure color preference might play a bigger role; on the other hand, for ambient product that attached to the environment, the atmosphere of the usage situation might play a bigger role. Human's Kansei on colors contains a lot more implications and implicit information that worth digging. When we study on the colors of products and consumers' behavior, we should not just simply focus on the color preference. There are more information on colors that affect consumer's Kansei and behavior.

Capturing the trend of customers' choice of product color in different usage situations is essentially useful for designers, researchers and marketers in this area. Using visualized usage situations of the product could create atmospheres, then expand the potential of different colors for marketing purpose. Understanding the Kansei of people on colors and categorizing the user experience into different situations would help designers and retailers improve the user experience of products and the marketing potential.

Human's Kansei of a product is very subjective and difficult to measure directly, therefore in the Kansei process of decision making, we could measure how human describe their perceptions to indirectly understand Kansei. However, how human beings describe the perceptions is also very subjective and individually different. By applying diverse visualized usage situations, people could construct a clearer thought in the Kansei process of decision making, thus we could get much clearer trend in how human describe their perception. This means that we would be able to understand more about the Kansei process behind people's decisions on products, and gather more information we need in Kansei research as a result.

## **10.2 Limitation and Future Study**

First of all, this study suggested the classification of personal products and ambient products, to distinguish whether the color preference or atmosphere of usage situations would play a more important role in decision making process. This classification of products category was made by observing literatures including clothes, automobile and furnitures, and comparing tableware in this study with pen in preceding study. To support and strengthen this concept, future studies involving more types of products are absolutely encouraged and welcoming.

Being a study focused on the color of tableware, this research followed the literature by mainly targeting on plate and bowls. In order to reduce the effects of specific shape and texture, this study intentionally used printed color samples instead of actual product with colors, and indicated participants to associate tableware such as plate and bowl. Although the shape and design of regular plates and bowls are considered simple and similar, it cannot be denied that some of the participants might associated particularly novel, different type of plates or bowls. In future studies, researchers should consider including this factor. Collecting information about what kind of product participants associated after the experiment might be a good approach.

As being said, atmosphere and situation are two sides of a coin [91][90]. This research has set an example of studying product usage situations by using the approach of atmosphere. It is also tested that visualized dining situations using sketches could create different atmospheres, and clearly sensed by females more than males. For future studies, a model including color of the product, usage situation and the atmosphere might work well with female consumers. However, this study only compared the simplicity of two versions of the visualized dining situation sketches in the preliminary study, and applied the detailed version in the main study. A deeper discussion between the simplicity and other features of the visualized situations would be recommended for future studies.

In Chapter 5, the relationship between visual details and the atmosphere in dining situations were discussed. Although this part was not the main topic in the whole study, the results suggested some intriguing connections between visual details and the evoked atmosphere. Some of the small visual details, for instance, whether the character is holding a cup, or how many females are in the situation, might have potential effects on specific atmosphere from the dining situation. There are very few related studies that could be found in the literatures, but the potential of expanding this topic is considered promising. Future studies focusing on this topic are recommended.

Study 2 discussed the difference between males and females on the Kansei and choice of tableware colors. However, when applying the visualized dining situations, only females were recruited for the main study. The reason is that the model of using visualized situation sketches in the research is not mature yet, the experimental process and the design of the visualized situations is still very raw. Females were selected because of their stronger sensitivity on atmospheres from the visualized situations, thus they had bigger potential to showcase effects of atmosphere. On the other hand, eliminating the gender effects would simplify the experimental settings and the analysis due to the complexity of multivariate study. Nevertheless, the Kansei and interaction of males with visualized usage situations should not be

ignored. Future studies using visualized situations on males are needed to complete the puzzle.

## Note

This dissertation interpolates material from two papers by the author [179, 180]. Chapter 4 uses material from reference [179], coauthored with Shinichi Koyama and Toshimasa Yamanaka. Meanwhile, Chapter 7 uses material from reference [180], coauthored with Yusuke Shiokawa, Satoshi Suzuki and Toshimasa Yamanaka.

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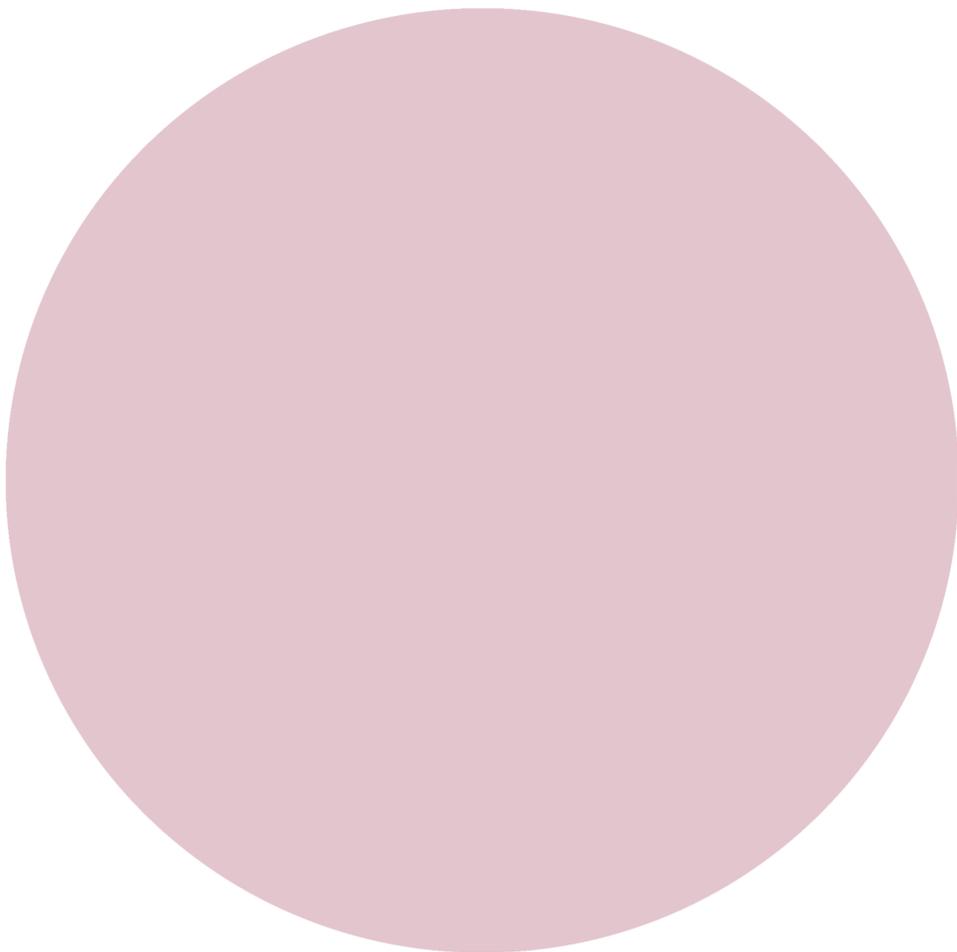
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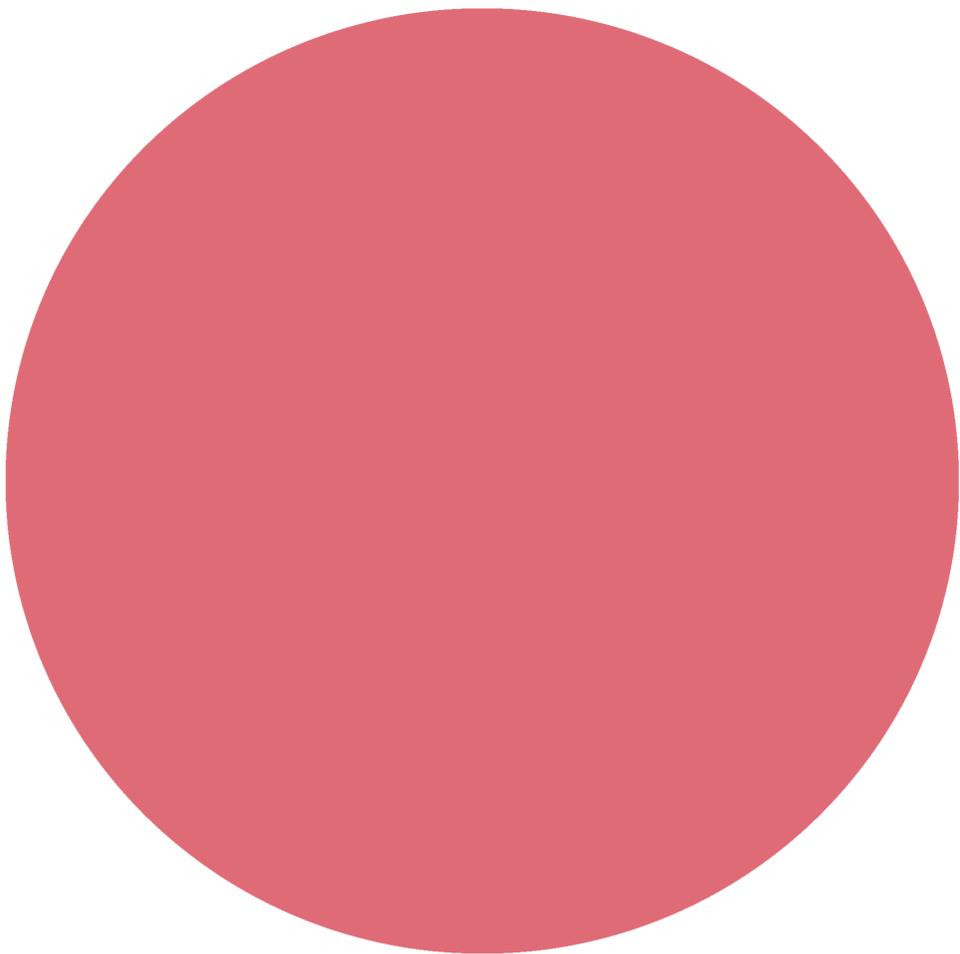
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## **Appendix A: Color Samples**

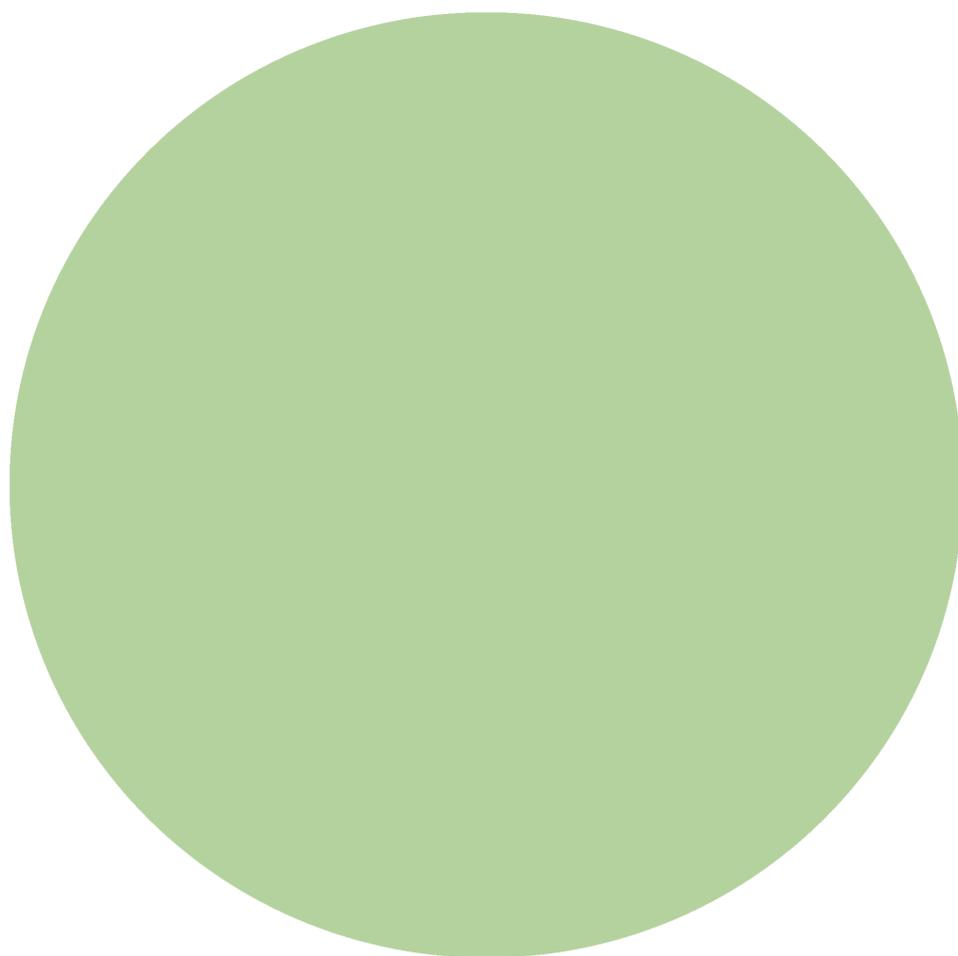
**1**



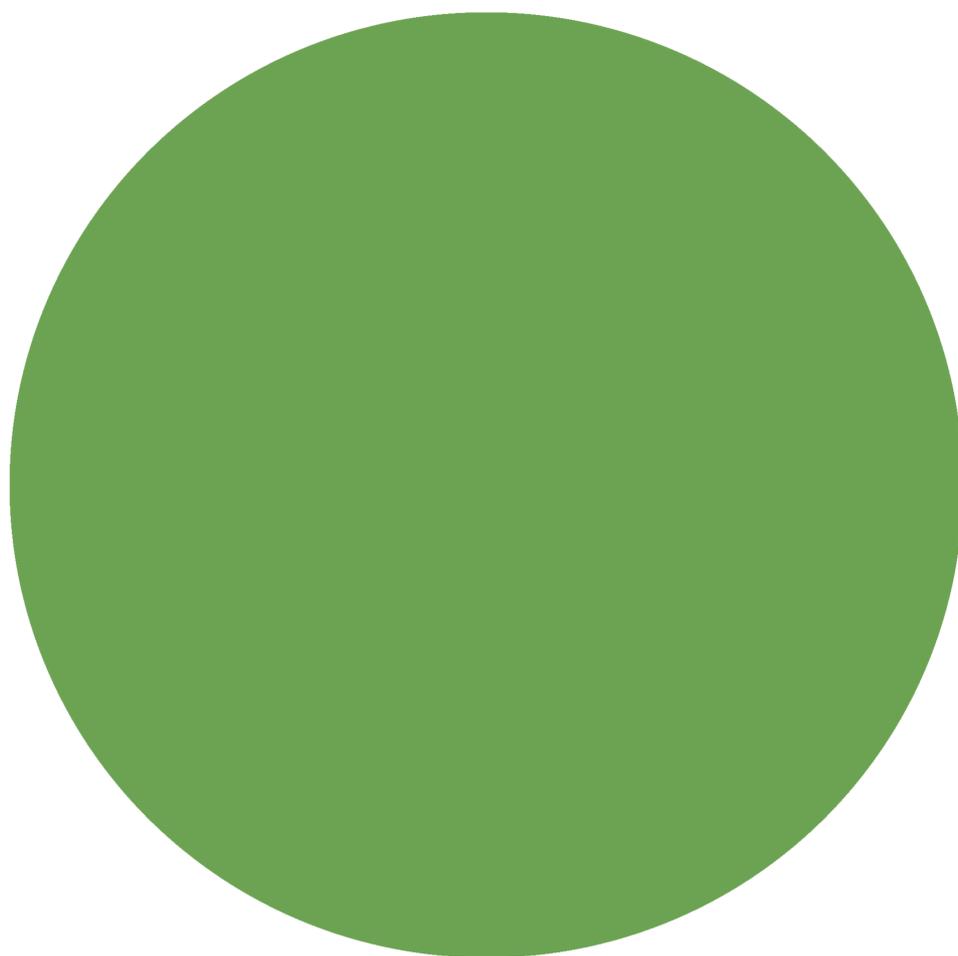
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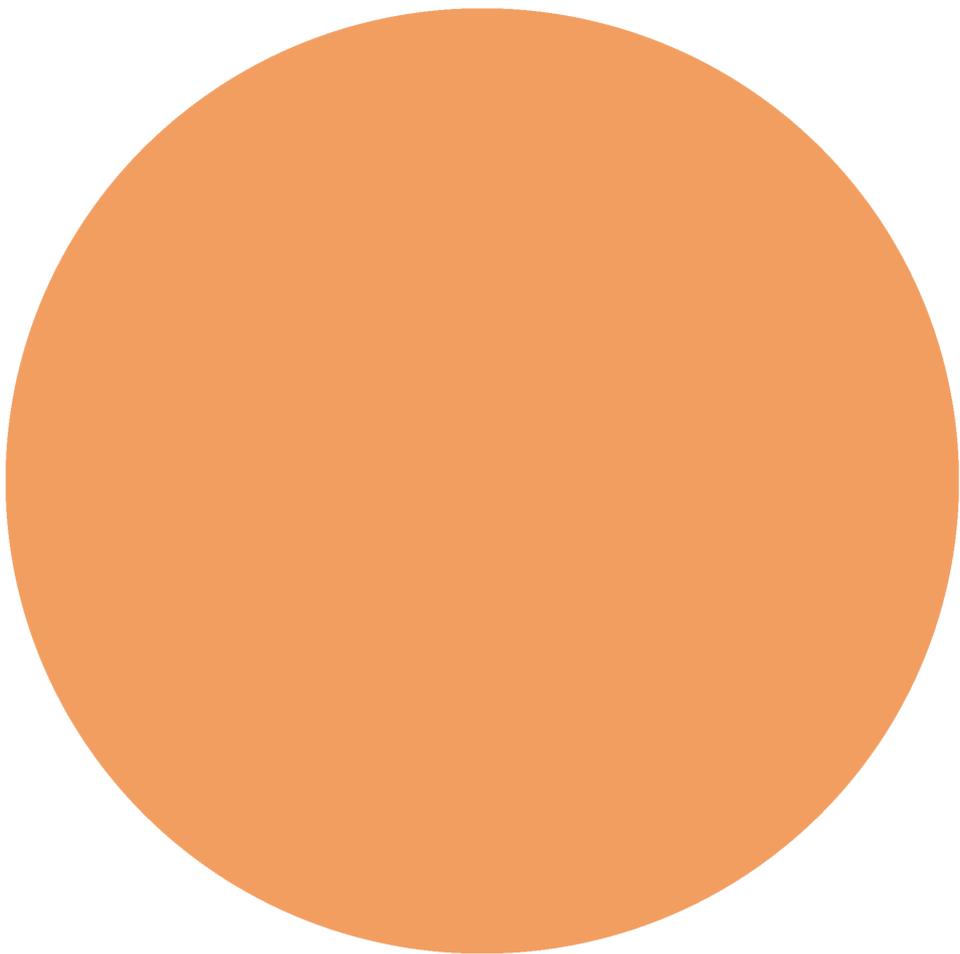
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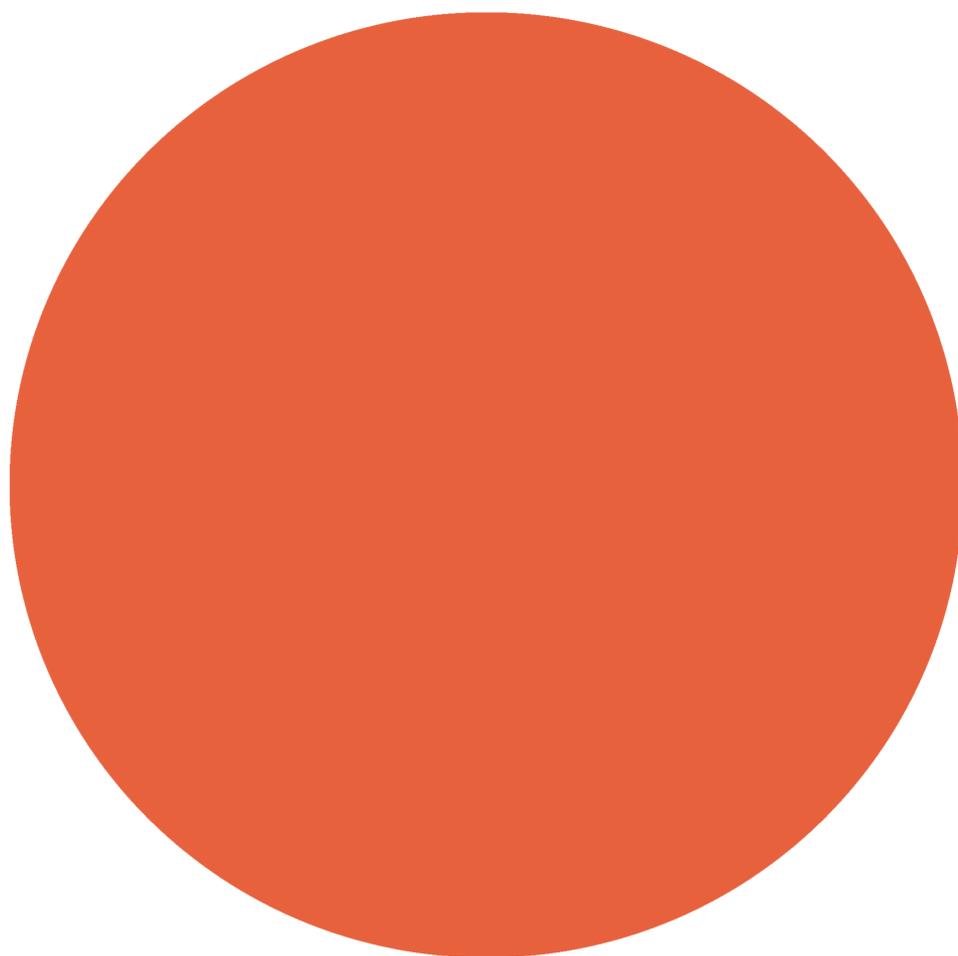
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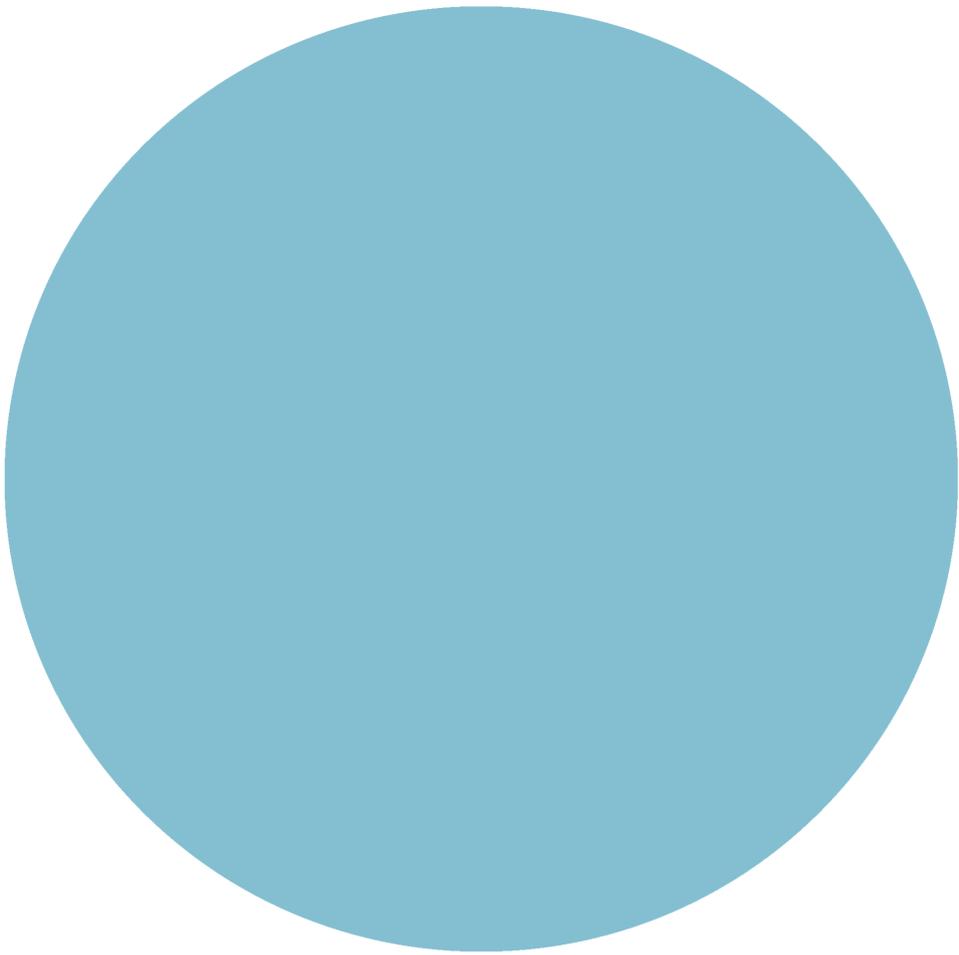
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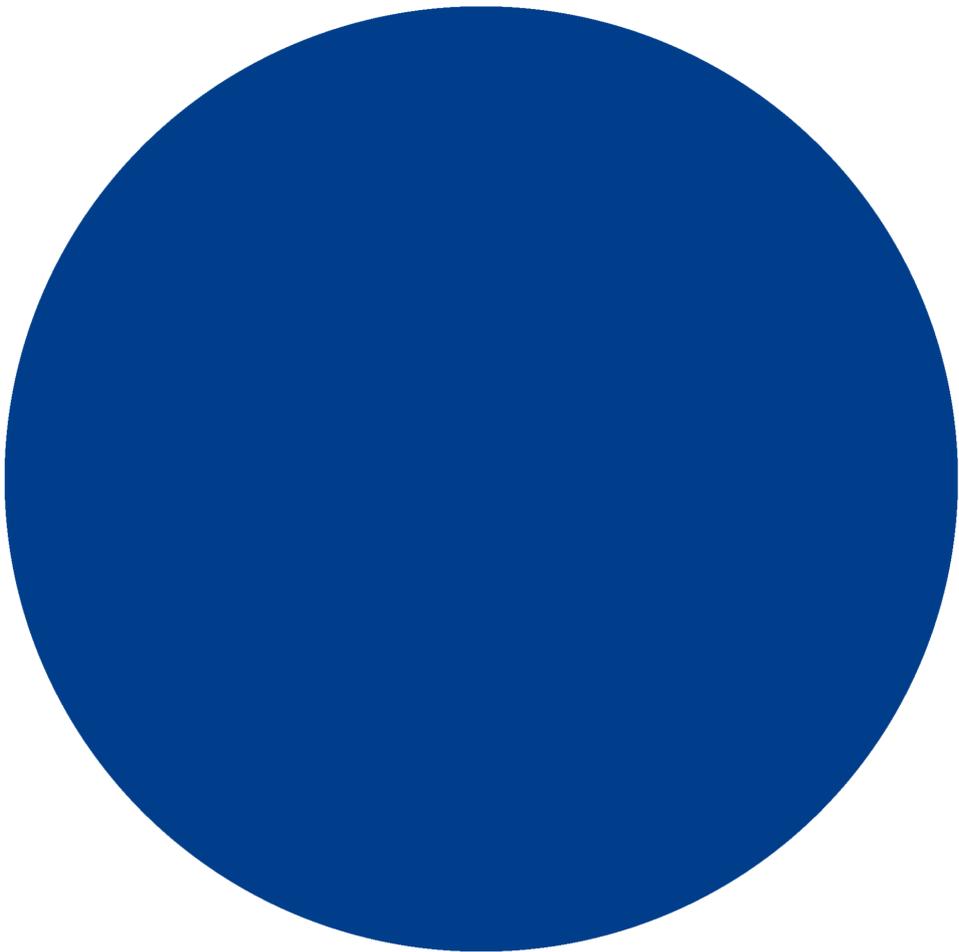
6



7



8



## Appendix B: Questionnaire Samples

### ①恋人とデート



イラストを見て、食事場面の雰囲気の評価してください。  
以下の項目に対して当てはまるところに「○」をつけてください。

	非常に多くあった	かなりあった	まあまああった	少しあった	全くない
楽しさを感じる	4	3	2	1	0
賑やかさを感じる	4	3	2	1	0
幸せを感じる	4	3	2	1	0
安らぎを感じる	4	3	2	1	0
あたたかい感じがする	4	3	2	1	0
冷たい感じがする	4	3	2	1	0
爽やかな感じがする	4	3	2	1	0
変な感じがする	4	3	2	1	0
のびのびできる	4	3	2	1	0
静かさを感じる	4	3	2	1	0
退屈な感じがする	4	3	2	1	0
寂しさを感じる	4	3	2	1	0
空っぽな感じがする	4	3	2	1	0
窮屈な感じがする	4	3	2	1	0
一緒にいると感じる	4	3	2	1	0

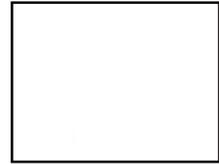
## ②家族と晩ご飯



イラストを見て、食事場面の雰囲気を評価してください。  
以下の項目に対して当てはまるところに「○」をつけてください。

	非常に多くあった	かなりあった	まあまああった	少しあった	全くない
楽しさを感じる	4	3	2	1	0
賑やかさを感じる	4	3	2	1	0
幸せを感じる	4	3	2	1	0
安らぎを感じる	4	3	2	1	0
あたたかい感じがする	4	3	2	1	0
冷たい感じがする	4	3	2	1	0
爽やかな感じがする	4	3	2	1	0
変な感じがする	4	3	2	1	0
のびのびできる	4	3	2	1	0
静かさを感じる	4	3	2	1	0
退屈な感じがする	4	3	2	1	0
寂しさを感じる	4	3	2	1	0
空っぽな感じがする	4	3	2	1	0
窮屈な感じがする	4	3	2	1	0
一緒にいると感じる	4	3	2	1	0

### ③家で一人飲み



イラストを見て、食事場面の雰囲気を評価してください。  
以下の項目に対して当てはまるところに「○」をつけてください。

	非常に多くあった	かなりあった	まあまああった	少しあった	全くない
楽しさを感じる	4	3	2	1	0
賑やかさを感じる	4	3	2	1	0
幸せを感じる	4	3	2	1	0
安らぎを感じる	4	3	2	1	0
あたたかい感じがする	4	3	2	1	0
冷たい感じがする	4	3	2	1	0
爽やかな感じがする	4	3	2	1	0
変な感じがする	4	3	2	1	0
のびのびできる	4	3	2	1	0
静かさを感じる	4	3	2	1	0
退屈な感じがする	4	3	2	1	0
寂しさを感じる	4	3	2	1	0
空っぽな感じがする	4	3	2	1	0
窮屈な感じがする	4	3	2	1	0
一緒にいると感じる	4	3	2	1	0

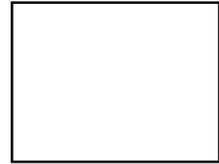
#### ④家で朝ごはん



イラストを見て、食事場面の雰囲気を評価してください。  
以下の項目に対して当てはまるところに「○」をつけてください。

	非常に多くあった	かなりあった	まあまああった	少しあった	全くない
楽しさを感じる	4	3	2	1	0
賑やかさを感じる	4	3	2	1	0
幸せを感じる	4	3	2	1	0
安らぎを感じる	4	3	2	1	0
あたたかい感じがする	4	3	2	1	0
冷たい感じがする	4	3	2	1	0
爽やかな感じがする	4	3	2	1	0
変な感じがする	4	3	2	1	0
のびのびできる	4	3	2	1	0
静かさを感じる	4	3	2	1	0
退屈な感じがする	4	3	2	1	0
寂しさを感じる	4	3	2	1	0
空っぽな感じがする	4	3	2	1	0
窮屈な感じがする	4	3	2	1	0
一緒にいると感じる	4	3	2	1	0

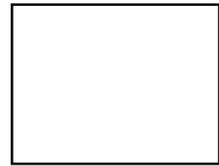
## ⑤家族と公園でピクニック



イラストを見て、食事場面の雰囲気の評価してください。  
以下の項目に対して当てはまるところに「○」をつけてください。

	非常に多くあった	かなりあった	まあまああった	少しあった	全くない
楽しさを感じる	4	3	2	1	0
賑やかさを感じる	4	3	2	1	0
幸せを感じる	4	3	2	1	0
安らぎを感じる	4	3	2	1	0
あたたかい感じがする	4	3	2	1	0
冷たい感じがする	4	3	2	1	0
爽やかな感じがする	4	3	2	1	0
変な感じがする	4	3	2	1	0
のびのびできる	4	3	2	1	0
静かさを感じる	4	3	2	1	0
退屈な感じがする	4	3	2	1	0
寂しさを感じる	4	3	2	1	0
空っぽな感じがする	4	3	2	1	0
窮屈な感じがする	4	3	2	1	0
一緒にいると感じる	4	3	2	1	0

## ⑥友達と鍋パーティー



イラストを見て、食事場面の雰囲気を評価してください。  
以下の項目に対して当てはまるところに「○」をつけてください。

	非常に多くあった	かなりあった	まあまああった	少しあった	全くない
楽しさを感じる	4	3	2	1	0
賑やかさを感じる	4	3	2	1	0
幸せを感じる	4	3	2	1	0
安らぎを感じる	4	3	2	1	0
あたたかい感じがする	4	3	2	1	0
冷たい感じがする	4	3	2	1	0
爽やかな感じがする	4	3	2	1	0
変な感じがする	4	3	2	1	0
のびのびできる	4	3	2	1	0
静かさを感じる	4	3	2	1	0
退屈な感じがする	4	3	2	1	0
寂しさを感じる	4	3	2	1	0
空っぽな感じがする	4	3	2	1	0
窮屈な感じがする	4	3	2	1	0
一緒にいると感じる	4	3	2	1	0