

# Differences of Cast Shadows on Food Image Perception

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## Abstract

Light in photography is considered by most practitioners as one of the most important visual element since through it the human is able to recognize shapes, texture, color depth and even create diverse moods in the images. In food photography, light settings also imply the creation of several forms of shadows which become a secondary visual element. Thus, the effects of different types of shadows on food photos can generate different perceptions of the food creating either a positive or negative impression on human behavior.

This paper aims to explore the usage of cast shadow on food photography in order to open a new discussion in this topic. The main approach was to create and survey food images with several cast shadow composition; evaluate them and determine if the difference of cast shadows has an impact on how food images are perceived.

As a result, the experiment showed that different cast shadows affect not only the mood in which food is perceived but also the taste of the food. These findings can be useful to explain how cast shadows are also a key visual element in the decision making process or human behavior when choosing what to eat from a group of food images.

*Keywords: Food Photography, Visual Elements, Cast Shadows, Perception, Human Behavior*

Food images are widely used as a marketing tool when it comes to advertise a restaurant. For instance; attracting new customers (as external marketing), as well as for designing more appealing menus in order to persuade customers to choose a more profitable dish (as internal marketing). Usually the process of creating food images, involves three major participants: the chef, the photographer and in most cases a food stylist or food coordinator, whose role is to create balance in colour and context between the food and its surrounding.

## **Literature review**

In photography there are several techniques applied to the creation of food images. Each technique has been developed in order to enhance visual characteristics of the food. Although food images can be classified according to its purpose; labels, menus, pamphlets, websites, etc., it is possible to identify several visual elements within their composition. Additionally, colour, lightning, background, decorations, shadows and camera angle are some if not all the visual elements that have to be considered when creating this type of images. For this reason, several scientific researches have been conducted in order to see how most of these visual elements have an influence on the taste of the food (Mizutani et al., 2010; Wada et al., 2010), the purpose of this research is to explore the influence of shadows on food image perception.

According to Da Vinci (2009), shadow can be defined as “the absence of light, merely the obstruction of the luminous rays by an opaque body. Shadow is the nature of darkness. Shadows always exists whenever there is presence of light and an object. Therefore, to speak about shadows is necessary to speak about light as well”.

Furthermore Mamassian (1998) said; “In order to understand the information content of shadows, it is important to recognize that shadows come in two types, depending on how they are formed on surface”. In figure 1 we can see the different elements that compose shadows.

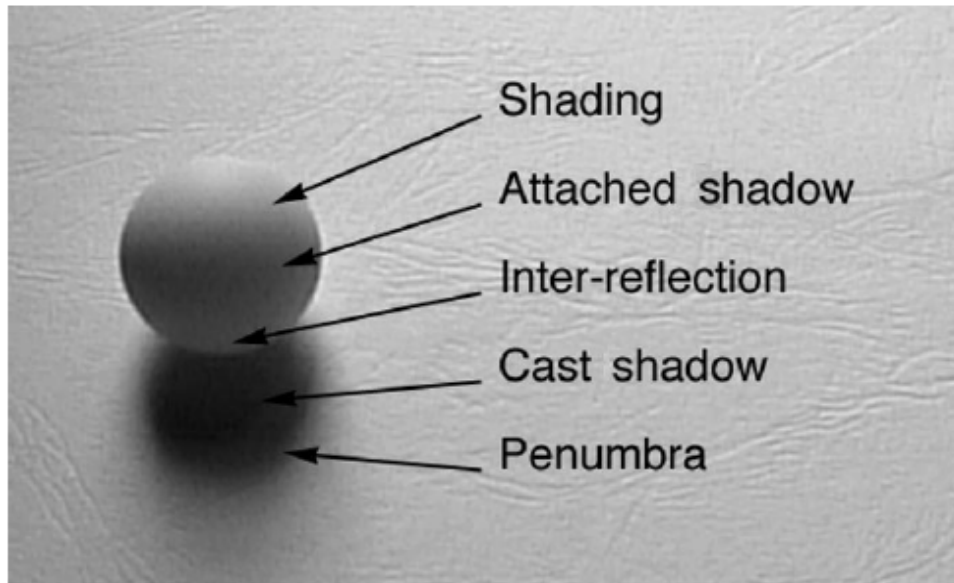


Figure 1: Elements of shadows (Mamassian et al., 1998)

In this way, shadows are important in human perception since they provide important visual cues such as relative positions of objects, information about the geometry of a receiver (background) and information about geometries that are out of the field of view (Hasenfratz et al., 2003).

### **Research Method**

There are several types of food worldwide; each country has its own type of food, presentation, colour, textures, etc. Also there is a vast amount of descriptors for each type of food. This paper focuses on a preliminary shadow evaluation of two shadows schemes which will be denominated “soft shadows” and “hard shadows”. On a previous study made on this research, a shooting procedure was created in order to avoid certain visual elements such as colour, lightning, etc. to differ from each shadow scheme (Sakay O. et al., 2017).

In order to evaluate how does both shadows schemes have an impact on food perception, a survey was designed using 18 food descriptors and sensory related words (Fig. 2).



Figure 2: Descriptor and sensory related words

These words were chosen after running a small survey with several practitioners (experts on image creation) and people with no knowledge on food image creation. The criteria chosen to select the words was the frequency in which they were chosen by the participants. The objective of this preliminary shadow evaluation is to narrow down the food types as well as to see which food descriptors have an impact over these 2 shadows schemes. Separately a second survey was also designed to explore the level of awareness of the participants towards different visual elements such as lightning, colour, shadows, camera angle, background and decoration.

### Participants

Graduate and undergraduate students were recruited from the University of Tsukuba (aged 20-30 years,  $M=24.5$ ,  $SD= 2.72$ ). All participants had a self-reported normal sense of sight.

### Stimuli

A total of 60 images were created using the shooting procedure mentioned above; 30 of the images with the soft shadow scheme and its counterpart with the hard shadow scheme. All images were printed on photographic glossy paper (Epson Crispia) using an Epson PX-5002 K3 technology professional printer which was properly calibrated in order to get accurate images in terms of colour and brightness. In addition, the environment where the experiment took place was also properly set to avoid colour distortions due to the temperature of the light in which the image were going to be shown. The food chosen to create the images were classified in 2 groups: A) raw food such as fruits and vegetables, B) manmade food such as cakes. It was also considered to use other types of foods such as hot dishes, but limitations with the shooting environment did not allowed the creation of these images and therefore they were excluded from the research.

## Surveys and evaluation scale

The first survey used was the visual elements evaluation (survey A), in this survey the participants had to evaluate how important they consider the following visual elements: Colour, Illumination, Background, Decoration, Shadows and Camera Angle. The second survey (Survey

B) the participants have to evaluate the descriptors shown on Figure 2. In both surveys, an intensity scale from 0 to 6 was used, being 0 the lowest rate value and 6 the highest.

## Survey procedure

At the beginning of the experiment, all the participants were told to recall any food image of their choice. After they recalled the food image, it was requested complete survey A. Immediately after completing the survey, food images were randomly shown and while gazing them, the participants proceeded to answer survey B. After completing survey B they had a small refreshing brake to proceed with the next image until all 60 images were evaluated (within- participant design). Figure 3 illustrates the procedure.



Figure 3: Experimental procedure

## Results

Survey A was analysed using a mean rating value for each visual element. The results showed that colour was rated as the most important visual element with an average rating of 5.39 while shadows was rated as the least important visual element with an average rating of 3.11. This can tell us that the level of awareness of the shadows on food images is low. Furthermore this unawareness could lead us to believe that shadow evaluation is subconscious due to the unique properties of shadows. (Fig. 4)

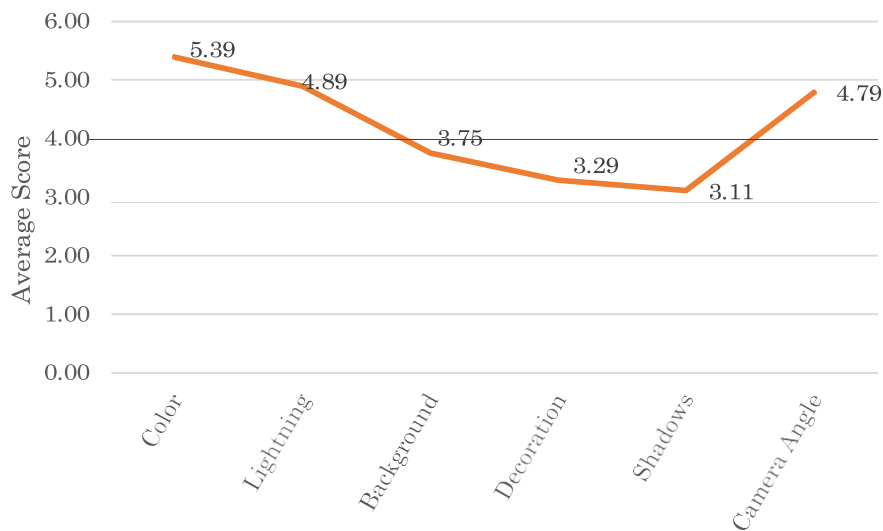


Figure 4: Visual Elements importance score

Survey B was analysed by obtaining the difference of means between both shadows schemes on each of the words evaluated. Figure 5 shows the results of the analysis.

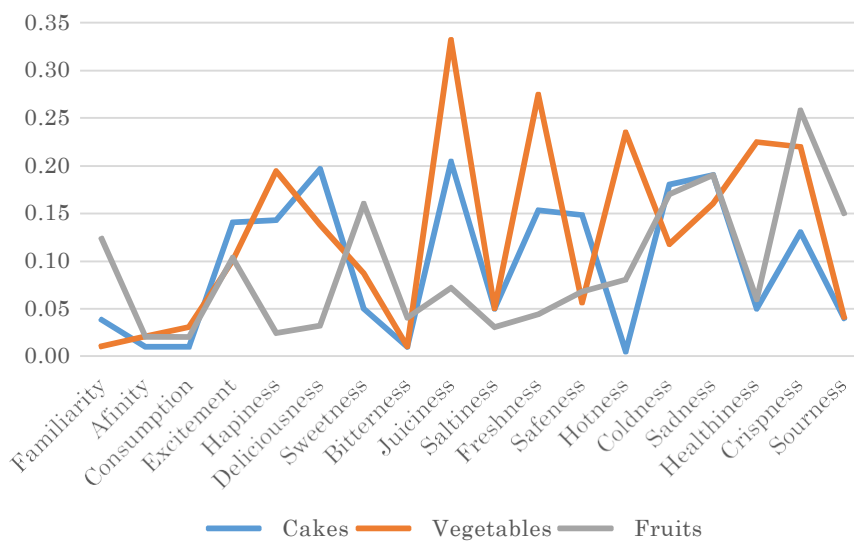


Figure 5: Difference of means between soft and hard shadows

For both shadows schemes, the evaluation of vegetables and fruits were higher than cakes when comes to descriptors such as juiciness, freshness and healthiness. This could be explained since when we look at an image of an orange, we also recall our knowledge and experiences with oranges. For example, how much juice it might contain; the way we have learned how eating

oranges are good for our health and through the orange colour, lighting condition and texture we are also able to assess its freshness (Wada et al., 2010). Also, Figure 5 shows that cakes had higher difference of means on descriptors such as excitement, deliciousness, safeness and coldness. Finally fruits showed higher difference of means on descriptors such as sweetness and crispness.

So far the preceding paragraph remarked which descriptors have the biggest differences on each food category, but this does not mean that the analysed data follows a pattern. Therefore a paired T-test ( $p$ -value  $< 0.05$ ) analysis was performed on all 18 descriptors and the results showed that excitement, deliciousness, freshness and crispness had statistical significance. With these results, cakes were chosen as food category for further shadow research since it was the category that had the highest amount of descriptors with statistical significance. Furthermore cakes have a unique property of not providing visual cues regarding its actual flavour while fruits and vegetables do. Thus, abstraction is considered necessary to really comprehend the role that shadows have on food image perception.

## Conclusions

Depending on the type of food, the perception of shadows is different. In other words if we talk about raw food (vegetables and fruits), our subconscious is already programmed to visualize these foods in the wild (on a tree, in a farm, on the ground, etc.). It is on this type of locations where the lighting conditions, hence the shadows conditions correspond to the hard shadow scheme. However, cakes cannot be seen in the wild since they are manmade food and therefore its natural environment is the display window of a bakery with artificial light. We know that cakes are a combination of different ingredients but the output can take different shapes, colours and textures. Although we might have had experience with a certain type of cake (chocolate cake), judging the cake by its colour could be deceitful. Additionally if the cake does not possess any other type of visual cue that could give away the flavour (fruits), the actual flavour will be uncertain until we actually try it, making this type of food suitable for further experimentation.

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## Author Biography

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