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**PREFERENCE AND VISUAL IMPRESSION OF HUMAN
FACES LIT IN VARIOUS DIRECTIONS**

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PREFERENCE AND VISUAL IMPRESSION OF HUMAN FACES LIT IN VARIOUS DIRECTIONS

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Abstract

The preference and visual impression of human faces were investigated using various lighting settings including luminance and direction of lighting. Thirty observers assessed preference and visual impressions of 48 sculpture images shown on an LCD display. The results show strong connections between light directions and visual impressions, and between luminance contrast in the sculpture image and the visual impressions. The results indicate that the observers tended to have positive impressions for sculpture images with the light coming from the top rather than from the bottom. In addition, the observers tended to have positive impressions for sculpture images with a small luminance contrast rather than a large contrast. This implies that we can use various lighting conditions to evoke various moods from the observers.

Keywords: visual response, lighting, luminance, light direction

1 Introduction

Lighting plays a much greater part in photography or life than most people realize. There is an increasing demand from the industry for understanding how ambient lighting can affect human visual perception in terms of preference and visual impression. Lighting not only plays an important role for customer in making decisions on what they like and dislike, but also evokes various feelings such as liveliness, excitement, and naturalness. It is still unclear, however, as to how our preference and impression of a creature or an object, can be affected by types of lighting in terms of incident light angle.

2 Human faces lit in various directions evaluation experiment

2.1 Experimental environment

To address the issue, the present study used a head of the Venus de Milo sculpture, with 6 by 6 by 10 inches in size, lit by a computer simulation of a ring light with 4 dimming sections, simulated using a 52-inch display, TOSHIBA 52XV500G. The 4 dimming sections were varied in luminance to generate various types of light directions, in order to produce different effects of light and shadow on the sculpture. The 48 test images were results of 48 types of lighting, generated from a computer simulation of a ring light with 4 dimming sections, top, bottom, left and right, presented on the 52-inch display in a darkened room. The sculpture was placed in front of the display, with a distance of 12 inches. Each image was taken using a Redmi Note 3 with ISO 200 and a shutter speed of 1/125, positioned at the centre of the simulated ring light. Figure 1 shows the experimental setting.

Thirty observers, including 15 males and 15 females, were all Taiwanese university students and took part in the experiment. Each being taken as a test image for a panel of observers to assess using 9 bipolar semantic scales: two-dimensional/three-dimensional, soft/hard, strange/natural, unconfident/confident, unfashionable/fashionable, unclear/clear, lifeless/lively, common/mysterious and dislike/like.

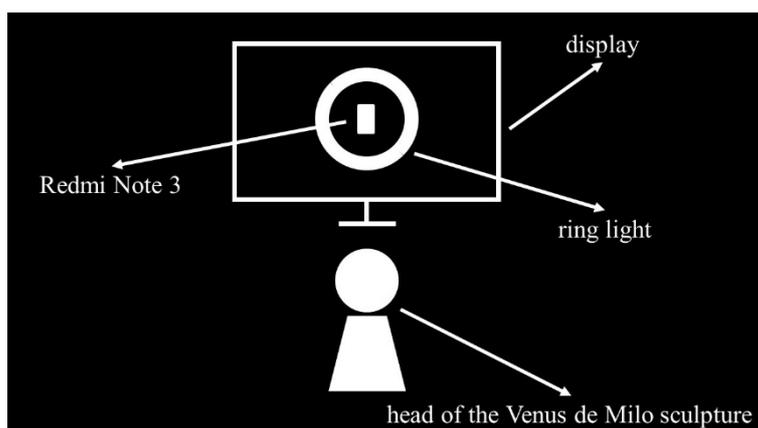


Figure 1 – Experimental set-up

2.2 Experimental procedure

Each observer assessed 48 images of the sculpture, 4 by 3 inches in size, presented one by one on a computer display. A uniform grey with L^* of 50 was used as the background for each image. The viewing distance was about 20 inches for each observer. The 48 lighting types were generated by varying the luminance levels of each of the 4 dimming sections. The 4 dimming sections were set to a combination of the following luminance levels, 15.6, 9.12, 4.43, 1.13 and 0.06 cd/m^2 , as shown in Figure 2, using the following 5 lighting strategies, as also illustrated in Figure 3:

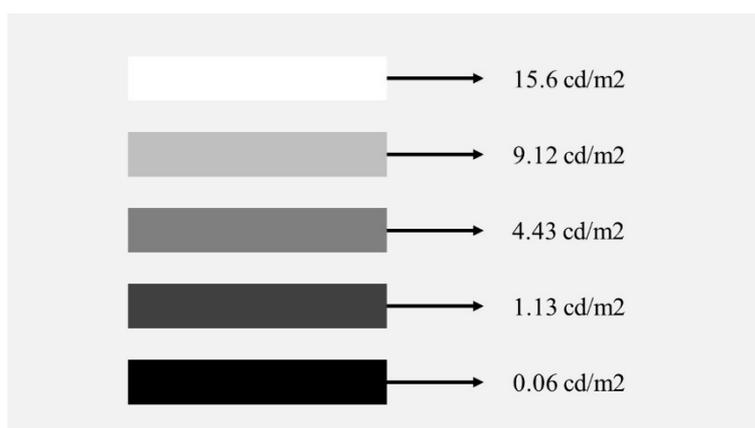


Figure 2 – The 5 luminance levels

- O lightings where all the 4 dimming sections were of the same luminance.
- C lightings where one section was at a lower luminance than the others, the latter all being at 15.6 cd/m^2 .
- S lightings where two adjacent sections were both at 15.6 cd/m^2 , and the other sections were of the same luminance but at a lower level.
- II lightings where two symmetrical sections were both at 15.6 cd/m^2 , and the other sections were of the same luminance but at a lower level.
- T lightings where only one section was at 15.6 cd/m^2 , and the others were at 0.06 cd/m^2 .

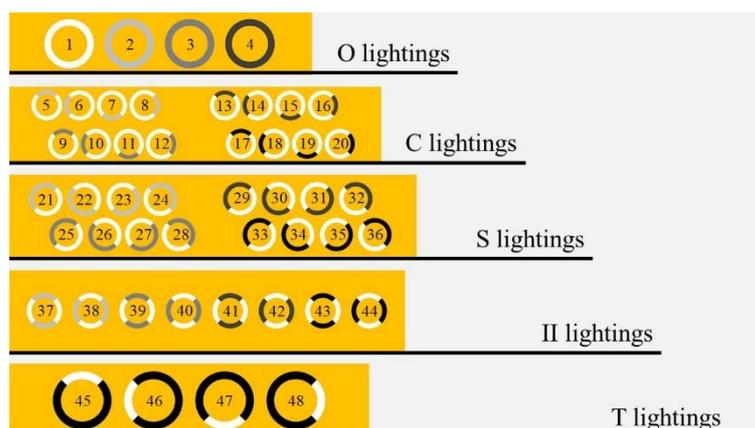


Figure 3 – The 5 lighting strategies

During the experiment, each observer was asked to assess the 48 test images using 6-point forced choice categorical judgement scaling method, e.g. “very soft”, “soft”, “slightly soft”, “slightly hard”, “hard”, “very hard”. The 48 images, as shown Figure 4, were presented in random order for each observer.



Figure 4 – An example of the test images

3 Experimental results

For O lightings, the higher the luminance for all the 4 dimming sections was, the more the images tended to feel liked, three-dimensional, soft, common, natural, fashionable, clear, lively and confident.

For C lightings, the observers tended to like the images where the dim section was at the bottom, and disliked images where the dim section was at the top. The larger contrast between the dim section and the other sections, the larger variation in all the scales studied when comparing different light directions. There is little difference in all scale values between images where the dim section was at the right and those at the left.

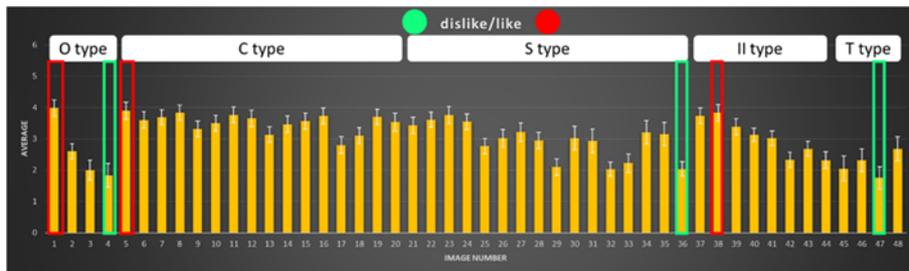
For S lightings, the observers tended to like the images where one of the dim sections was at the bottom, and disliked images where one of the dim sections was at the top. The larger contrast between the dim section and the other sections, the more mysterious the images tended to feel. There is little difference in all scale values between images where the dim section was at the right and those at the left.

For II lightings, the position of dim sections had little impact on the observer responses, but the luminance contrast between the dim sections and the bright sections played an important role. The larger the contrast was between the dim sections and the bright sections, the less the

images were liked, and the more mysterious, more unnatural and less confident the images tended to feel.

Images of T lightings tended to be disliked and have negative impressions.

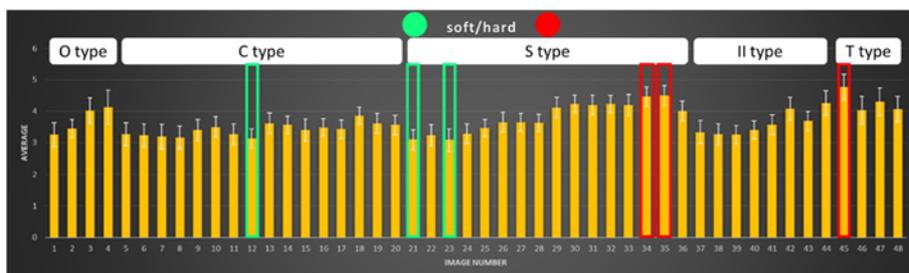
As Figures 5 (a)-(i) show, the experimental results for all the scales.



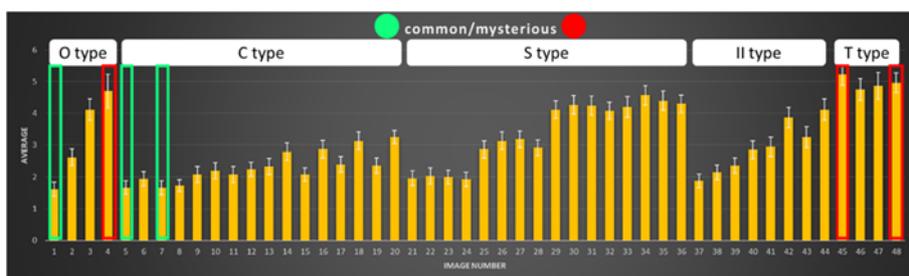
(a)



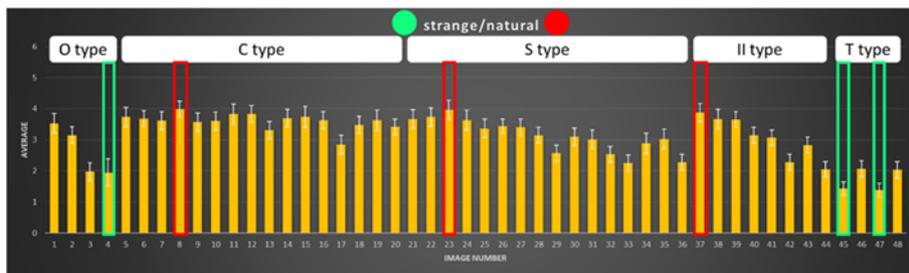
(b)



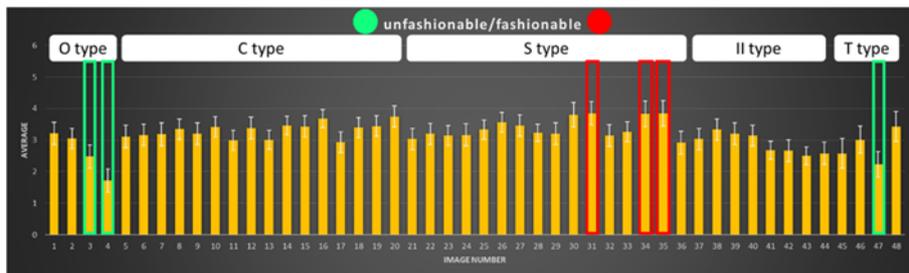
(c)



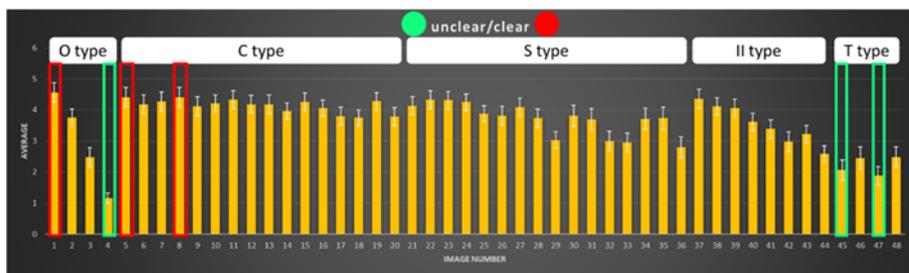
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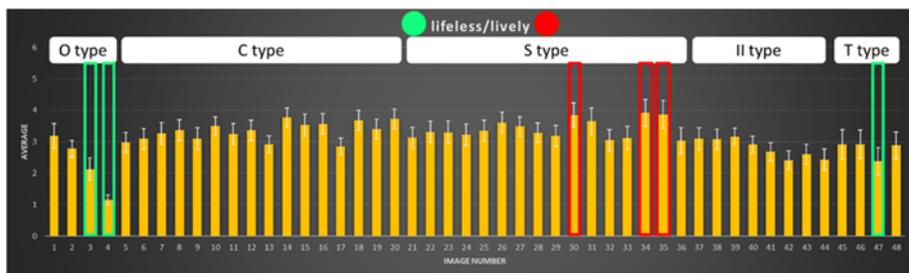
(e)



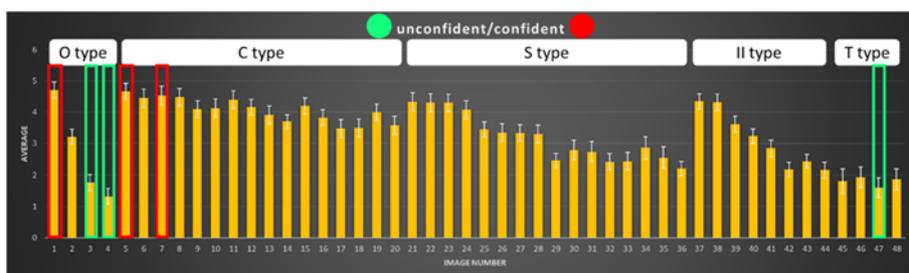
(f)



(g)



(h)



(i)

Figure 5 – Relationship between the scales and lightings used in this experiment

4 Conclusion

Experimental results show strong connection between light directions and visual impressions. Results for C and S lightings indicate that the observers tended to have positive impressions for sculpture images with the light coming from the top rather than from the bottom. Experimental results also show strong connection between luminance contrast in the simulated ring light and visual impressions. Results for C and II images indicate that the observers tended to have positive impressions for sculpture images generated by the simulated ring light with a small luminance contrast rather than a large contrast.

Reference

CIE 2017. CIE x044:2017. Human Visual Responses to Painting Affected by Lighting Conditions. Taiwan: CIE