BLACKNESS JUDGMENT OF LACQUER WARE BY EXPERT AND NAÏVE GROUPS

Yuki Sakaue[1]*, Yoshitake Takahashi[1], Tomoharu Ishikawa[1], Sakurako Matsushima[2], Miyoshi Ayama[1]

[1]*Graduate School of Engineering, Utsunomiya University, Japan*
[2]*Faculty of Education, Utsunomiya University, Japan*

*Corresponding author: Yuki Sakaue, +81-028-689-6264, mt126624@cc.utsunomiya-u.ac.jp

Keywords: lacquer, expert, material, paint, blackness

ABSTRACT

In this study, we examined the degree of observer's ability to identify the test bowls of the same shape but composed of different materials that are painted by lacquer or cashew, with or without glossiness. Performance of expert and non-expert groups is compared in relation to the luminance distribution of test bowls.

1. INTRODUCTION

Lacquer ware has been used for a long time since ancient era in a wide area of eastern and south-eastern Asia because wooden ware painted by lacquer becomes impermeable and durable. Also, many different ways of decoration can be added to lacquer ware, such as gold work, gold-embedded work, or mother-of pearl work, etc., and thus lacquer painting is used for interior finishing of religious buildings. However, due to the distinctive decrease of plants after the world war II, and the cost-cutting stream of modern industry, industrial production of Japanese lacquer ware has become extremely small. Instead of natural lacquer, cashew oil mixed with a resin is often used for a painting material that mimics Japanese lacquer ware. Quality of appearance of cashew ware is fairly high and it is difficult for people who do not have special interest in lacquer ware to discriminate it from natural lacquer ware. It is said that lacquer craftspeople can distinguish the appearance of real natural lacquer ware from 'fake' lacquer ware. To seek the perspective of expert in identification of real Japanese lacquer is an interesting issue for the study of recognition of material appearance [1].
Therefore, in this study, we examined the degree of observer's ability to identify the test bowls of the same shape but composed of different materials that are painted by lacquer or cashew, with or without glossiness. Performance of expert and non-expert groups is compared in relation to the luminance distribution of test bowls.

2. EXPERIMENT

2.1. Test bowls

We prepared 12 bowls of the same shape. They are composed of wood, bonded wood, or plastic, and painted by Japanese lacquer, cashew, or urethane with or without glossiness. Cashew and urethane are mixed with resin. Among them, the test bowls painted by Japanese lacquer and cashew were used as test stimuli. Table 1 shows the property of the test bowls employed in the experiment.

Table 1: Property of test bowls used in the experiment

Paint	Material	Gloss or matte	Weight[g]
Japanese lacquer	Wood	Glossy	95
		matte	108
	Bonded wood	Glossy	116
		matte	116
Cashew	Bonded wood	Glossy	110
		matte	114
	Plastic	Glossy	82
		matte	90

2.2 Identification experiment

Eight test bowls were placed on the table at the north window. To examine the effect of some non-uniformity of diffused sun light, 2 kinds of paper curtains were installed, one was with thin horizontal bamboos and the other was a uniform paper. They are called with and without stripes, respectively. Settings of the test bowls are shown in Figures 1 and 2.

One session is composed of 2 blocks, and 1 block includes 2 runs. At the beginning of the first block, the observer was handed 8 small cards in which the property of test bowl is written. Then, the observer was instructed to place each card in front of the corresponding test bowl without touching them. Observer could spend a time as long as they became satisfiable. When this task was done, the experimenter checked whether each card was placed at the correct test bowl. We call the first run 'observation only'. After the first run, the experimenter changed the position of test bowls randomly. Then in the second run, observer was handed 8 cards again, and he/she was given the same instruction as the first run, except that he/she could not only see, but also touch, hold, or smell test bowls freely. After the placement of 8 cards, the experimenter's check was done in the same way as the first run. We call the second run 'observation with touch'. These are the tasks performed in the first block. Between the blocks, the leaning period was given to the observer. He/she was taught the property of each test bowl and could see and touch them freely to memorize which was which. Duration of learning period is not limited, but usually within ten minutes. Then, the second block was carried out in the same way as the first run.

For each of with and without stripes condition, one session was conducted for each observer. The order of with and without stripes session was counterbalanced among observers in each group. Seven experts and 20 naïve observers participated the experiment.

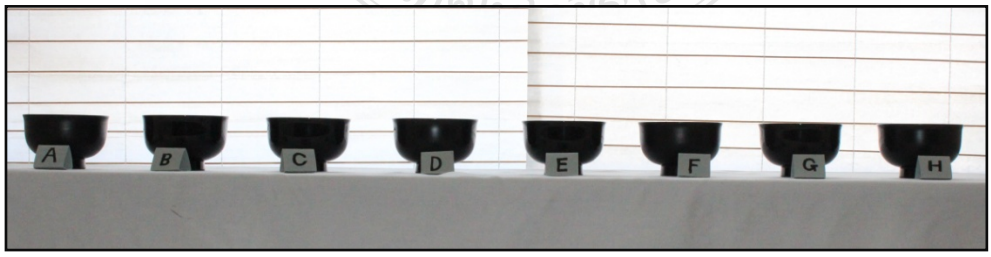

Figure1. Test bowls placed at the north window with stripes session

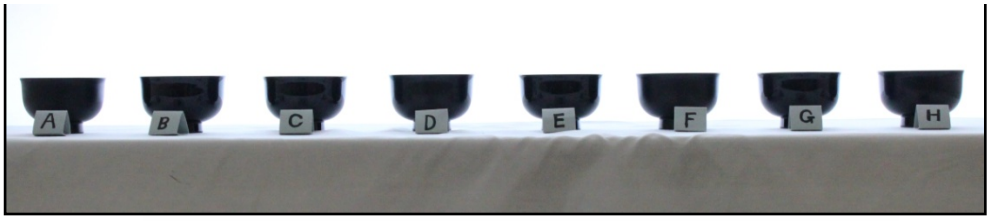

Figure2. Test bowls placed at the north window without stripes session

3. RESULTS OF IDENTIFICTION EXPERIMENT

Figure 3 (a) and (b) show the percentage of correct identification in the first block of with and without stripe conditions, respectively. As shown in the figures, performance of expert group is higher than that of naïve group for all runs. Performance of the second run, 'observation with touch' is higher than that of the first run, 'observation only'. Performance of 'observation with touch' in the with stripes condition is higher than that in the without stripes condition, while that of 'observation only' is vice versa in the expert group.

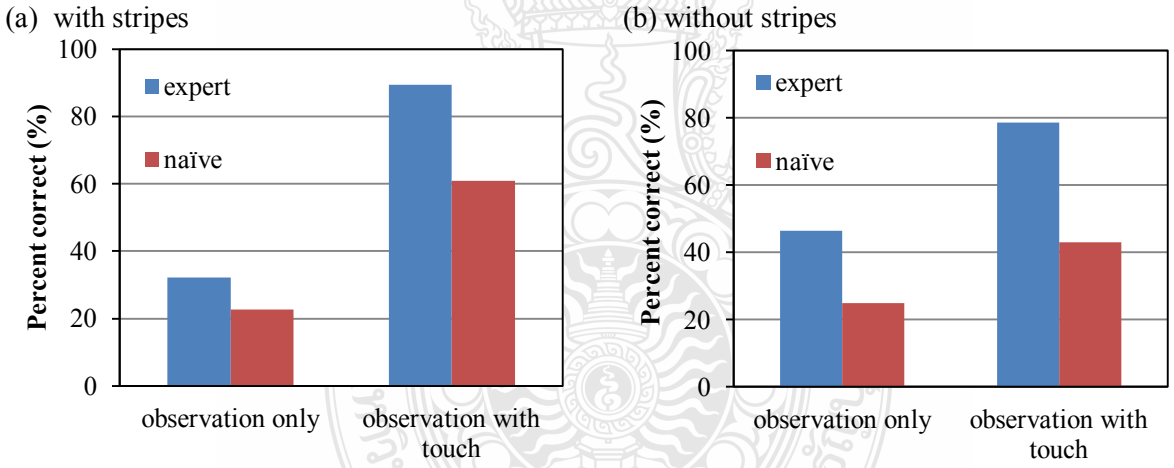

Figure 3. Results of identification experiment. (a): with stripes, (b):without stripes conditions

4. DISCUSSION

To seek visual cue by which experts can identify each of 8 test bowls, we measured the luminance distribution of test bowls in various settings. Lee et al., measured angular reflectance property of lacquer and synthetic resins, and reported that one of the difference between Japanese lacquer and cashew with resin is the reflectance change with tilted angle [2]. During the observation with touch run, most of expert observers looked at the inside of bowl carefully with changing the viewing angle. Therefore, we compared the luminance distribution of the bottom of the test bowl at the tilt angles of 0, 3, and 5 degrees. Results of the measurement for the two test bowls, painted by Japanese lacquer or cashew with gloss are shown in Figure 4. Both of them are composed of bonded wood, and thus the weight of the bowls is the same.

Luminance distributions of the inside bottom of the bowl in with stripes condition show slight difference between Japanese lacquer and cashew. Also, Japanese lacquer bowl shows subtle change between the tilt angles of 0 deg and 3 deg, whereas cashew bowl does not show such a change. In

our previous study, we found that perceived blackness of lacquer plates correlates with the luminance measured from observer's eye position [3]. Thus, difference or change of luminance distribution may induce variation of perceived blackness for the expert observers. At the present, we consider that the expert observers in this study utilize this kind of subtle change and/or difference of luminance information and combine other sensory information such as sense of touch and smell, to identify the test bowls.

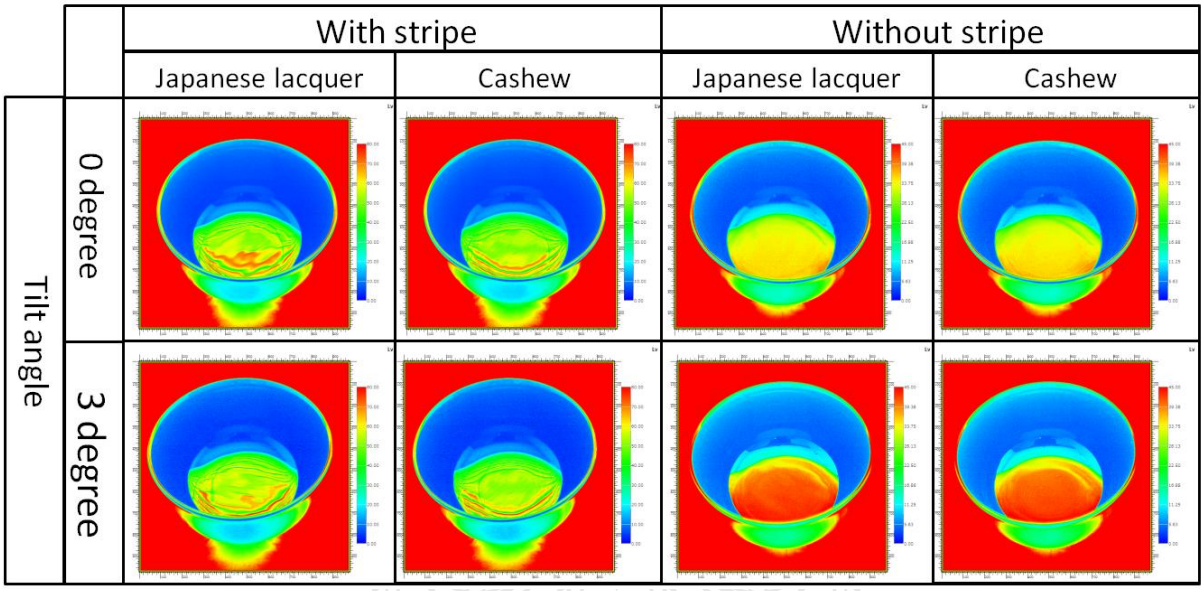

Figure 4. Luminance distribution of two test bowls, painted by Japanese lacquer or cashew, with gloss. Both are composed by bonded wood

ACKNOWLEDGEMENT

This research is partly supported by the Grant-in Aid from the Japan Society the Promotion of Science (No.22500184) in 2010-2011. We thank Professors M.Ohkura and Y.Ohtani for their discussion on the study.

REFERENCES

1. Shimoide, Y., Ohtani, Y., & Yasunaga, H. (2011). How do craftspeople distinguish the appearance of natural-lacquerware? –Approach by optical image analysis-. *Journal of Japanese Society of Color Materials*, *84*(3), 81-86.
2. Lee, W., Sato,M., Asami,T., Oyabu,H., Tominaga.S. (2002). Relation of light reflection to visual texture on black coating films of urushi (Japanese Lacquer) and various synthetic resins. *Journal Color Science Association of Japan* , 26(4), pp236-247.
3. Kohno,T., Sakaue,Y., Ishikawa,T., Matsushima,S., Ohkura,M., Kasuga,M., Ohtani, M., & Ayama, M.(2012). Blackness of Japanese lacquer and its relation to surface property. *Proceedings of the AIC2012*, Taipei, CD-ROM.