A Study of the Effect of the Shape, the Color, and the Texture of Ikebana on a Brain Activity

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Abstract. A study was performed on the difference between beginners and experts of Ikebana. The brain activity measurement results showed that for beginners, the incidence of α wave increased with time both during the planning and the production of the arrangement. However, for experts, the incidence of α wave decreased with time during the planning and increased during the production of the arrangement. This result indicated that the experts concentrate the mind more during the planning through the course of the arrangement, and relaxes more during the production of the arrangement. Also, the result of questionnaire survey showed that beginners were unable to recognize the formal beauty of an Ikebana arrangement, while experts were able to evaluate it correctly. It indicates that the experts have the special criteria of the formal beauty of Ikebana cultivated through the long-term training.

1   Introduction

Ikebana, along with the tea ceremony, is a traditional culture that represents Japan. It originates from the Buddhist tradition of flower offertories for the deceased and possesses a 1500-year history.

Unlike western flower arrangement, Ikebana is distinct because it finds the light of life not only in beautiful flowers but also in wilted or rotten flowers. Another characteristic is how emphasis is given not only to the structural form, but also to the arrangement process and the mental focus and unity during the arrangement. Ikebana's adherence to Taoist concepts, as seen in its other name "Kadou," is derived from these features. However, there is marginal to no research on Ikebana that focuses on the act of arranging and the arrangements themselves. Hence, it is difficult to say whether the essence of Ikebana arrangements is sufficiently understood [1, 2].

It is necessary to maintain a constant level of competence and to establish the most rational, scientific, data-driven training method by scientifically clarifying the act of and the actual arrangement of Ikebana. Such a rational training method developed on the basis of data should result in the most effective, universal method for teaching Ikebana, which will enable the worldwide expansion of Ikebana, regardless of nationality or cultural environment.

2   Methods

2.1   Purpose

The purpose of the experiment was to measure and to compare the brain activities of experts and beginners during the planning of and production of an actual Ikebana arrangement by having experts and beginners produce an Ikebana arrangement. Then, by having other experts and beginners view the arrangements, an impression evaluation survey was conducted, and a comparison of the results was presented.

2.2   Ikebana Style

Shouka is selected as the best style of Ikebana for these experiments, because it involves standardized technique and both experts and beginners are able to produce.

2.3   Materials

Five red willow branches and two chrysanthemums were used to make a total of seven materials of Ikebana for this experiment. As red willow branches can be bent by force to make an ideal shape, and because bending them requires a certain touch, they are a material that effectively reflects the Ikebana experience.

2.4   Participants

Two participants were selected for brain activity measurement: a female with 63 years of experience as an Ikebana artist and 51 years of training experience (Participant A, age 72) and a male with 4 years of experience (Participant B, age 27).

      Three participants were selected for the impression evaluation survey: a male with 20 years of Ikebana experience, whose occupation is the production of Ikebana arrangements (Participant C, age 42), a female with two years of Ikebana experience (Participant D, age 25), and a male student of the Kyoto Institute of Technology with no previous Ikebana experience (Participant E, age 24).

2.5   Experimental Method

(1) Brain Activity Measurement
The experiment site was a conference room that is approximately 5 m in width and 15 m in depth, surrounded by white walls apart from a south-facing window. One corner was surrounded by partitions and used as the experimental space. To enable participants to focus on the experiment, the experimental space was separated from the rest of the room by three partitions, with the wall being the fourth side. A table 1 m in width and 0.6 m in depth with a chair was placed inside. This space was designated as the production of and viewing location for the Ikebana arrangements as shown Fig. 1.

      In the experiment, one participant at a time produced an arrangement, while wearing an electroencephalogram (EEG) monitor. A chair and table were placed, and the participant arranged the Ikebana in a seated position. As shown in Fig. 2, after the

arrangement of one material, the participants were refrained from physically changing the arrangement for 20 s, which was the time designated for planning. This pause for planning was repeated after every act of arrangement. Brain activity was measured throughout the process. The planning time of 20 seconds was also maintained before the final adjustments during completion, and an additional time of 20 seconds was provided for viewing after the completion of the arrangement.

The brain activities were measured by a portable EEG monitor, developed and distributed by Digital Medic Inc. This EEG monitor obtained a correlation coefficient of 0.94 in a comparative study of measurement results with a medical EEG monitor (NEC San'ei Synafit 1000).

(2) Impression Evaluation Survey

An impression evaluation experiment was conducted following the completion of the expert's and beginner's arrangements.

The evaluation experiment was conducted on one participant at a time. The arrangements were replaced after each viewing to prevent the simultaneous viewing of the arrangements of Participant A and B. The participants recorded their evaluation results on the questionnaire survey sheet during viewing.

Using the items employed in the plant impression evaluation research [3-6] as reference, 32 pairs of adjectives (e.g., "peaceful–not peaceful") were selected as survey items and were evaluated on a 7-point scale.

Fig. 1. Production of an Ikebana arrangement (wearing of an EEG)
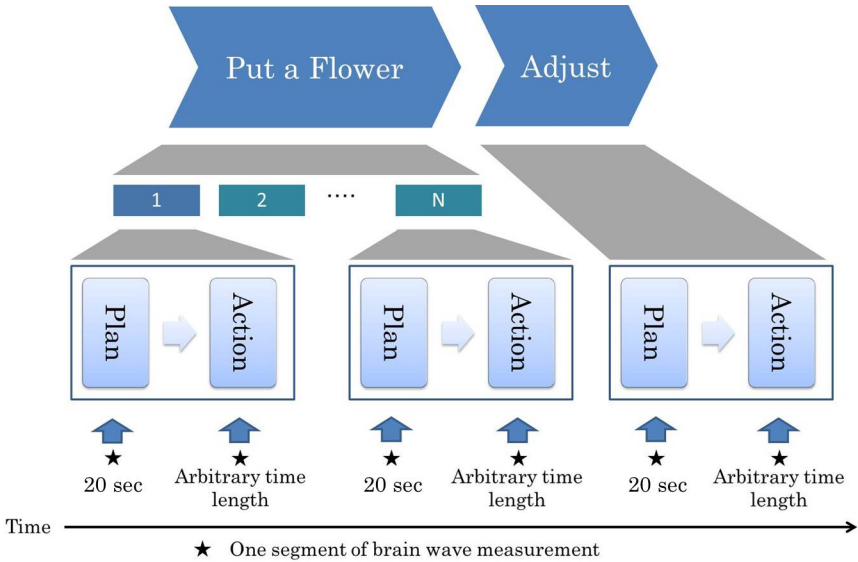
Fig. 2. Flow of brain activity measurements during an Ikebana arrangement

3   Results

3.1   Brain Activity Measurements of Ikebana Artists during Planning and Arranging

Fig. 3 shows the brain activity measurement results of Participant A (Expert). The vertical axis shows the incidence rate of α wave, and the horizontal axis shows the brain activity measurement points. Fig. 3(a) shows the changes in brain activity during planning before arranging the materials, and Fig. 3(b) shows the changes in brain activity during the act of arranging the materials.

Fig. 4 shows the brain activity measurement results of Participant B (Beginner). As shown in Fig. 3, the vertical axis shows the incidence rate of α waves, and the horizontal axis shows the brain activity measurement points (★) shown in Fig.2, Fig. 4(a) shows changes in the brain activity during the planning before arranging the materials, and Fig. 4(b) shows changes in the brain activity during the process of arranging the materials.

A negative correlation (-0.68, $p < 0.05$) was observed between the incidence of α waves and measurement points for the expert during planning, while a positive correlation (0.70, $p < 0.05$) was observed between the incidence of α waves and measurement points during the process of arrangement. Conversely, a positive correlation (0.48, $p < 0.1$) was observed between the incidence of α waves and measurement points for the beginner during planning, while a positive correlation (0.60, $p < 0.05$) was observed between the incidence of α waves and measurement points during the act of arrangement.
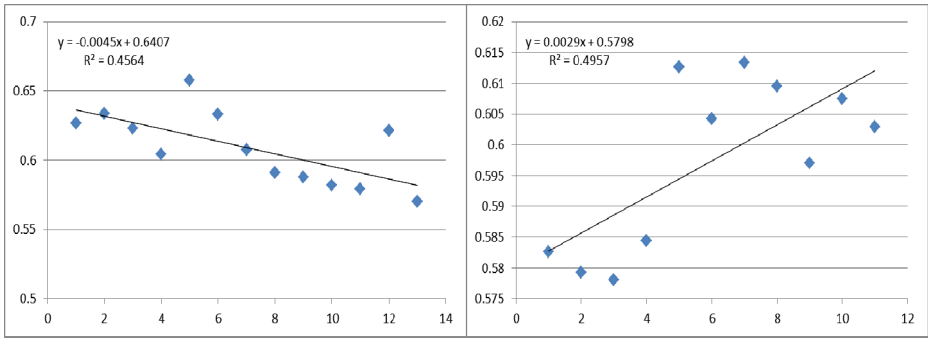
(a) Change in α wave incidence during arrangement

(b) Change in α wave incidence during act of planning

Fig. 3. Brain activity measurement of the expert
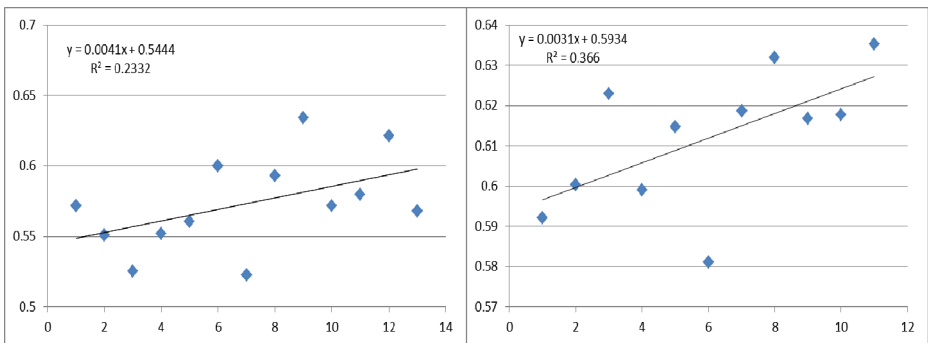
(a) Change in α wave incidence during arrangement

(b) Change in α wave incidence during act of planning

Fig. 4. Brain Activity Measurements of the Beginner

3.2   Results of the Impression Evaluation of Ikebana

As an example, Fig. 5 shows the profile of the beginner's impression evaluation results. As show in Fig. 5, the beginner could not recognise the difference of the formal beauty between expert's and beginner's Ikebana. The inexperience is almost the same as the beginner. However, expert's profile shows completely deferent pattern.

In proof of this, the average absolute value of the difference of every survey item between expert's and beginner's Ikebana were calculated and compared. The results are shown in Fig. 6. The differences in the evaluation values show a major trend, from the largest to the smallest, in the order of the expert, beginner, and inexperienced person. While there is an average difference of two points in the evaluation values for the expert, the average difference was about 0.3 points for the inexperienced person, who barely noticed any difference between the expert's and beginner's arrangements. Also, the one-way analysis of variance showed a significant difference in the evaluation, based on differing years of experience ($F(2, 92) = 16.35$, $p < 0.01$).
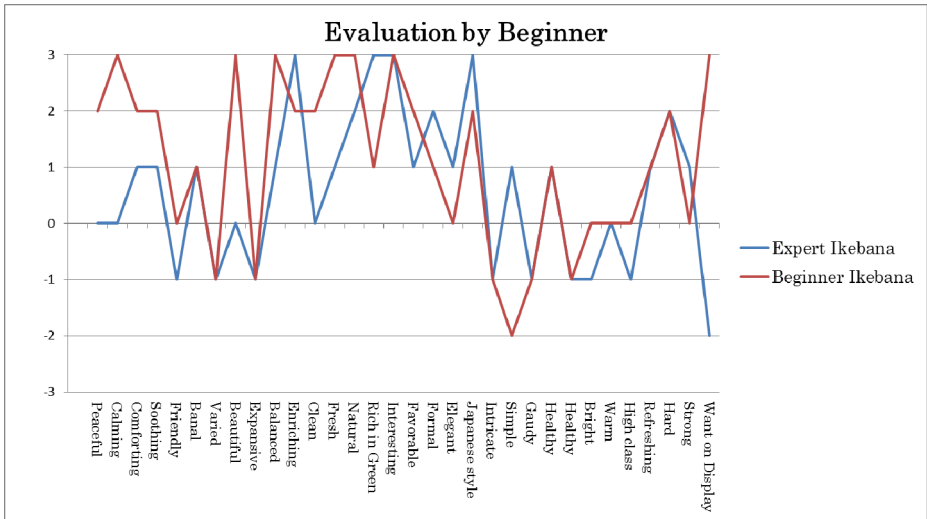
Fig. 5. Profile of the beginner's impression evaluation results
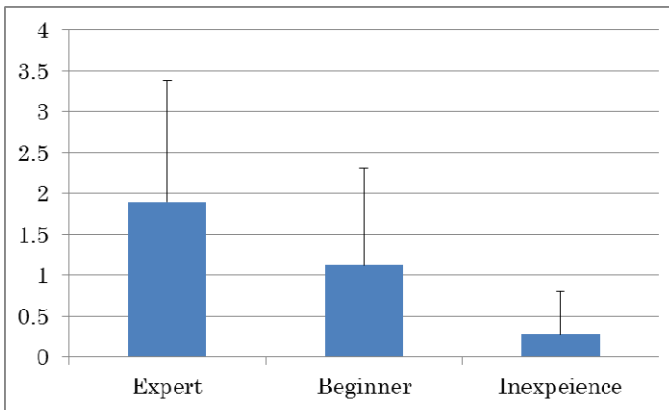

Fig. 6. Comparison of the difference in evaluation values (absolute values) of the expert, beginner, and inexperienced person

4   Summary and Future Work

The expert's incidence of α wave during planning decreased with time in the process of production. It was believed that this occurred because of an increase in the expert's mental concentration level. On the other hand, the incidence of α wave during arrangement increased with time in the process of production. This was believed be an indication that the expert was entering a deeper relaxed state as the process of production progressed. This result suggests that the Ikebana expert was alternatively experiencing concentration and relaxation during production. It is inferred that this is connected to the mental discipline, as displayed in the concepts of Kadou. The

beginner's incidence of α wave during planning increased with time in the process of production. This indicates the reason for why the beginner lost the degree of concentration in the process of production.

Among the viewers of the arrangement, Participant C (expert) displayed a clear difference in the evaluation of Participant A (expert)'s arrangement and Participant B (beginner)'s arrangement. Participant D (beginner) and Participant E (inexperienced person)'s graphs of impression evaluation results show that the distribution of evaluation values for both arrangements was very similar, suggesting that they could not distinguish the differences between the arrangements. Further research will address the factors that divide the evaluation results between experts and beginners/inexperienced people and the origins of these divisions.

References

1. Okamoto, H., Mukai, N.: A Study on Improvement of Learning Effect for an Ikebana Simulator. Institute of Electronics, Information, and Communication. Technical Report Educ. Technol. 111(237), 7–12 (2011)
2. Takara, S., Mukai, N., Kosugi, M.: Ikebana Training System. ITE Technical Report 32(54), 25–30 (2008)
3. Kim, E., Fujii, E.: A Fundamental Study of the Physio-psychological Effects of the Color of Plant. J. Jpn. Inst. Landscape Architect. 58(5), 141–144 (1995)
4. Hideyuki, A., Nishina, H., Namba, R., Masui, Y., Hashimoto, Y.: Evaluation of the Impression of Ornamental Foliage Plants and Psychological Rating of Rooms with Ornamental Foliage Plants by Means of Semantic Differential Method. Shokubutsu Kojo Gakkaishi. Journal of Shita 7(1), 34–45 (1995)
5. Hasegawa, S., Takashi, S.: Comparison of Psychological Effects on Workers between a Small Interior Plant and a Large Interior Plant. Journal of the Japanese Society of Revegetation Technology 36(1), 63–68 (2010)
6. Hasegawa, S., Takashi, S.: Influences of the Plants' Shape, Size, and Distance to the Estimator on the Impression Evaluation of the Indoor Plant. Landscape Research (online collection) 4, 24–32 (2011)