

Experience Factors Influence on Motion Technique of “The Way of Tea” by Motion Analysis

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Abstract. In this paper, the difference technique of motion and process for “The way of tea” on were investigated. The expert and beginner’s motion and trace were captured by High-speed camera system. In order to verify the correct motion technique, a tea master and three people were employed as expert and beginner, and two kinds of motion techniques and moving tracks were summarized and compared during the whole tea making process. The expert’ motion can be considered as a good reference.

Keywords: The way of tea · Tea whisk · Bubble form · Japanese tea

1 Introduction

“The way of tea” is the Japanese tea ceremony, which is called “Chanoyu” or “Sadō”, “Chadō” in Japan. It is a ritual process of preparing and serving “Matcha”, a kind of green tea powder. As the same with other tea ceremony in East Asian, “The way of tea” is a special culture of judge tea and discusses tea, but also has distinct national characteristics and unique content and form. The history of “The way of tea” can be traced back to the 13th century, which was originally concentrated the mind by monks, and later developed into appreciating ceremony.

The most important mind in the ceremony of “The way of tea” is that all participator should pay attention into the predefined movements during the tea preparing. The whole process is not only drinking the tea, but also is enjoying the tea ceremony and feeling the tea making guest’s heart. Each movement and gesture was always considered as an important part of ceremony. In additionally, tea-mixing movement process is the basic skill difficult to master with less progress, which was also the main content of this research.

In previous research, expert and beginner with different experience years were focused. The speed and frequency of the tea-mixing process of expert and beginner was

Author Proof calculated and summarized. And the level of final teas made by expert and beginner were inspected and compared as well. It is deserved to find that expert's action quicker but accurate, focus longer but shift to next action without hesitation, which provided a beauty of the dependable environment for the guests rather than non-expert [1, 2, 3].

A good tea master can mix the green tea powder into the hot water with a period of proper time, which ensures the mixed tea hold the optimal tasting temperature. As same with stirring speed and frequency, the movement skills and stirring track is also one of the most important features influence factors for master. In order to obtain a excellent cup of tea, master has to use the correct mix motion and stirring track to make a high level tea using experienced way.

In this research, one expert and three beginners were employed as the behavior subjects. During "the way of tea" performance, the expert and beginner's motion and trace were captured by High-speed camera system during the tea-mixing process. Base on the data from the High-speed camera system, each key gesture of expert and beginner were focused, motion feature affect on final teas were extracted and analyzed. It is deserved to find that expert's action quicker with high speed but accurate at first period. And changed gesture and stirred around with uniform speed at second period. The expert can make a delicious Japanese tea using this method, which provided a beauty of the dependable environment for the guests rather than beginner.

In a word, this study was focus on the stirring motion during the way of tea process between expert and beginner. Through High-speed camera system, expert's motional characteristics were summarized into two main parts and gave beginners as reference.

2 Experiment

2.1 Participants and Subjects

One Japanese tea masters and three beginners from Kyoto were employed as the participants. One of the participants had more than 20 years experience in "the way of tea", which was called as expert in this paper. Other participant had 20 years experience as called non-expert.

One classical type of Japanese tea whisks was selected for proceeding the experiment called as "Kankyuan" as shown in Fig. 2.

2.2 Experimental Process

The participants were required to whisk together green tea powder and hot water as shown in Fig. 1. 1.5 g of "Matcha" tea powder and approximate 56 g of hot water were dumped into the bowl, and the moisture content of tea was controlled at approximately 97 % steadily. Two time stages including 100 % and 50 % of tea making finishing time were required and investigated for the tea made by expert and beginners called "First period" and "Second period". And 100 % and 50 % of tea-mixing processes of expert and beginners were clearly recorded by a high-speed camera (FASTCAM SA4 Photron CO. Ltd) from same angle as shown in Fig. 3. The shutter speed was 3600 frames per-second.



Fig. 1. The way of tea



“Kankyuan”

Fig. 2. Japanese tea whisks

2.3 Analysis Processing

The three different markers were affixed to the participants' hand in order to make the further analysis by software as shown in Fig. 4. The coordinates of three markers in the x or y direction was captured and analyzed by TEMA 3.5 software (Photron CO. Ltd) as shown in Fig. 5. The angle B was calculated according to three markers coordinates by cosine law as called Finger-angle in this research.



Fig. 3. High-speed camera system

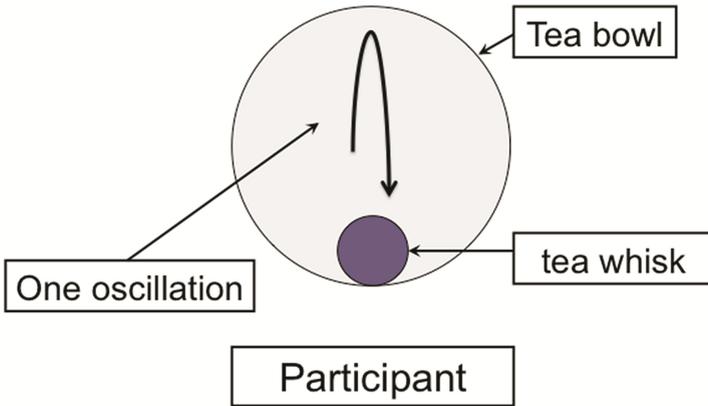


Fig. 4. The schematic diagram of tea whisk oscillate process

All movement elements of expert and beginners were counted and summarized by watching the High-speed video. The numbers of tea-mixing frequency was judged and summarized according to tea whisk oscillate back and forth as shown in Fig. 4.

The time of entire process was calculated accurately be given to two decimal places. The whole processes of expert and beginners divided into first period process and second period process were paid attention and contrasted with each other.

3 Results and Discussions

The tea-mixing motion of expert and beginner were categorized into two types and two tracks based on the High-speed camera data. The tea-mixing gesture was divided into two types depending on whether the fingers are moving or are holding slight as called “Type-1” and “Type-2”. In case of “Type-1”, the fingers kept moving during the tea-mixing process with slight power. And the tea whisk was moved like “A” shape as shown in Fig. 6. In other case of “Type-2”, the fingers were held the tea-whisk tightly, and the

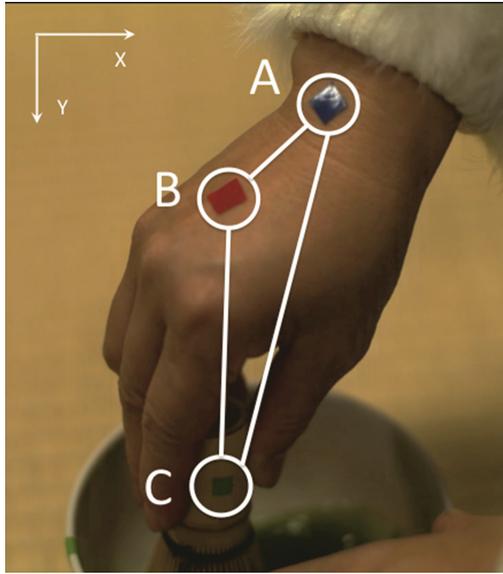


Fig. 5. Finger-angle



Fig. 6. The motion of “Type-1”

tea whisk was moved by elbow. The tea whisk was presented the horizontally moving as shown in Fig. 7.

The tea-mixing track of expert and non-expert also was divided into two types depending on tea whisk’s moving trajectory as called “Track-1” and “Track-2”. In case of “Track-1”, the tea whisk was move back and forth as shown in Fig. 8 (Backwards and forwards moved). In case of “Track-2”, the tea whisk was move back and forth and laterally as shown in Fig. 9 (Backwards, forwards and horizontally moved).

Based on the High-speed camera data, the feature of expert and beginners was summarized as shown in Table 1. The expert used the “Type-1” gesture and “Track-1” method to mix the tea powder and water at the first period. And used “Type-2” gesture and “Track-2”



Fig. 7. The motion of “Type-2”

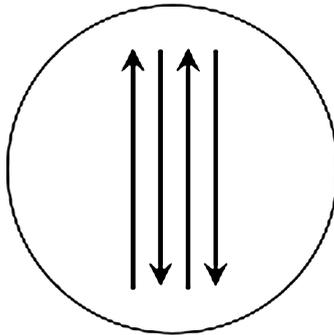


Fig. 8. The way of “Track-1”

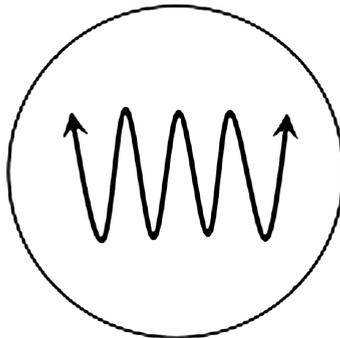


Fig. 9. The way of “Track-2”

method to break up the bubble on the surface of tea at the second period. The beginner used “Type-2” gesture and “Track-1” method to make the tea. It is easy to found that, used the “Type-1” gesture can obtain larger displacement by small fingers movement (Thumb, forefinger, and middle fingers) as shown in Fig. 6. Used the “Type-2” also can got faster speed, but it is difficult to obtain large displacement as shown in Fig. 7.

In previous research, the expert’s method was considered that expert was able to perform high stirring speed during the first period in order to agitate the tea powder in hot water quickly, and control the suitable speed during the second period so that and mix agitated tea powder and presented the wider distribution of small bubbles finally, so that generate the beautiful tea in the end. In order to verify the motion characteristics of finger movement between expert and beginners, the “Finger-angle” of each participant was calculated and compared in Fig. 10. According to the result, the expert’s finger angle was presented large standard deviation during the first period. It’s mean that the expert’s fingers was keeping move during the first period because the “Finger-angle” show the large change. The tea mixing speed also was calculated on the Fig. 11. The result explained that only the expert presented highest speed mixing during the first

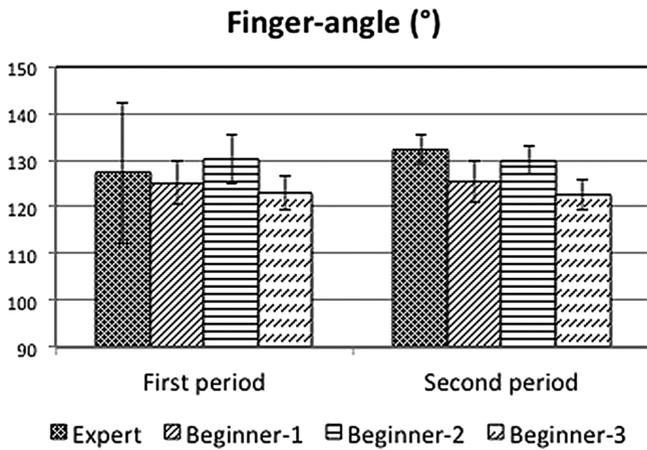


Fig. 10. The “Finger angle” of expert and beginners

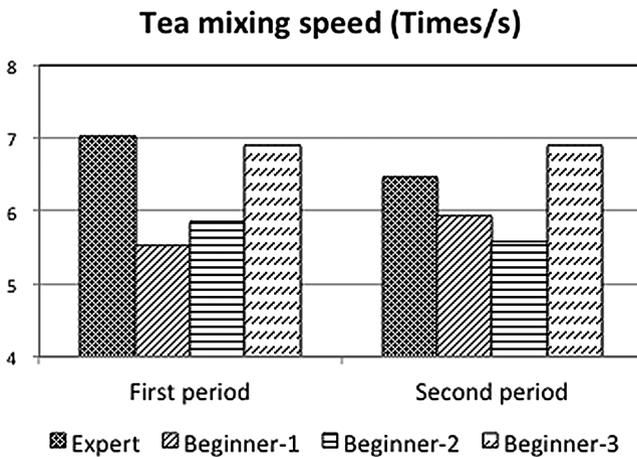


Fig. 11. The mixing speed of expert and beginners

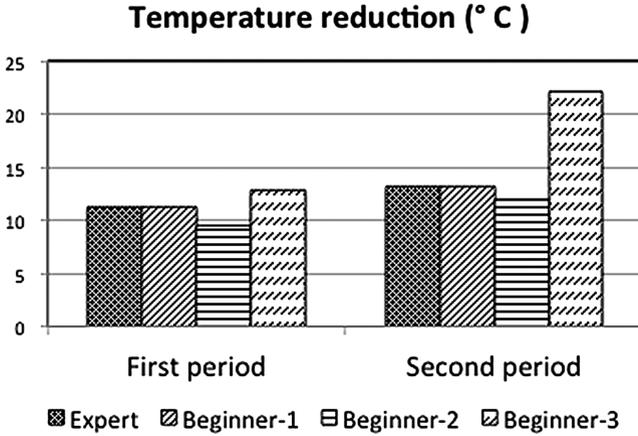


Fig. 12. The mixing speed of expert and beginners

period, and slowed down and controlled the speed during the second period. Relatively, the beginner-1 and beginner-2 mixed the tea without high speed during the whole process. But the beginner-3 was kept the high speed during the whole process. However, the temperature of beginner-3 was decreased largely. The temperature reduction result was shown in Fig. 12. It also demonstrates the rationality of the expert’s method (Table 1).

Table 1. The movement features of expert and beginners

	The first period			The second period		
	Type	Track	Speed	Type	Track	Speed
Expert	1	1	High	2	2	Slow
Beginner-1	2	1	Slow	2	1	Slow
Beginner-2	2	1	Slow	2	1	Slow
Beginner-3	2	1	High	2	1	High

4 Conclusions

In a word, it can be considered that the expert’s method (“Type-1”, “Track-1” on first period; “Type-2”, “Track-2” on second period) can easy to achieve fast mixing speed with high frequency and large displacement. Afterwards, even mixing tea with appropriate speed so that keep temperature.

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