Can People Sense Their Personalities Only by Watching the Movements of Their Skeleton in Street Dancing Performances?

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Abstract. Dancing is a way of communication using the body and self-expression and is a kind of action where each individual's uniqueness connects directly to his or her movements. Furthermore, how well a dancer can express his or her personality is one of the indicators of their ability, which proves the importance of personality in dancing. This study focused on personality in dancing, in particular the possibility of its extraction. Specifically, we asked skilled dancers and unskilled dancers to practice and perform a dance during which we acquired each individual's bone structural data with the use of a Kinect sensor. Afterwards, we played back the data to each participant and asked them to choose what they thought were their own dancing forms, the form they most preferred, and the forms they thought were good. As a result, both the skilled and unskilled participants were capable of distinguishing their own dancing forms, which indicated the existence of a dancing personality. Furthermore, while there were differences between the skilled dancers and the unskilled ones, there was a common tendency of matching dance forms that participants favored and dance forms that participants considered good.

Keywords: Personality, Dance, Street dance, Motion capture.

1   Introduction

It is impossible for people's movements to be the same every time they perform an action, such as picking up an item or sitting down. The differences are due to multiple factors such as the individual's personality, the environment in which he or she has grown up, and past experiences. Individuals unconsciously fix these differences as unique habits; in other words, habits become one's personality.

Sports are activities where one's personality is salient. When athletes practice a particular motion, their personality appears in the unique traits of each individual's movements, such as in the way of batting in baseball, way of serving in tennis, or even the way of running in track and field. Video clips of professional athletes are popularly used as references of their movements. As a result, we can say that personality is very important in sports.

Dancing is an activity like sports in which personality is especially crucial. Dancers communicate physically and express themselves by moving their bodies. Throughout its long history, dancing has had many purposes, including religious rituals and prayers for rain and a good harvest. Regardless of the purpose, dancers use their bodies to express their inner thoughts and feelings, and personality is evident in each dancer's movements. Therefore, improvement in dance skills refers to the development of a dancer's personality; skilled dancers are those who can fully express their uniqueness through their movements, and acknowledging their own personality is one of the methods by which dancers become better.

Recently, dancing has started to receive attention for numerous reasons, such as the introduction of dance classes in school curriculums. Several studies on dancing have been conducted in the field of information processing. However, these studies have focused mainly on supporting the improvement of individual dancing skills. Consequently, studies which put a spotlight on the personality of dancers are still scarce.

In this study, we focus on the genre of street dance. The reason for choosing this particular genre is that while many genres of dancing do not have specific forms, there are particular steps and forms in street dancing. Street dancers strive towards the perfection of the same steps while adding the essence of their personality; hence, we thought this genre would be a suitable subject for extracting personality. Moreover, we imagined that this study is the first step towards making the extraction of personality in street dance possible. Once such a extraction becomes possible, it can be used in applications such as educational support for dancing, introduction of practice support programs that are adaptable to individual dancers, and easier methods of studying dancers with similar dancing styles. Furthermore, it could become possible to impose one dancer's personality on the dance form of another and visualize a new dancing style.

The contribution of this paper is our finding that almost all people can judge their own dance form simply by watching the movements of images of their skeletons and that skilled dancers can judge their own dance forms more accurately compared with unskilled dancers.

2 Related Work

There are many studies on dancing. Fink et al. [1] tested what kind of dancing women prefer when evaluating men dancing. Furthermore, Hugill et al. [2] tested whether or not the difference in allurement seen in male animals' courtship dances can also be seen in humans. However, these studies were ones in which women evaluated men dancing; they did not acknowledge or include the extraction of personality.

There have been numerous studies that focus on dance education. Yonezawa [3] studied the change in attitudes of teachers in elementary and middle schools that have started to include dancing in their curriculum and its impact. Yamaguchi et al. [4] introduced a system that supports dance education by creating sounds which match the dancer's movements in real-time. Nakamura et al. [5] invented a device that gives the right timing for starting particular movements through vibration and described methods

for supporting amateur dancers. Yang et al. [6] used virtual reality and showed the movements of skilled dancers to amateurs. The amateurs could then imitate the movements, as a dance education support for beginners. Fujimoto et al. [7] mapped beginners' movements over the movements of talented dancers so that the amateurs could see their own dance forms and strive to become better. These studies were all aimed at supporting dance education; they did not acknowledge personality and had different motives from ours.

As for studies on skilled dancers, Sato et al. [8] focused on the analysis of talented street dancers' arm movements. They captured them on camera and showed the differences between beginners and talented dancers, thereby clarifying the characteristics of skilled dancers. However, their study did not focus on personality either, so it had a different motive from ours.

3   Dance Dataset for Experiment

To conduct the experimental test on the personality in dance, we prepared a dance dataset. To generate the dataset, we recruited several participants and divided them into two groups, skilled dancers and unskilled dancers, and let them dance while we used a Kinect sensor to capture their movements in the form of bone structural data. The reason we used bone structural data only is that it is not affected by any kind of physical appearances.

Specifically, we asked 11 university students (20-23 years old) who had no experience of dance training and 11 university students (20-23 years old) who had experience of dance training to dance following a particular choreography and videotaped them as they did. The reason we divided participants into two groups (skilled dancers and unskilled dancers) is that we were concerned about possibly confusing differences in skill between skilled and unskilled dancers with differences in personality. Bone structural data was acquired with the use of a Kinect v2. The data consisted of the x, y and z coordinates of 14 body parts, as shown in Figure 1.
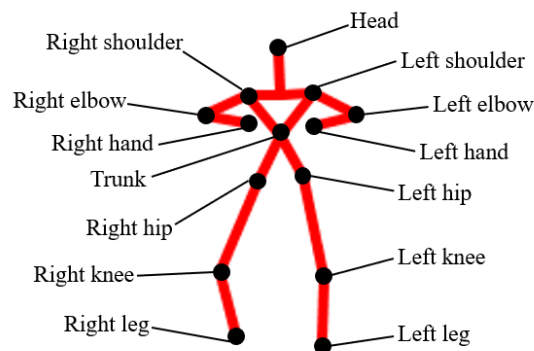

Fig. 1. Fourteen body parts recorded by the Kinect v2

The choreography used for this experiment can be categorized as hip hop, a genre in which the author is skilled, and is made up of four measures which include four basic steps (see Table 1).

We had the participants take 30 minutes to review the choreography and then had them take another 30 minutes to practice on their own in front of wall-mounted mirrors in a gym while listening to the hip hop music track (see Figure 2). After the review and practice, participants performed the choreography five times by themselves in front of the Kinect v2 while listening to the music. The participants took short breaks between each practice.

Table 1. Steps in the experiment.

Step 1	Step 2	Step 3	Step 4
Crouch	Crouch of one step	Crouch of four steps	Box step

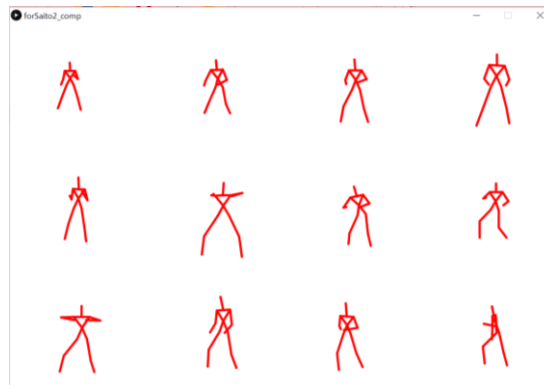**Fig. 2.** Participants practicing choreography.

Fig. 3. Screen shot of the acquired data.

4 Experiment

In order to test whether or not personality is visible when dancing, we tried to see if the participants were capable of discriminating their own dancing and what kind of dancing they favored. We hypothesized that they would be able to identify their own dance forms and that they would match the dance forms they favored. The dance dataset was bone structural data, and we showed the data of all participants synchronously at once to each participant and had them make a ranking from first to third in three categories:

- The participant's own dancing form
- The dancing form that the participant thought was good
- The dancing form that the participant favored

When showing the movements, we always randomly included one out of the five sets of bone structural data on each participant. We also showed the average bone structural data taken from the 11 participants at the same time (see Figure 3). As a result, we had the participants choose from images of 12 bone structure movements when making their ranking. The reason for including the average data was that we wanted to test whether or not participants would recognize their own dancing forms in data which included even a slight aspect of their personality.

We asked each participant to answer each question 20 times. Each time, we randomized the positions on the screen that the bone structural data was shown and randomly selected each participant's data out of the five times they danced.

Table 2. Results of each participant judging their personality (unskilled dancers).

Participant	A's dance	B's dance	C's dance	D's dance	E's dance	F's dance	G's dance	H's dance	I's dance	J's dance	K's dance	average dance
A	0.15	1.00	1.70	1.00	1.30	0.80	0.65	0.65	0.05	0.00	0.20	1.50
B	0.00	3.35	1.00	3.20	0.00	0.00	0.00	0.45	0.45	0.45	0.00	0.10
C	0.15	0.65	2.35	0.50	0.00	0.05	1.75	1.40	0.85	0.80	0.25	0.25
D	0.00	2.05	0.30	4.05	0.00	0.00	0.00	1.20	0.10	0.15	0.00	1.15
E	0.20	1.10	0.70	0.45	1.30	0.35	0.30	1.50	0.40	0.05	0.60	2.05
F	0.90	0.85	0.15	0.05	2.45	1.80	0.25	0.45	0.60	0.10	1.40	0.00
G	0.15	0.05	1.10	0.00	1.10	0.55	3.95	1.30	0.00	0.35	0.00	0.45
H	0.00	0.95	1.35	2.30	0.05	0.00	1.45	2.50	0.05	0.35	0.00	0.00
I	1.45	0.00	1.00	0.20	0.00	0.00	0.25	0.50	3.30	2.15	0.15	0.00
J	1.50	0.25	0.40	0.70	0.00	0.00	0.05	0.45	0.60	4.55	0.00	0.50
K	0.00	0.15	0.15	1.70	0.05	0.00	0.25	0.50	0.70	1.90	2.00	1.60

Table 3. Results of dance preferred by each participant (unskilled dancers).

Participant	A's dance	B's dance	C's dance	D's dance	E's dance	F's dance	G's dance	H's dance	I's dance	J's dance	K's dance	average dance
A	3.55	0.85	0.65	0.30	0.00	0.30	0.15	0.15	1.60	1.30	0.00	0.15
B	0.00	2.95	0.55	3.25	0.00	0.00	0.00	0.20	1.30	0.75	0.00	0.00
C	2.10	0.90	0.90	1.45	0.30	0.00	0.05	0.25	1.85	1.15	0.00	0.05
D	0.00	1.05	0.90	4.50	0.00	0.00	0.05	0.90	0.25	1.25	0.00	0.10
E	2.35	1.10	0.45	0.60	0.05	0.50	0.10	0.10	2.65	0.90	0.00	0.20
F	0.00	1.05	1.65	1.40	0.25	0.00	0.70	0.35	0.85	2.75	0.00	0.00
G	0.00	1.40	0.25	2.90	0.00	0.00	0.25	0.80	0.40	2.70	0.00	0.30
H	0.00	1.40	0.75	2.35	0.00	0.00	0.80	1.40	0.75	1.20	0.00	0.35
I	0.80	1.90	0.55	2.00	0.05	0.00	0.25	1.15	1.05	0.40	0.05	0.80
J	0.80	0.30	0.45	0.60	0.15	0.00	0.00	0.75	1.00	4.90	0.00	0.05
K	0.05	0.80	0.15	3.50	1.55	0.60	0.15	0.60	0.95	0.60	0.00	0.05

Table 4. Results of dance evaluated by each participant as good (unskilled dancers).

Participant	A's dance	B's dance	C's dance	D's dance	E's dance	F's dance	G's dance	H's dance	I's dance	J's dance	K's dance	average dance
A	3.25	0.50	0.90	0.50	0.00	0.10	0.00	0.30	1.65	1.45	0.05	0.30
B	0.00	2.05	0.70	4.30	0.00	0.00	0.00	0.20	0.55	1.20	0.00	0.00
C	0.35	0.65	1.40	3.25	0.00	0.20	0.50	0.25	1.55	0.55	0.15	0.15
D	0.00	3.10	2.45	1.10	0.00	0.00	0.15	0.65	0.20	0.60	0.00	0.75
E	0.40	1.05	0.55	2.00	0.00	0.00	0.00	0.35	2.65	1.70	0.15	0.15
F	0.05	1.05	1.25	0.70	0.00	0.15	0.40	0.75	0.30	4.30	0.05	0.00
G	0.00	0.85	0.30	4.05	0.00	0.00	0.55	0.45	0.00	2.80	0.00	0.00
H	0.00	1.35	0.80	3.35	0.00	0.15	0.30	1.70	0.00	1.35	0.00	0.00
I	0.65	0.90	1.15	1.90	0.00	0.00	0.45	0.65	0.75	1.00	0.00	1.55
J	2.20	0.20	0.05	0.55	0.00	0.00	0.00	0.00	1.40	4.60	0.00	0.00
K	0.00	1.85	0.00	4.80	0.65	0.40	0.00	0.60	0.40	0.15	0.00	0.10

Table 5. Results of each participant judging their personality (skilled dancers).

Participant	L's dance	M's dance	N's dance	O's dance	P's dance	Q's dance	R's dance	S's dance	T's dance	U's dance	V's dance	average dance
L	2.35	0.70	0.60	0.60	0.05	0.10	1.10	0.45	1.05	1.65	0.00	0.35
M	0.40	4.25	0.40	0.10	0.30	1.10	1.00	0.15	0.20	0.45	0.35	0.30
N	1.10	0.85	2.10	0.75	0.45	0.20	1.20	0.00	0.45	0.30	0.45	1.15
O	0.40	1.20	0.75	2.15	0.45	1.15	2.05	0.00	0.25	0.00	0.30	0.30
P	0.05	0.55	0.15	0.10	5.00	0.10	0.70	1.30	0.40	0.15	0.50	0.00
Q	0.20	0.60	0.00	0.75	1.80	2.90	0.75	0.20	0.10	0.00	1.55	0.15
R	0.65	1.95	0.40	0.35	1.35	0.40	1.60	0.45	0.65	0.30	0.90	0.00
S	0.45	1.00	1.60	0.50	0.25	0.15	1.55	1.70	1.10	0.15	0.55	0.00
T	0.35	0.65	0.40	0.15	0.30	0.15	0.50	0.10	5.00	0.50	0.55	0.35
U	0.40	1.95	0.25	0.15	0.15	0.15	0.60	0.05	0.20	4.65	0.40	0.05
V	0.95	1.60	0.80	0.70	0.50	0.85	1.35	0.30	0.20	0.55	1.20	0.00

Table 6. Results of dance preferred by each participant (skilled dancers).

Participant	L's dance	M's dance	N's dance	O's dance	P's dance	Q's dance	R's dance	S's dance	T's dance	U's dance	V's dance	average dance
L	0.35	1.35	0.80	0.60	0.15	1.10	0.30	0.95	0.85	2.10	0.45	0.00
M	0.25	1.10	0.70	1.15	0.05	0.60	1.50	0.90	1.95	0.25	0.55	0.00
N	0.25	2.15	0.90	0.75	0.55	0.80	1.45	0.30	0.70	0.30	0.85	0.00
O	0.15	1.60	0.50	0.95	0.80	1.25	1.40	0.30	0.30	0.80	0.45	0.50
P	0.40	0.95	0.45	0.00	3.80	0.80	0.70	0.05	0.40	0.40	0.65	0.40
Q	0.65	0.55	0.70	0.45	1.30	1.70	0.70	0.50	0.45	0.15	0.40	1.45
R	0.00	0.80	0.80	0.80	1.85	1.80	1.05	0.45	0.30	0.15	1.00	0.00
S	0.70	3.2	0.90	0.00	0.00	0.00	1.90	1.15	0.65	0.05	0.15	0.30
T	0.75	1.60	0.90	0.25	0.15	0.60	0.60	1.00	2.05	0.40	0.40	0.30
U	0.30	1.15	0.90	0.45	0.00	0.00	0.35	0.00	0.30	5.00	0.55	0.00
V	1.25	1.45	0.40	1.05	0.45	0.90	1.60	0.05	0.55	0.25	1.05	0.00

Table 7. Results of dance evaluated by each participant as good (skilled dancers).

Participant	L's dance	M's dance	N's dance	O's dance	P's dance	Q's dance	R's dance	S's dance	T's dance	U's dance	V's dance	average dance
L	0.15	1.25	1.15	0.60	0.50	0.80	0.20	1.35	0.55	1.55	0.90	0.00
M	1.20	0.75	1.05	1.45	0.05	0.65	0.65	0.75	1.50	0.65	0.30	0.00
N	0.35	1.30	1.70	0.30	0.25	0.85	1.55	0.00	1.65	0.30	0.60	0.15
O	1.60	1.70	0.65	0.30	0.40	1.30	0.55	0.15	0.65	0.45	0.40	0.85
P	0.25	2.45	0.40	0.55	2.70	1.05	0.60	0.20	0.15	0.10	0.55	0.00
Q	0.20	1.75	0.30	0.45	0.55	3.05	0.95	0.00	1.15	0.45	0.15	0.00
R	0.65	2.05	0.50	0.40	2.55	0.50	0.70	0.55	0.35	0.20	0.55	0.00
S	1.25	1.95	1.35	0.05	0.25	0.70	1.95	0.60	0.60	0.10	0.15	0.05
T	1.00	1.15	1.40	0.50	0.40	0.65	0.45	0.20	2.25	0.00	0.40	0.60
U	0.10	2.00	0.85	0.15	0.05	0.05	0.00	0.00	0.20	5.00	0.60	0.00
V	0.45	0.75	1.00	1.10	1.60	0.15	1.7	0.55	0.20	0.00	1.45	0.05

5　Results

We scored the participants' answers and used the average score of each set of bone structural data to discuss the topic. First place accounted for five points, second place received three, and third place got one point. The dance which received the highest score for each participant is marked in orange in the tables.

5.1　Unskilled Dancers

Table 2 shows the result of asking participants to choose their own dance from a total of 12 bone structural data sets; one set from each of the 11 participants and one set of average data.

Since Table 2 shows that eight out of the 11 participants were able to choose their own dance, it can be said that recognition of personality is possible. Furthermore, although some were unable to choose their own dance, these participants tended to focus on a single data set (person) when choosing. This shows that they too were capable of recognizing personality. A possible reason that they did not choose themselves could be that they were unable to completely identify their dancing forms when practicing in

front of the mirror. Another reason could be that the participants were unskilled dancers. In future, we will lengthen the practice time and allow participants to identify their dancing forms before conducting the personality recognition test. In this experiment, participant E identified the average bone structural data as his own, and this suggests that he had recognized himself in the average data which included his bone structure. Regarding this fact, we will create average bone structural data with various combinations for future experiments.

Next, we studied whether the participants tended to favor their own dancing over others. We hypothesized that individuals would like their own dancing, but we could not see a relation between an individual's dance and the dance he/she favored when we examined the data (see Table 3).

However, the participants did not all choose the same dancing forms as their favorite; the favored dancing forms differed for each person. Six out of the eleven participants ended up choosing D's dance. This is presumably the result of the difference in level between unskilled and skilled dancers. Also, when we examined the participants' choices, we found that those who chose the same dance forms tended to like the same style of dancing. This proves that there is a possibility of categorization based on the type of dancing individuals favor.

After that, we studied whether there was a relationship between individuals' own dancing forms and the forms they think are good. Similar to the results with the favorite dance forms, participants tended not to evaluate their own dancing as skilled. However, the answers for the dance forms participants favored and the dance forms participants considered good were almost identical (see Table 4).

On the other hand, since all participants were unskilled in dancing, it could be that they confused their favorite dance forms with dance forms they thought were good.

5.2 Skilled Dancers

Table 5 shows the results of skilled dancers for the same experiment as above. We can see that nine out of the eleven participants were able to identify their own dancing, which is a greater number compared to the result for unskilled dancers. Moreover, seeing how participants P and T correctly identifying themselves in all twenty experiments and participants M and U exceeded four points, we concluded that they were able to identify their own dancing with more accuracy than the unskilled participants could. The reason for this is that the skilled participants understood their own dancing better from practicing in front of a mirror on a daily basis. There were numerous participants who were even capable of identifying the dances of other participants. We assumed that they could do so because all participants in this experiment knew each other's dancing styles and characteristics very well from practicing together at the same dance group. We are planning to conduct more experiments on how precisely individuals can distinguish the personalities of other people. Also, we are considering conducting the same experiment with other participants with dance experience but who do not know each other.

Another result which differed from that of the unskilled participants was the scores for the average bone structural data. Unskilled dancers gave the average data high scores, and some thought they themselves were the average bone structural data. On

the other hand, the scores which skilled dancers gave were considerably lower. The reason for this is that while skilled dancers have strong personalities and different movements of the arms and legs, these movements lose their width and activeness when averaged. We will conduct further research on this issue by making averaged bone structural data in different ways.

For the unskilled dancers, there was no relation between dance forms which participants thought to be their own and dance forms they favored. However, the responses of four out of eleven of the skilled dancers showed such a relation (see Table 6). This result is thought to be that individuals practice their favorite dance styles, resulting in identical choices for favorite dance forms and dance forms of their own. Moreover, most of these four participants had chosen their own dance forms with high accuracy. This is probably because the participants who have closer dancing styles to their favorite styles spend more time practicing, and they are more aware of their own dancing style. We will conduct further research on the relationship between identifying oneself and preferences.

Furthermore, the skilled and unskilled dancers who did not choose the same dance form for their favorite and as their own showed differences in their answers. The choices of unskilled dancers for their favorite dance forms tended to be the same, but the choices of the skilled dancers varied. We concluded that this is because skilled dancers have a wider pool of dancing forms to pick their favorite forms from. These results proved that there is a difference in the number of categories by preference between skilled and unskilled dancers. In the future, we will verify where this difference arises.

Finally, we examined the dancing forms which skilled dancers thought were good (see Table 7). As in the case of the dancing forms the participants favored, there were some differences between the skilled and the unskilled dancers' choices. Although no relation was seen between the participants' own dancing forms and the dancing form they thought was good for the unskilled dancers, four out of the eleven skilled dancers made the relation. Furthermore, three of those four also had a relation between dancing forms which they thought were their own and dancing forms which they favored. These results prove that when examining a certain dancing form, the tendency of participants to think it is good increases when the form is close to their favorite or a form that they identify as themselves.

Moreover, focusing on only the dancing forms participants favored and the dancing forms they thought were good, ten out of the eleven skilled participants tended to select the same dancing forms, the same as the results of the unskilled dancers. Before this experiment, we had thought the dancing forms that the skilled dancers favored would differ from those they thought were good, but there were no such differences, just as with unskilled dancers.

On the other hand, the results of the skilled dancers differed from those of the unskilled dancers in regard to the average bone structural data. Even though the unskilled dancers didn't rank the average bone structural data in first place, some of them ranked the average data in the top three. By contrast, none of the skilled dancers ranked the average data in their top three for any category. We can interpret this result as being that the skilled dancers saw the averaged forms as lacking personality, i.e., lacking the

essence with which to become better at dancing, even though the images incorporated their own forms.

6   Conclusion

In this study, we generated a dance dataset and had 22 participants evaluate their dancing in order to study the possibility of extracting personality by examining the relationship between an individual's own dance forms, the dance forms he/she favors, and the dance forms the individual considers good. In conclusion, we found that most participants were capable of identifying their own dance forms or, when they could not, could still see characteristics in the dance forms and recognize individuals. Furthermore, we found that skilled dancers were able to identify themselves with higher accuracy compared to those who are unskilled. Given these results, we can conclude that people can feel their personality simply by watching movements of their skeleton, and it is possible to extract one's personality in street dancing.

Moreover, the experiments showed that while unskilled dancers could not relate their own dancing with their favorite dancing or dancing they thought was good, a portion of the skilled dancers could do so. We also discovered that both skilled and unskilled dancers showed tendencies to match their favorite dances with dances they thought were good.

In the future, we would like conduct experiments with more participants, breaking them down into more precise dancing levels. Once extraction of personality for dancers with different levels of skill becomes possible, we will be able to search for similar dance forms by automatic categorization of individual dances. We hypothesize that this knowledge will eventually become a useful support in dance education. We will continue to study applications of our findings and to develop various systems.

Acknowledgements

References

1. Fink, B., Weege, B., Flügge, J., Röder, S., Neave, N., McCarty, K.: Men's personality and women's perception of their dance quality. In: Personality and Differences, vol. 52, issue 2, pp. 232–235. (2012).
2. Hugill, N., Fink, B., Neave, N., Besson, A., Bunse, L.: Women's perception of men's sensation-seeking propensity from their dance movements. In: Personality and Individual Differences, vol. 41, issue 4, pp. 483-487. (2011).
3. Yonezawa, M.: Investigations of teachers' attitudes to dance in the face of scholastic requirement of dance in middle schools in Heisei 24 (2012) academic year. In: Studies in Humanities of Kanagawa University, no.178, pp. 53-80. Kanagawa (2012).

4. Yamaguchi, T., Kadone, H.: Supporting creative dance performance using a grasping-type musical interface. In: Robotics and Biomimetics (ROBIO), 2014 IEEE International Conference. Bali (2014).
5. Nakamura, A., Tabata, S., Ueda, T., Kiyofuji, S., Kuno, Y.: Dance training system with active vibro-devices and a mobile image display. In: Intelligent Robots and Systems (IROS 2005), 2005 IEEE/RSJ International Conference, Edmonton (2005).
6. Yang, U., Kim, G.: Implementation and Evaluation of "Just Follow Me": An Immersive, VR-Based, Motion-Training System. In: Presence, vol. 11, issue 3. (2002).
7. Fujimoto, M., Tsukamoto, M., Terada, T.: A Dance Training System that Maps Self-Images onto an Instruction Video. In: The Fifth International Conference on Advances in Computer-Human Interactions, pp. 309-314. (2012).
8. Sato, N., Imura, S., Nunome, H., Ikegami, Y.: The motion characteristics of expert street dancers during performance. In: Health, Physical Fitness, Sports, vol. 34, no.1, pp. 35-39. Nagoya (2011).