

MOTION CHARACTERISTICS IN HIP HOP DANCE UNDERLYING SUBJECTIVE EVALUATION OF THE PERFORMANCE

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The purpose of this study was to extract the motion characteristics that are closely related to the subjective evaluation of hip hop dance performance. The subjects were 11 expert, six non-expert and nine novice hip hop dancers. Each dancer performed the “wave” motion as the experimental task. Movements of upper extremities during the task were captured by a motion capture system and several kinematic parameters including the propagation velocity of the wave (PV) were calculated. We found that the coefficient of variance of the PV was highly correlated with the subjective evaluation by the judges ($r=0.770$, $p<0.01$). This result indicated that smooth propagation of the wave was most closely related to the subjective evaluation to the wave performance.

KEY WORDS: quality evaluation, judge, wave.

INTRODUCTION: Hip-hop dance refers to dance styles primarily performed to hip-hop music. The hip hop dance were being performed on the street, but nowadays the dancers sometimes strive for mastery in the contests. In the contests, the performance of a dancer is evaluated by the rating of the judge. In other sports competition such as the gymnastics or the figure skating, the performance also graded according to a difficulty level of the skill or a technical score which are prescribed in detail in the rule, and the superiority or inferiority of the performance is decided on common objectivity. However, in the hip hop dance contest, a judge often marks subjectively, and objective criterion for each evaluation is not clearly defined. Defining a criterion for objective evaluation in the dance performance has been recognized as very complicated task because it is quite difficult to avoid the influence of the subjectivity of the judge. Only a few attempts, to date, have been made to define the criterion to measure the quality of dance performance. In these studies, new measurement tools for the evaluation of qualitative aspects of dance performance such as Aesthetic Competence Evaluation (ACE) (Chatfield & Byrnes, 1990) or Performance Competence Evaluation Measure (PCEM) (Krasnow & Chatfield, 2009) were developed for modern dance. In contrast, the systematical way of qualitative evaluation of the hip hop dance has received little interest in the research literature.

In this study, therefore, we aimed to find out if hidden motion characteristics that represent the skill levels of the hip hop dancers were also closely related to the subjective evaluation of the judges.

METHODS: The subjects were 11 expert hip hop (expert), six non-expert (non-expert) and nine novice dancers (novice). Expert dancers including prize-winning dancers of national level competitions had 9.3 ± 2.3 years of experience in the hip hop dance. Non-expert had 4.7 ± 1.9 years of experience and novice had none. Twelve experienced judges of hip hop dance evaluated the performance of the subjects.

The wave motion by the upper extremities was selected as an experimental task. The wave motion is one of the fundamental techniques in the hip hop dance, and it expresses the propagation of the wave by a series of vertical motion of the upper extremities. In this technique, the dancers try to mimic the wave by showing its smooth propagation using the vertical motion of six joints on the upper extremities. The subjects were asked to perform the wave motion as smooth as possible in the sitting position on the 40cm height chair. Their

wave motion were captured using a six-camera motion capture system (Vicon, Oxford Metrics Ltd, Oxford, UK) sampled at 60Hz. The subject wore a black leotard, and twelve spherical markers 12mm in diameter were attached on the skin or clothing over the anatomical points (acromial, lateral epicondyle of humerus, medial epicondyle of humerus, styloid processes of ulna, styloid processes of radius and middle finger tip of both side). The joint center of the elbow was defined as the mid-point between the lateral epicondyle of humerus and medial epicondyle of humerus markers, and that of the wrist was defined as the mid-point between the styloid processes of ulna and styloid processes of radius markers. After the measurement, the 12 judges evaluated the wave motion by observing the animation of the stick figure on the computer display instead of actual motions of the subjects to minimize the effect of judges' bias. The performance of each subjects were graded on a scale of one to ten. The subject was sorted in ranking based on the grade by the judges. To evaluate of how much the wave motion of each subject mimics an ideal wave, we defined the ideal wave as a sine wave with constant amplitude (no damping) and constant propagation velocity. We calculated amplitude (A_m) and propagation velocity of the wave (PV), and deviation from ideal wave shape (DI) in each measurement. Variation in A_m and PV of each measurement point was calculated as coefficient of variation (CV). Differences in the average values between the groups were statistically checked using 1-way ANOVA followed by Turkey post hoc tests. Inter-rater reliability of the judges was evaluated using the intra-class correlation coefficients. Spearman rank-correlation coefficient was also used to estimate the relationship between the subjective evaluation and the kinematic parameters. Statistical significance was set at $p < 0.05$.

RESULTS: Coefficient of variation of the A_m (CV_{A_m}) and the PV (CV_{PV}), and the DI in the expert, the non-expert and the novice are shown in Figure 1. As shown, the expert showed the smallest value, followed by the non-expert and the novice. The CV_{A_m} , the CV_{PV} and the DI were significantly different between the expert and the novice ($p < 0.01$, $p < 0.01$ and $p < 0.05$, respectively). In contrast, only the CV_{PV} was significantly different between the non-expert and the novice ($p < 0.01$).

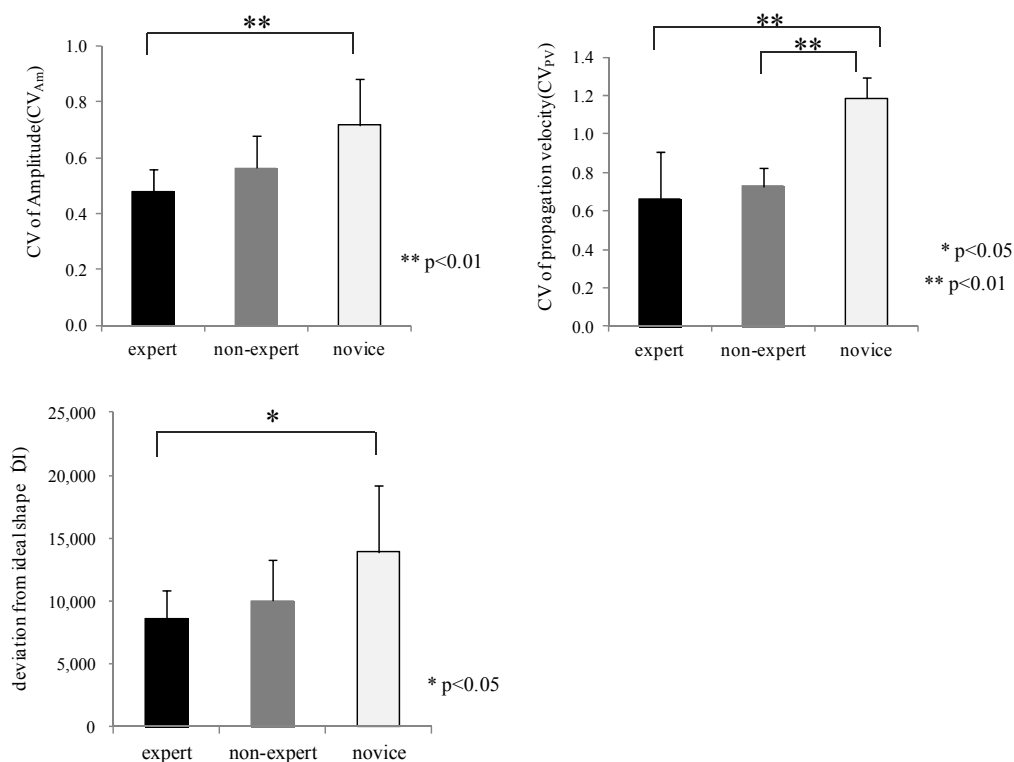


Figure 1: Comparison of the coefficient of variation of the A_m (CV_{A_m}), the coefficient of variation of the PV (CV_{PV}) and the DI between the three groups.

Intra-class correlation coefficients of the subjective evaluation were 0.762. The subjective

evaluation are shown in Figure 2. In the subjective evaluation, the expert had the highest rank, followed by the non-expert and the novice. The rank of the expert was significantly higher than that of the non-expert and the novice.

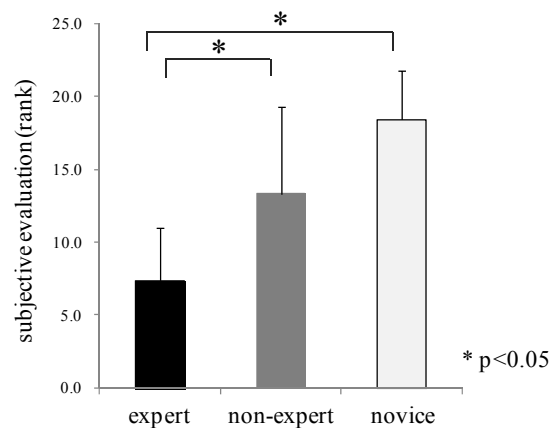


Figure 2: Comparison of the subjective evaluation between the three groups.

There were moderate to high correlations between the subjective evaluation and the CV_{Am} , the CV_{PV} and the DI ($r=0.479$, $p<0.05$, $r=0.700$, $p<0.01$ and $r=0.510$, $p<0.01$, respectively). Only the CV_{PV} was highly correlated with the subjective evaluation from the judges (Figure 3).

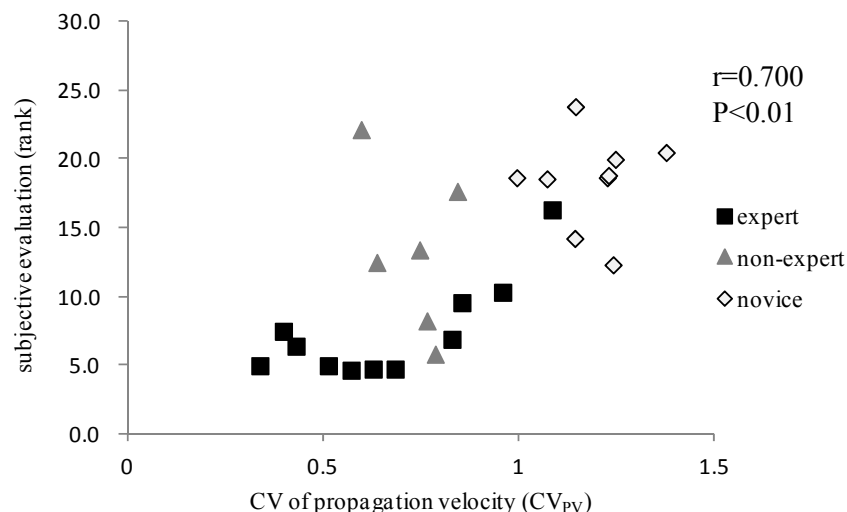


Figure 3: The correlation between the subjective evaluation and the coefficient of variation of the propagation velocity.

DISCUSSION: The wave motion in the hip hop dance is the movement of the upper extremities imitating the propagation of the actual wave like a “wave” of audiences that travels through a packed stadium. The dancers should control the vertical motion of six joints of the upper extremities which are located unequally spaced. To find kinematic characteristics of the wave motion performed by each subject, we focused on variations of amplitude, propagation velocity, and the deviation from the ideal wave.

In this study, the subjects were divided into three groups based on their experiences of the hip hop dance. The given rank of the expert was the highest among the three groups and significantly different from that of the non-expert and the novice. Thus, it can be assumed that the way of grouping applied in this study was most likely appropriate to the relationship between some motion characteristics and the skill levels of the hip hop dance.

In the ideal wave, the CV_{Am} , the CV_{PV} and the DI should be 0. On the other hand, in the expert, variation of Am and PV , and DI were smaller than non-expert and novice. These

results indicated that these parameters are related to the skill level of the dancers because the CV_{Am} , the CV_{PV} and the DI varied with the years of experience of each group. In particular, the CV_{PV} showed significant differences amongst the expert, the non-expert and the novice. The CV_{PV} is also most closely related to the years of experience.

In this study, there observed moderate correlations between the subjective evaluation of the judges and the CV_{Am} and the DI, and a high correlation between the subjective evaluation of the judges and the CV_{PV} . As the CV_{PV} was highly correlated with the subjective evaluation of the judges, it can be considered that in the evaluation of the wave motion, the judges pay most attention to the variability of propagation velocity, in other words a smooth propagation of the wave will get a high score.

In the present study, we succeed in extracting hidden motion characteristics of the wave motion which affect the evaluation of the judges. The results also provided fundamental but quantitative information to develop a new effective practice method in the hip hop dance.

CONCLUSION: In this study, an attempt was made to extract some motion characteristics of the wave motion which closely related to the subjective evaluation of in hip hop dance. The coefficient of variation of the propagation velocity was highly correlated with the subjective evaluation of the judges. Therefore, it was suggested the constant propagation velocity is the most important element in the wave motion in order to make the audience feel a smooth wave.

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