意味空間において運動のリズムパターン
に影響をうける舞踊のイメージ

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　本研究は，意味空間における舞踊のイメージが，視覚的な運動のリズムパターンによりどのような影響をうけるかについて研究することを目的とする。イメージの調査のために，歩行運動，基本的な連結運動（歩行，回転，跳躍，滑歩，平衡）と混合リズムをもつ連続運動で10個の刺激が構成された。歩行運動と基本的な連結運動は，4拍子で同間隔のリズムパターン，3拍子で同間隔のリズムパターン，4拍子で異なる間隔のリズムパターン，3拍子で異なる間隔のリズムパターンの4つの異なるリズムパターンを持っている。実験1は，4つの異なるリズムパターンを持つ歩行運動と連続運動の5つの刺激でまとめられ，実験2は，4つの異なるリズムパターンを持つ基本的な連結運動と実験1で用いたものとまったく同一の連続運動の5つの刺激で構成された。この2回の実験は，2巻の8m/mカラーフィルムに収録された。

　イメージの測定のためには，著者らがすでに作った46個の意味尺度が用いられた。刺激としての10個の異った内容に，116名の大学生が，各46個の意味尺度を用いて反応した5段階評定が資料として取り上げられた。その資料をもとにして，46尺度相互間の相関行列が行なわれ，主因子解法とNormal varimax基準による直交回転がほどこされ，多因子解を出した。

　1）多因子解法からは，次の8つの因子が抽出され，命名された。即ち，1）情緒性，2）調和性，3）柔軟性，4）空間性，5）多様性，6）跳離性，7）重量性，8）触感性の8因子である。これらの命名された因子をもとにして，刺激間の跳離が分析された。

　2）歩行運動と基本的連結運動の相違は，4種類の4拍子の運動の中で，また4種類の3拍子の運動の中で示された。4拍子の歩行運動は，第7因子の"重量性"の中で，4拍子の基本的連結運動に比べ，より軽量感がイメージされた。また3拍子の歩行運動は，3拍子の基本的連結運動に比べて，第2因子の"調和性"ではより協和感が，そして，第5因子の"多様性"ではより単調感がイメージされた。4種類の歩行運動の中では，異なる間隔を持つ4拍子の運動は，他の3種類の歩行運動とは異ってイメージされたが，4拍子の基本的連結運動と相似してイメージされた。これらのことから，運動の種類の差異は，3拍子や4拍子間の中でイメージされたが，間隔に長短のあるリズムパターンは，より複雑な運動に相似する傾向がみられたと言える。

　3）3拍子の運動と4拍子の運動の相違は，歩行運動と基本的連結運動の中でみられた。4拍子の歩行運動は，3拍子の歩行運動に比べて，第4因子の"空間性"の中ではより狭小感がイメージされた。また，4拍子の基本的連結運動は，3拍子の基本的連結運動に比べて，第2因子の"調和性"の中でより不協和感がイメージされた。加えて，4拍子の異なる間隔を持つ運動は，3拍子の異なる間隔を持つ運動に比べて，第2因子の"調和性"では，より不協和感，第6因子の"距離性"では，より浅くイメージされた。更に，3拍子では，2つの歩行運動間と2つの基本的連結運動間に相似がみられた。すなわち，同じ拍子を持つ似かよった運動は，異った間隔のリズムパターンを持つにもかかわらず，お互いに似かよってイメージされた。しかしながら，4拍子の歩行運動では異った間隔のリズムパターンは，異ってイメージされたため，ビート間の長短の影響は，運動の違いによってあらわれると言えよう。

　4）等間隔のリズムパターンの運動と，異なる間隔のリズムパターンの運動のイメージの相違は，4拍子の歩行運動においてみられた。等間隔の4拍子の歩行運動は，異なる間隔の同運動に比べて，第2因子の"調和性"では，より協和感，第3因子の"柔軟性"では，より柔軟感，第5因子の"多様性"では単調感，第6因子の"距離性"では，より深くイメージされた。

　5）まったく同一の連続運動は，似かよってイメージされたが，異なる実験群の中では，他の運動との関連の程度に異りがみられた。

　以上をもって，舞踊のイメージは，運動のリズムパターンに影響をうけることが推論された。

THE IMAGES OF DANCE AFFECTED BY MOVEMENT RHYTHM PATTERNS IN SEMANTIE SPACE

Akiko ZUKAWA

INTRODUCTION

Theories of dance help to understand dance as a part of the cultural heritage of human beings. Knowledge of the theories is useful for developing and exploring dance abilities of a person who dances, choreographes, and teaches dance. When a person wants to impart his/her dance experience to some other persons, it might take a long time to be understood without the knowledge. Moreover, the contents which are communicated by him/her might be limited in the narrower world. On the other hand, if his expanded dance experience and knowledge is conveyed to dancers, audiences, students, and scholars, dance is widely and rapidly comprehended by many people. Therefore, this study was done to contribute choreographers and educaters an understanding dance in a scientific way.[1],[8]

The purpose of this study is to define images of dance affected by movement rhythm patterns. The focus of this study is on dance movements, especially movement rhythm patterns having three beat or four beat, and even interval of beats or uneven interval of beats are analyzed statistically. This topics are delineated by the following problems:

1. Identification of common factors determined by factor analysis in order to analyze the images of dance in this study.
2. Identification of the difference between images of walk movements and images of combining basic movements.
3. Identification of the difference between images of three beat rhythmic movements and images of four beat the rhythmic movements.
4. Identification of the difference between images of even interval rhythmic movements and images of uneven interval rhythmic movements.
5. Identification of the difference between images of repeating rhythmic movements and images of non-repeating rhythmic movements.

Terms used in this study are defined as follows:

Combining basic movement : a dance movement joining basic movement such as walk, turn, hop, slide and balance.

Even interval rhythmic movement : a dance movement having even length between each two of beats in a bar.

Factor analysis : a method to analyze factors which explain part of the whole variance of a measured characteristic.[10]

Image of dance : a mental picture of dance in the absence of any sensory stimuli.[2]

Movement rhythm pattern : a form made by time elements such as accent, stress, beat, meter and length between beats of human activities.[6]

Non-repeating rhythmic movement : a movement composed of different rhythm patterns. In this study, this movement is identical to a sequential movement.

Repeating rhythmic movement : a movement composed of repeating the same rhythm pattern in a bar.

Semantic differential method : a method to measure rating of distances among different ideas, concepts or objects on semantic scales.[3]

Semantic scale : a scale having 5, 7 or 9 positions of extreme opposites, adjectivly speaking.

Semantic space : multidimensional space selected by factors.[9]

Sequential rhythmic movement : a continuous series of combining rhythmic motion and steps. For this study, the movement rhythms are mixed by three beats, four beats, even interval and uneven interval rhythms.

Uneven interval rhythmic movement : a dance movement having an uneven length between two beat in a bar.

For the purpose of this study it will be assumed that :

1. Images of walk movements and images of combining basic movements are different. However, they are affected by rhythm patterns.

2. Images of three beat rhythmic movements are different from images of four beat rhythmic movements.

3. Images of even interval rhythmic movements are different from images of uneven interval rhythmic movements.

4. Images of repeating rhythmic movements are different from images of a non-repeating rhythmic movement.

The scope of this study is identified as being those images of dance movements that are affected by movement rhythm patterns. Several delineations will be imposed on the study to facilitate data collection:

1. 10 different dance movements danced by one dancer will be divided in two parts and will be filmed in two rolls of 8 m/m color film.

2. Multivariate statistical analysis procedures will be applied to identify the problems.

Acknowledged weaknesses for this study are affirmed as follows.

1. The scope of the study does not include the artistic value of the dance movements and films.

2. This study does not discuss all of movement rhythm patterns. However, it is identified if images of dance movements are affected by the rhythm patterns having four beats, three beats, even interval and uneven interval in two different kinds of dance movements.

3. Each person has his/her own images of the dance movements. This study does not discuss these individual images, but common images are defined statistically through analyzing a large amount of quantitative data.

4. Semantic differential scales which were composed for measuring images of dance specially can not measure all images, but emotional and affecting images of dance are measured.

The significance of this study to the approach of dance is the attempt to develop and to evolve a theory of dance composition through the use of a psychological method. In order to develop the theory, elements of the dance composition such as time, space, energy, forming, style, sound and group working will be analyzed. However, in this study time is chosen as one of the elements and rhythm patterns relating to the time element of dance movements were analyzed.

In 1981, it was concluded that images of dance movements were affected by auditory rhythm patterns which were composed of different meter and length of interval between two beats in a bar by the author and the cowerker.[13] Specifically, visual stimuli with auditory stimuli were analyzed. In this study, however, it is deduced that images of dance are affected by movement rhythm patterns. In particular, visual stimuli, rhythm patterns in dance movements themselves are analyzed.

In order to solve the problem a semantic differential method is used. Although the method was first organized by Charles E. Osgood(1952)and P. R. Hofstater (1957), scales in this study were selected by the author and the cowerekers through statistical procedures in 1980. As the result, 46 semantic differential scales were chosen for measuring images of dance specially.

In this study images of dance are measured by language, especially adjectives which express feelings, emotions and affections of human kinds. Therefore, the images expressed by the adjective words do not describe all of dance precisely. However, the images examined in this study are expressed by not only one adjective word, but they are delived through several adjective words clustered into semantic factors. Therefore, quality of dance can be described similar to the sensations and the emotions in audience.

METHOD AND DESIGN

The major focus of this study is on the statistical evaluation of the images of dance affected by movement rhythm patterns. Explicitly, four different walk movements and four different combining basic movements which were combined with basic movements such as walk, turn,

hop, slide and balance and a sequential rhythmic movement were shown to obserbers. In order to measure images of dance, semantic differential method was utilized. Multivaliate statistical analytic procedures were applied to data for identifying the problem.

The Stimuli

All dance movements for this study were performed by Kyoko Oyaide, a professional dancer. Also, suggestions for composing the movements were provided by Miki Wakamatsu, a professor of the University of Tsukuba and a professional choreographer. All stimuli were danced along a diagonal line from downstage right to upstage left in a rectangle of 15m×10m in the dance gymnasium at the University of Tsukuba. Moreover, the dances were performed accompanied by sounds of a metronome (Yamaha Musical Instrument Company, Japan) which produced a steady tempo (Maelzel Metronoms ♩ = 96). Ten different stimuli were divided into two groups and each five stimuli was filmed on a roll of 8m/m color film (Fuji Photo Film, Japan) on March 9, 1981.

1. Experiment 1
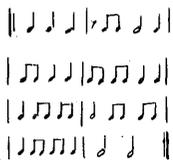
Five different stimuli were arranged by four different movements and a sequential rhythmic movement. The four different walk movements were a walk movement with four beat and even interval rhythm patterns, three beat and even interval rhythm patterns, four beat and uneven interval rhythm patterns and three beat and uneven interval rhythm patterns.

2. Experiment 2

Five different stimuli were arranged by four different combining basic movements and a sequential rhythmic movement, the same one in Experiment 1. The four different combining basic movements were a combining basic movement with four beat and even interval rhythm patterns, three beat and even interval rhythm patterns, four beat and uneven interval rhythm patterns and three beat and uneven interval rhythm patterns.

The order of 10 different stimuli for the survey is defined in Fig. 1.

Obserber

In order to survey the images of dance, 116 students were chosen, 84 males and 32 femeles. All of them were undergraduate students in the School of Physical Education at the University of Tsukuba.

Experiment 1

walk movements and
a sequential movement

	frame (second) of each stimulus	rhythm pattern	
1	582(32.33) walk	‖: ♩ ♩ ♩ ♩ :‖	even interval and 4 beat rhythm
2	524(29.11) walk	‖: ♩ ♩ ♩ :‖	even interval and 3 beat rhythm
3	586(32.56) walk	‖: ♩. ♪ ♩ ♫ :‖	uneven interval and 4 beat rhythm
4	611(33.94) walk	‖: ♩. ♪ ♩ :‖	uneven interval and 3 beat rhythm
5	395(21.94) sequence	‖ ♩ ♩ ♩ ♪♫ ♩ ♩ ‖	mixed rhythm

‖ ♫ ♩ ♩ ♫♫ ♩ ♩ ‖
‖ ♩ ♫ ♫ ♩ ♩ ♫ ‖
‖ ♩ ♫ ♫ ♩ ♩ ♩ ‖

Experiment 2

combining basic movements
and a sequential movement

	frame (second) of each stimulus	
6	423(23.50) combination
7	418(23.22) combination
8	505(28.06) combination
9	432(24.00) combination
10	395(21.94) sequence

Fig. 1 Length and character of each stimulus

Data of the Survey

The survey was taken in a 75 minute class, on October 29, 1981.

The Method for the Survey

In order to survey the images of dance, the semantic differential method was applied. 46 extreme opposite adjective scales drawn up by the author and the coworkers in 1980 were used. Each of the scales used a five step scale assigned a number of 1 through 5 in a direction from left to right, and defined by adverbs, "very", "somewhat" and "not". Then, each obserber choose one digit representing one item in the list of 46. The judgement was repeated 10 times for the 10 stimuli.

The Treatment of Data

The data which were gathered in the survey were punched onto computer cards in an arrangement consistent with the form of this survey. The order was such that each obserber had 10 separate cards for each of 10 stimuli judged with the scals from 1 to 46. For the analysis of the raw data, FACOM M-200 computer in the Science Information Processing Center at the University of Tsukuba was used. In addition, programs were written by Yoshiyuki Matsuura, Ph.

D, a professor at the University of Tsukuba, and the author.

Result and Discussion

The raw data were analyzed by multivariate data analysis. The results presented in Table 1 through 5 and Fig. 1 through 7 were described and discussed as follows.

1. Interpretation of Factor Extracted

First, from the raw data, a 46×46 correlation matrix of 10 stimuli for Factor analysis were acquired through using standard deviation, correlation coefficient, z transformation and mean correlation.

Next, 8 factors were chosen by the factor analytic technique. In this procedure, Principal component analysis was applied and the factors which were shown to have eigenvalues greater than 1.0 were selected. Then, after Normal valimax criterion were used for orthogonal rotation, 8 factors were extracted. As the results, the final varimax criterion was 939.923 after 16 rotations.

Third, the 8 factors were clustered in groups of selected higher loadings over the level 4.0 and were reordered and numbered by the amounts of contribution. As shown in Table 1, the

Table 1 Contribution of each factor

	1	2	3	4
Factor 1	7.70379	16.75	16.75	32.21
Factor 2	3.65112	7.94	24.69	15.26
Factor 3	3.21504	6.99	31.68	13.44
Factor 4	3.14359	6.83	38.51	13.14
Factor 5	2.24811	4.89	43.40	9.40
Factor 6	1.43428	3.12	46.52	6.00
Factor 7	1.35268	2.94	49.46	5.66
Factor 8	1.16863	2.54	52.00	4.89

1: Amount of contribution　3: Degree of cumulative contribution
2: Degree of contribution　4: Degree of common contribution

contributions of the factors were from 7.70379 to 1.1686 by the number of factors from 1 through 8. The amount of the contributions are shown to be from 16.75 percent to 2.54 percent in the all contributions and expressed from 32.21 percent to 4.89 percent in common contribution which is 52.00 percent in the all contributions. In each factor the factor loadings were rearranged from the highest to the lowest greater than ±0.4 (Table 3). In order to name the factors properly, variables with higher loadings are more important than variables with lower loadings. Therefore, the factors were labeled and interpreted by considering main variables with higher loadings.

The first factor was defined as emotionality, defined as instinctive passion and sensibility, by judging the variables of scales: merry-suffering, interested-uninterested, loving-hating, good-bad,

Table 2 Factor pattern matrix

	Scales	F1	F2	F3	F4	F5	F6	F7	F8
1	wide-narrow				0.628				
2	kind-cruel			-0.523					0.452
3	cold-hot				-0.401				0.488
4	stable-shaky		0.684						
5	delicate-rugged					0.430			
6	exciting-calm			0.346	0.371	0.389			
7	large-small				0.650				
8	funny-serious		-0.572				-0.315		
9	exuberant-sober	0.358			0.579				
10	natural-artificial	0.345	0.549						
11	high-low				0.484				
12	decent-indecent	0.437	0.463						
13	young-old	0.595							
14	beautiful-ugly	0.585	0.423						
15	hard-easy					0.584			
16	heavy-light	-0.304	0.304				0.305		
17	accurate-inaccurate		0.630						
18	many-a few				0.410			0.399	
19	pleasant-unpleasant	0.659							
20	shallow-deep						-0.587		
21	coordinated-chaotic		0.710						
22	near-far	0.333					-0.532		
23	active-passive	0.454			0.450				
24	clean-dirty	0.479	0.374						
25	short-long				-0.443				
26	strong-weak	0.358		0.450	0.320				
27	like-hate	0.658							
28	different-same		-0.357						0.472
29	happy-sad	0.592							
30	strained-released			0.601		0.321			
31	masculine-feminine			0.648					
32	light-dark	0.651			0.327				
33	communal-lonly	0.598			0.329				
34	individual-common	0.512							
35	good-bad	0.665							
36	fresh-stale	0.643							
37	fast-slow	0.527		0.303					
38	simple-complex					-0.601			
39	loving-hating	0.680							
40	thin-thick							0.664	
41	merry-suffering	0.745							
42	interested-uninterested	0.716							
43	straight-curved			0.695					
44	regular-irregular		0.538			-0.302			
45	hard-soft			0.706					
46	sharp-dull	0.329		0.365		0.368			

Table 3　Naming of factors, selected scales and meaning of signs

Factor	Selected scales	Meaning of signs	
		−	+
1	Emotionality (7.70379) merry-suffering, interested-uninterested, loving-hating, good-bad, pleasant-unpleasant, like-hate, light-dark, fresh-stale, communal-lonly, young-old, happy-sad, beautiful-ugly, fast-slow, individual-common, clean- dirty, active-passive, decent-indecent	pleasant	unpleasant
2	Harmoniousness (3.65112) coordinated-chaotic, stable-shaky, accurate-inaccurate, serious-funny, natural-artificial, regular-irregular, decent-indecent, beautiful-ugly	harmonious	inharmonious
3	Flexibility (3.21504) hard-soft, straight-curved, masculine-feminine, strained- released, cruel-kind, strong-weak	stiff	flexible
4	Spatiality (3.14359) large-small, wide-narrow, exuberant-sober, high-low, active-passive, long-short, many-a few, hot-cold	wide	nallow
5	Variety (2.24811) complex-simple, hard-easy, delicate-rugged	complex	simple
6	Distance (1.43428) deep-shallow, far-near	deep	shallow
7	Weight (1.35268) thin-thick	thin	thick
8	Touching (1.16863) hot-cold, same-different, cruel-kind	hot	cold

(　): Amount of contribution

pleasant-unpleasant and like-hate.

The second factor is identified itself as harmoniousness including selected variables such as coordinated-chaotic, stable-shaky and accurate-inaccurate. These variables are considered as qualities of agreement or disagreement in the stimuli.

The third factor is named as flexibility by considering selected variables such as hard-soft, straight-curved, masculine-feminine, and strained released.

The others from Factor 4 through Factor 8 are labeled spatiality, variety, distance, weight and touching by judging the variables belonging to each factor. In total, these 8 are named as follows: 1) emotionality, 2) harmoniousness, 3) flexibility, 4) spatiality, 5) variety, 6) distance, 7) weight, and 8) touching. The reason that adjectival nouns were used for these names was for the purpose to distinguish the name from variables composed by using adjectives. Adjectives are then used to be labeled meanings of signs in selected scales. These labeles are shown in Table 3.

These factors are similar to studies which were already reported by the author and the coworkers (1980, 1981, and 1982). When the results of this study are compared with the results of the four past studies, "emotionality", "harmoniousness", and "flexibility" are shown in each study. However, "activity" which were shown in the past studies cannot be found in this study. Also, the other factors are selected differently from the past studies because it is thought that each study has different concepts. Therefore, it is infered that the three factors in Factor 1 through Factor 3 were characterized as main elements in this study.

2. Images of Dance Affected by Movement Rhythm Patterns

In order to identify the differences among qualities of stimuli, distances between stimuli in semantic space and semantic scores were computed using a test of estimation of factors by short method. Euclidean distance were applied to compute the distances. Also, coordinates of dimensions in the semantic space were determined by using original raw data and the factor analytic results, and the semantic scores were counted as means of the coordinates. In addition, t-tests were used for discussing the significancy of the semantic scores.

1) The distance between concepts in semantic space

The distance between stimuli shown in Table 4 are synthesized concepts in 10 semantic dimensions. The distances between Stimulus 2 and 4 and between 7 and 9 are much shoter than the other distances. These relationships can be explained as three beat rhythmic movements in the similar movements. The next shoter distances are found between Stimulus 4 and 7, and between Stimulus 6 and 8. The former relationship is three beat and even interval rhythmic movements in the different kinds of movements. The later is four beat rhythmic movements in combining basic movements. Then, the shoter distances are found between Stimulus 2 and 7, between Stimulus 4 and 9 and between Stimulus 3 and 8. These relationships are three beat and even interval rhythmic movements, three beat and uneven interval rhythmic movements and four beat and uneven interval rhythmic movements. The distance between Stimulus 5 and 10, which are exactly the same sequential movement is shoter in the next. Consequently, it is described that the movements with three beat rhythms are similar than the movements with four beat rhythms even if the kinds of movements and the intervals between beats of the movements are different. However, significancy of these tendencies cannot be obvious because they were interpreted as basic on the distances in 8 semantic dimensions. Therefore, their significance in each factor will be described in the next paragraph.

2) The distances between degrees of semantic dimensional scores

In this part, the result of semantic scores shown in Table 5 and results of the t-tests for factors delineated in Fig. 2 through Fig. 7 are discussed.

a) Differences between images of the walk movements and images of the combining basic movements are infered through analyzing images of the both movements with same rhythm patterns. As the results, significances of the distances were found between Stimulus 1 and 3, and Stimulus 6 and 8 in Factor 7 and between Stimulus 2 and 4, and Stimulus 7 and 8 in Factor 2. These results are interpreted as the walk movements with four beat rhythms are thiner than the combining movements with four beat rhythms. Also, the walk movements with three beat rhythms tend to be more harmonious and more simple than the combining movements with three beat rhythms. In

Table 4　Distance between stimuli in semantic space

	1	2	3	4	5	6	7	8	9	10
1	0									
2	0.920	0								
3	1.608	1.527	0							
4	1.020	0.300	1.579	0						
5	2.740	2.043	1.945	1.953	0					
6	1.688	1.402	0.789	1.321	1.539	0				
7	1.161	0.624	1.282	0.527	1.714	1.059	0.			
8	1.813	1.563	0.691	1.513	1.676	0.529	1.189	0		
9	1.307	0.772	1.151	0.668	1.572	0.866	0.385	0.933	0	
10	2.056	1.334	1.500	1.245	0.740	1.085	1.010	1.273	0.919	0

Table 5   Semantic scores

	F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8
1	0.325	-0.536	0.481	0.626	0.669	-0.076	-0.417	-0.271
2	0.166	-0.611	0.310	-0.106	0.333	-0.065	-0.098	-0.084
3	0.104	0.316	-0.384	0.460	-0.211	0.367	-0.526	-0.050
4	0.153	-0.441	0.374	-0.123	0.393	-0.105	0.117	-0.014
5	-0.679	0.410	-0.310	-0.797	-0.695	-0.259	0.302	0.440
6	-0.144	0.518	-0.298	0.144	0.096	0.238	0.023	-0.026
7	0.141	-0.146	0.360	-0.004	-0.011	-0.104	0.099	-0.124
8	0.149	0.449	-0.524	0.338	-0.206	0.236	0.111	-0.049
9	0.189	-0.059	0.017	0.003	0.004	-0.158	0.170	-0.014
10	-0.386	0.098	-0.027	-0.541	-0.370	-0.073	0.220	0.193

Note: The first down numbers stand for the number of stimuli

――――― Stimulus 1 (even interval and 4 beat rhythm)
············· Stimulus 2 (even interval and 3 beat rhythm)
――o―― Stimulus 3 (uneven interval and 4 beat rhythm)
――×―― Stimulus 4 (uneven interval and 3 beat rhythm)
――― Stimulus 5 (sequential rhythmic movement)
○   Stimulus having significancy in t-test
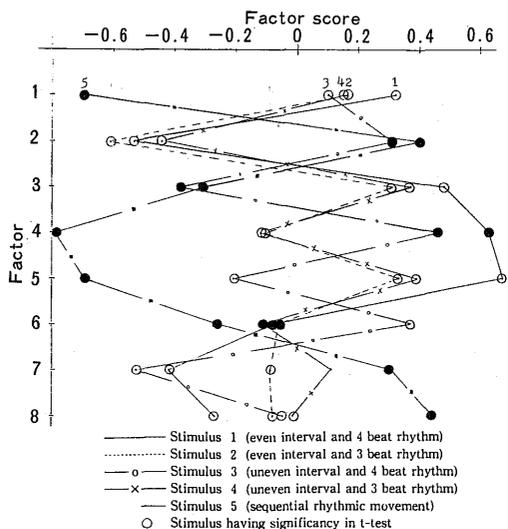
Fig. 2   Semantic score of Experiment 1 (walk movements and a sequential rhythmic movement)

――――― Stimulus 6 (even interval and 4 beat rhythm)
············· Stimulus 7 (even interval and 3 beat rhythm)
――o―― Stimulus 8 (uneven interval and 4 beat rhythm)
――×―― Stimulus 9 (uneven interval and 3 beat rhythm)
――― Stimulus 10 (sequential rhythmic movement)
○   Stimulus having significancy in t-test
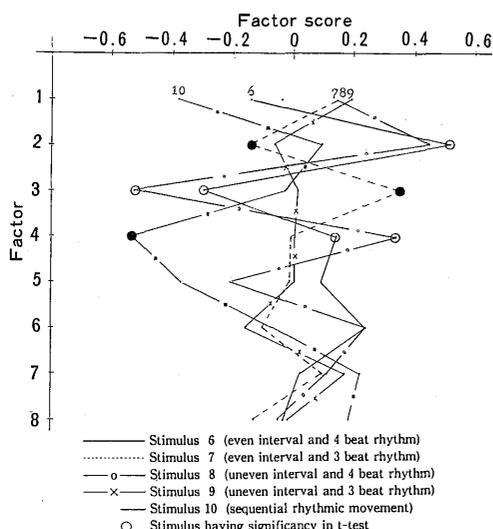
Fig. 3   Semantic score of Experiment 2 (combining basic movements and a sequential movement)

―・―・― Stimulus 1 (walk movement with even interval rhythm)
――o―― Stimulus 3 (walk movement with uneven interval rhythm)
――――― Stimulus 6 (combining basic movement with even interval rhythm)
――×―― Stimulus 8 (combining basic movement with uneven interval rhythm)
● ○   Stimulus having significancy in t-test

Fig. 4   Semantic score of 4 beat rhythmic movement

············· Stimulus 2 (walk movement with even interval rhythm)
――×―― Stimulus 4 (walk movement with uneven interval rhythm)
――――― Stimulus 7 (combining basic movement with even rhythm)
――o―― Stimulus 9 (combining basic movement with uneven rhythm)
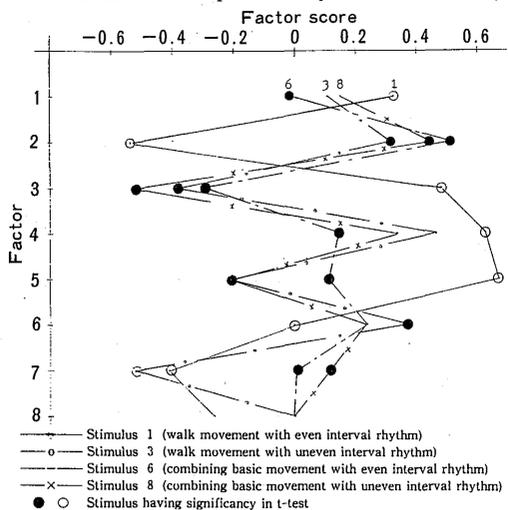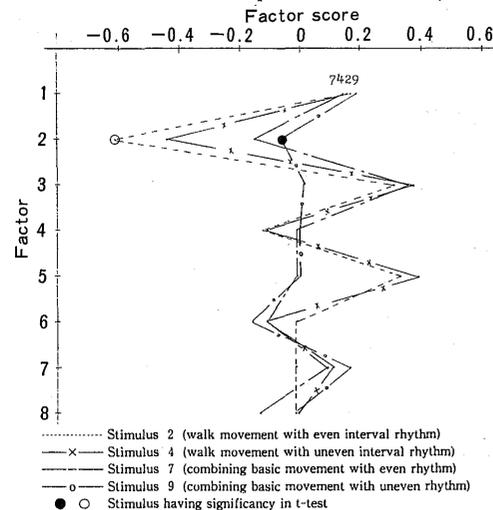● ○   Stimulus having significancy in t-test

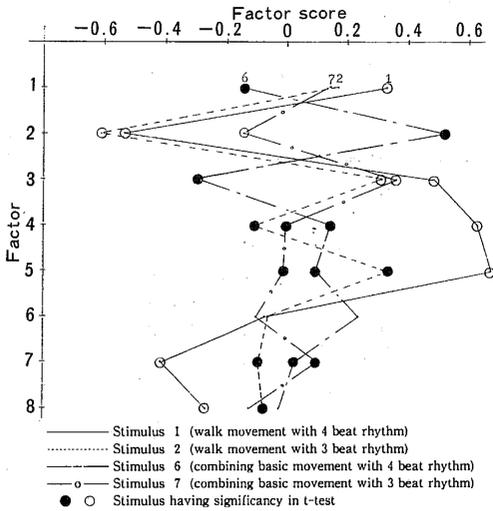Fig. 5   Semantic score of 3 beat rhythmic movement

Fig. 6　Semantic score of even interval
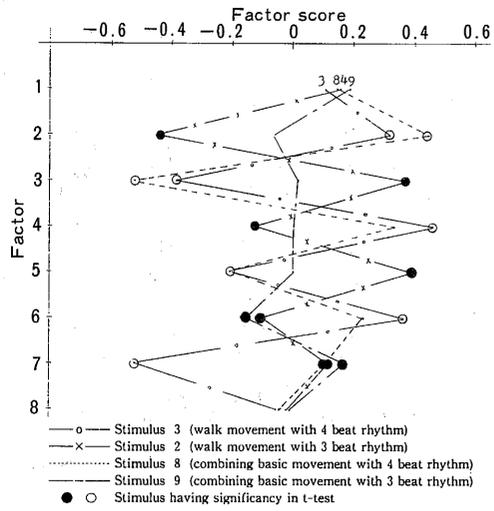rhythmic movement

Fig. 7　Semantic score of uneven interval
rhythmic movement

the next, Stimulus 3 in four kinds of the walk movements distinguishes from the three other walk movements in Factor 2, 3, 5 and 6.　Also, Stimulus 1 is different from Stimulus 6 in 7 factors besides Factor 8. These results are interpreted as the walk movements with uneven interval and four beat rhythms in more inharmonious in Factor 2, more stiff in Factor 3, more complex in Factor 5, and shallower in Factor 6 than the other three walk movements. Moreover, the images of the walk movements are more similar to the two other combining movements with four beat rhythms than the walk movement with four beat and even interval rhythms.　In addition, the walk movement with four beat and even interval rhythms is more unpleasant in Factor 1, more harmonious in Factor 2, more flexible in Factor 3, narrower in Factor 4, more simple in Factor 5, shallower in Factor 6, and thiner in Factor 7 than the walk movements with four beat and uneven interval rhythms.　Consequently, it is considered that the uneven interval rhythms in the walk movements with four beats can make distinctions from the even interval rhythms in the walk movements and similarities to more complicative movements.

b)　Differences between images of three beat

rhythmic movements and images of four beat rhythmic movements are described in this part. Significances of the distances between Stimulus 1 and 3, and Stimulus 2 and 4 in Factor 4 and between Stimulus 6 and 8, and Stimulus 7 and 9 in Factor 2. Also, Stimulus 3 and 8 tend to differ from Stimulus 4 and 9 in Factor 2 and Factor 6.　On the other hand, similarities are found among Stimulus 3, 6 and 8 in 7 factors except Factor 7, between stimulus 2 and 4, and between Stimulus 7 and 9.　Therefore, Stimulus 1 is found as a different one from the three kinds of four beat rhythmic movements.　Those results are interpreted as follows.　Two kinds of the walk movements with four beat rhythms are narrower than two kinds of the walk movements with three beat rhythms in Factor 4, and two kinds of the combining movements with four beat rhythms are more inharmonious than two kinds of the combining movements with three beat rhythms in Factor 2. Moreover, the two kinds of the movements with four beat and uneven interval rhythms are more inharmonious in Factor 2 and shallower in Factor 6 than the two kinds of the movements with three beat and uneven interval rhythms.　Then, three kinds of four beat rhythmic movements except a walk movement with even interval rhythms are similar to each other besides

Factor 7. In addition, similarities are found in relationships between the walk movements with three beats and between the combining movements with three beat rhythms.

c) Differences between images of even interval rhythmic movements and images of uneven interval rhythmic movements are explained in this part. A significance of the distance between Stimulus 1 and Stimulus 3 is found in Factor 2, 3, 5, and 6. The result is expounded as images of the even interval and walk movement with four beat rhythms is more harmonious in Factor 2, more flexible in Factor 3, more simple in Factor 5 and deeper in Factor 6 than that of the uneven walk movement with four beat rhythms.

d) Differences between images of repeating rhythmic movements and images of a non-repeating rhythmic movement are shown in Fig. 2 and Fig. 3. In Experiment 1, significances of the distances between Stimulus 5 and the other four stimuli are found. The sequential rhythmic movement with mixed rhythms is more pleasant in Factor 1, wider in Factor 4 and more complex in Factor 5. In Experiment 2, significances of the distance between Stimulus 10 which is exactly the same movement with Stimulus 5, and the other four stimuli are not confirmed. However, the difference between Stimulus 10 and Stimulus 6 and 8 are shown in Factor 4. The result is defined as the sequential rhythmic movement with mixed rhythms are wider in Factor 4 than a combining basic movements with four beat and even interval rhythm patterns and a combining basic movement with four beat and uneven interval rhythm patterns. Therefore, it is infered that both of the same visual stimuli are imaged similarly, but degrees of relationships between the sequential rhythmic movement and the other movements are shown differently in distinct groups.

SUMMARY AND CONCLUSIONS

The purpose of this study was to establish how visual rhythm patterns work on dance movements through investigation of the images of dance in semantic space statistically. In order to survey the images, 10 stimuli were composed of walk movements, combining basic movements composed by basic movements such as walk, turn, hop, slide and balance, and a sequential rhythmic movement with mixed rhythm. The walk movements and the combining basic movement have four different rhythm patterns such as four beat and even interval rhythm patterns, three beat and even interval rhythm patterns, four beat and uneven interval rhythm patterns and three beat and uneven interval rhythm patterns. Experiment 1 is composed of the four different walk movements and a sequential rhythmic movement and Experiment 2 is clustered of the four different combining movements and a sequential rhythmic movement which is exactly the same of the sequential movement in Experiment 1. These two experiment were filmed in two rolls of 8 m/m color films.

In order to measure the images, 46 semantic differential scales which were developed by the author and the coworkers were ulitised. As a result of surveying, in which 116 university students responded to the 46 semantic differential scales for 10 different concepts as stimuli, a 46×46 correlation matrix was applied for Factor analysis which used Principal component analisis and Normal varimax criterion. As the result, the following inferences were derived :

1. Eight factors which were extracted by factor analysis were named as follows:
1) emotionality, 2) harmoniousness, 3) flexibility, 4) spatiality, 5) variety, 6) distance, 7) weight, and 8) touching.
Based on these 8 labeled factors, distances between stimuli were interpreted.

2. The differences between images of the walk movements and images of the combining basic movements were identified in a relationships among the four kinds of the movements with four beat and four kinds of the movements with three beat rhythms. The walk movements with four beat rhythms were thiner in Factor 7, "Weight" than the combining basic movements. Also, the walk movements with three beat rhythms tend to be more harmonious in Factor 2, "Harmoniousness"

and more simple in Factor 5, "Variety" than the combining movements with three beat rhythms. Then, the walk movements with four beat and uneven interval rhythms was different from the three other walk movements, but it was similar to the two combining movements with four beat rhythms. Therefore, it is infered that the uneven interval rhythmic movements can make similarities to more complicate movements.

3. Images of three beat rhythmic movements were distinguished from images of four beat rhythmic movements. Two kinds of the walk movements with four beats are narrower than these with three beats in Factor 4, "Spatiality". Also, two kinds of the combining movements with four beat rhythms are more inharmonious than these with three beats in Factor 2, "Harmoniousness". Moreover, two kinds of uneven interval rhythmic movements with four beat rhythms are more inharmonious in Factor 2, "Harmoniousness" and shallower in Factor 6, "Distance" than these with three beat rhythms. In addition, similarities are found between the walk movement with three beat rhythms and between the combining movement with three beat rhythms. Therefore, it is thought that the similar movements with same meter are similar each other regardless of the different interval except the walk movement with four beat rhythms.

4. Images of even interval rhythmic movements and images of uneven interval rhythmic movements are identified between two walk movements with four beat rhythms. The even interval rhythmic movement was more harmonious in Factor 2, "Harmoniousness", more flexible in Factor 3, "Flexibility", more simple in Factor 5, "Variety" and deeper in Factor 6, "Distance" than that of the uneven interval rhythmic movements by the walk.

5. The sequential movement was imaged similarly but degrees of the relationships between the movement and the other movements in two distinct groups of the experiments.

Hence, it is infered that images of dance is affected by movement rhythm patterns.

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