THE ROLE OF RHYTHMIC ABILITIES IN DANCE

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Abstract

The relations between rhythmic abilities and dance performance have been established on the sample of 57 male and 47 female undergraduate physical education students. The data related to the rhythmic ability have been obtained by the test composed of three different rhythmic sequences, and the data related to the dance performance have been obtained by the standard procedure for the evaluation of practical and theoretical knowledge pertaining to the course subject Dance.

The results of the research have shown that it is to a relatively high degree feasible to predict the dance performance on the basis of the evaluation of rhythmic abilities, while the remaining percentage of the dance performance is probably incorporated in other motor knowledge and abilities.

Keywords: *dance, rhythmic abilities, performance, male and female students, regression analysis*

Zusammenfassung

BEDEUTUNG DES RHYTHMUS BEIM TANZEN

Die Relationen zwischen dem Rhythmus und der Tanzeffektivität wurden auf dem Muster von 104 Studenten (57 Studentinnen und 47 Studenten) der Fakultät für Körperkultur in Zagreb festgestellt. Die Daten über die rhythmische Fähigkeit wurden mittels eines Rhythmus-Tests erzielt, der aus 3 Rhythmus-Beispiele bestand. Die Daten über die Tanzeffektivität wurden mittels eines Standardverfahrens für die Beurteilung sowohl der praktischen als auch der theoretischen Kenntnisse im Studienfach 'Tänze' angesammelt.

Die Forschungsergebnisse haben gezeigt, daß es zum größten Teil möglich ist, aufgrund der Beurteilung von rhythmischen Fähigkeiten, die Tanzeffektivität zu antizipieren. Der Rest der Tanzeffektivität ist vermutlich in anderen motorischen Fähigkeiten und Kenntnissen ausdauernd.

Schlüsselwörter: *Tanz, Rhythmus, Effektivität, StudentInnen, Regressionsanalyse*

1. Introduction

Rhythm is a general phenomenon of universal motion, the law that governs all life manifestations in space and time. The motion of stars, the alternation of day and night, harmony and order of our life in each of its activities, all this happens in a specific rhythm. All functions of vital organs in a human being and the other living beings are rhythmically determined.

Attention, memory, and other mental abilities are presented in rhythmic waves. Rhythm is a sequence of tones of the same or different duration, activities or substance of a time unit. Rhythm is present in each human activity.

Musical conventional rhythm covers two determinants: *tempo* - the speed the music is or should be played at, in other words metric and rhythmic sequence of tones in a specific unit of time (slow: 40-60 beats per/min; moderate 60-120 beats per/min; fast 120-268 beats per/min; and *measure* the basic grouping of beats and accents that constantly recur.

Rhythm is most perfectly manifested in the human body by its movements. Rhythm organizes and facilitates movements. A sense of rhythm is *sine qua non* for harmony of movements both in biomechanical and motor sense. Rhythm is responsible for muscular tension, muscular activity, intensity of muscular performance, duration and restoration of muscular tension, hence its importance in sport and other activities. In consonance with the aforementioned there are three stable aspects in motor activity:

- in movement, first and individual action = *spontaneous movement or motor action*
- in continuous movement and organized motor action = *organized movement or motor action*
- in periodic movement, organized and automated motor repeated action in space and time = *organized cyclic movement or motor action repeated in space and time.*

Rhythmic maturity enables the precision of movement, by uniting the neuromuscular and psychic elements since each necessary muscle contraction occurs in the desired space and moment. Rhythm utilized in movement directly mobilizes adequate groups of muscles at the appropriate moment.

Rhythm versatility may be the consequence of the subject's constitution, characteristics and type of terrain or distance. In the search for optimum rhythm, movements are hindered by air, joints (allowing movements only to a certain extent) contraction of the antagonist group of muscles, inertia and the force of gravity. To master rhythm means to master a system of harmonious and automatically executed movements which contribute to motor and sporting performance.

The topic of this study is the impact of rhythm on the performance of conventional motion, specifically on dance. Most studies dealing with rhythm and interrelation of motor and rhythmic abilities did not find significant correlation between the two. The situation is partly the result of the few tests related to checking rhythm on

the one hand, and their dubious reliability and validity on the other.

2. To Date Research

To date studies dealing with the impact of rhythm on the dance performance are very modest, however, an insight into the related studies will to a certain extent clarify the issue.

Long ago in 1902 MacDougal provided the hypothesis for the positive impact of rhythm on human organism as regards motor behaviour.

Gusak, Kondratjev, and Lurje 1953 (Poljaković, 1972) drew attention to the fact that by utilizing music during the physical education classes participants develop a sense for rhythm and harmony of movements.

Kudu, A. 1963 (Poljaković, 1972) found that music affects performance in mastering movements. He also found that a sense of rhythm affects movement coordination. Hiriartborde in his study in 1964 (Ećimović-Žganjer, 1978) spoke about inherently motor perceptive qualities of rhythm which bring about expressiveness and order into movement.

Huff, J. (1972) studied the relation of auditory and visual perception of rhythm in top dancers, tennis players, swimmers, basketball players and their ability to adapt the performance of a motor sequence to the auditory and visual rhythm. The results of the study showed that the auditory and visual perception of rhythm was not highly correlated with the ability to perform rhythm as a pattern of behaviour. There is no evidence that training in music and dance contributes to the ability to perceive rhythm or to the ability to move to auditory or visual rhythm. Still, combined music and dance experience appears to have some relationship to auditory perception and performance. There were no significant differences between males and females in any of the analyzed measures.

Thomas and Moon (1976) studied methods for defining rhythmic abilities. The investigation was carried out on the sample of pre-school children in a summer school. The RAbASy system with tasks for measuring rhythm was applied which enabled the evaluation of spatial and time characteristics of most of motor responses to regular rhythmic stimuli. The results revealed significantly better performance in auditory stimuli; there were no differences between males and females; the response to auditory stimuli has greater implication for motor behaviour than reproductive rhythm.

One of a few studies directly associated with the relation of rhythm and the performance of dance structures was conducted by Ećimović-Žganjer (1978). The authoress hypothesized that there was a significant correlation between rhythm as a musical component and the performance in rhythmic gymnastics, and hence that it might be predictive of performance. The authoress tested the rhythmic abilities on the sample of 100 subjects and defined the size and level of motor information pertaining to a group of conventional aesthetic movements. The sample of variables consisted of 12 standardized procedures for rhythm evaluation which are the most relevant part of the test in the course subject *Fundamentals of Musical Education* and were used as predictor variables. Two criteria variables covered one standardized procedure for the evaluation of performance in the course subject *Dance* and one in the subject *Aesthetic Gymnastics*. The standardized procedures for the evaluation of a sense of rhythm consisted of the performance of six rhythmic sequences. The results obtained by the regression analysis indicated a significant correlation of rhythm as a musical component and dance. The authoress established that the sense of rhythm which positively affected the dance performance was best acquired by using folk dance melodies.

3. The Objectives and Basic Hypotheses

The primary objective of the research was to establish the relation of rhythm as a musical component and dance performance in the course subject *Dance*.

The secondary objective was to define the testing procedure, that is a group of tests for testing the rhythmic abilities on the basis of which it would be possible to predict dance performance.

Since the relation between rhythm, i. e. rhythmic ability as a musical component, and dance performance in the course subject *Dance* is evident, one can put forward the following hypotheses:

› *H1 There is a significant correlation between predictor group (of rhythmic sequences) and the success in the course subject Dance.*

› *H2 The predictor group regression coefficients (of rhythmic sequences) for the evaluation of dance performance are significant.*

4. Methods

4.1 Subjects

In order to establish the relationship between rhythmic abilities and the efficiency in performing dance structures, i. e. dance performance in this study, testing was carried out on a group of 57 males and 47 females who applied for and entered the Faculty of Physical Education in the academic year 1986/1987. The sample comprised all students who underwent the unvaried evaluation system at the entrance exam, and who entered the Faculty of Physical Education. To qualify for the participation in the research the students had to pass the exam in the course subject *Dance* in their junior year, that is 1989 when the research started.

Since the sample in the experimental procedure was not random owing to its fundamental defining criterion, and the specificity of the psychomotor status of the examinees, the generalization of the results will be feasible only for the population with the same characteristics as the sample used in the research.

4.2 Variables

The sample of predictor variables consisted of a battery of 7 tests, each of which had three rhythmic sequences aimed at the evaluation of a sense of rhythm, and which were specially constructed for the entrance exam.

The criterion variable was the mark gained at the exam in the subject *Dance* which was elaborated by the standardized procedure for the evaluation of the efficiency of performance of dance structures at the exam of the subject *Dance.*

4.2.1 Variables for the evaluation of rhythmic abilities

The predictor variables consisted of the battery of 7 tests each consisting of 3 specifically constructed rhythmic sequences for the purpose of the entrance exam constructed by Oreb, G (1986).

In all 3 rhythmic sequences the measure was 2/4. In the first sequence there were simple rhythms: *Ta, Ta te, Ta.* In the second sequence the same rhythms were presented in a somewhat more complex arrangement, whereas in the third sequence along with the previously mentioned patterns *Ta, Ta te, Ta* a still more complex rhythm pattern appeared *Ta e fe* (test number 1).

For the rest of the six tests the same holds good. In the test 2 in the fourth measure of the second sequence there was a pause. In the third test in the first rhythm sequence along with the rhythms *Ta, Ta te, Ta a,* another rhythm pattern was used *Ta te ti* which was also present in the rhythmic sequences of other four tests (4,5,6,7).

The stated rhythms in all seven tests were combined according to the principle "from easier to more difficult", so that the first was easy, the second slightly more difficult and the third was the most difficult. While designing the tests the author paid special attention that rhythmic tests (7) be of approximately the same qualitative and structural values, whereby equal testing conditions for all the testees were ensured.

Tests for testing rhythmic abilities

4.2.2 Procedure for testing rhythmic abilities

Standardized procedures for the evaluation of a sense of rhythm, in other words rhythmic abilities, were obtained on the basis of the test performance. One of the examiners first performed the rhythmic sequence on the tambourine and then the examinee repeated the rhythm:

-   by clapping hands; and
-   by movements.

Two other rhythmic sequences were performed in the same way.

Three examiners assessed the performance of the rhythmic sequences by agreeing on the score on a five-point scale for each rhythmic sequence separately. Although there were 30 examinees present during the assessment of the rhythmic performance, there was practically no possibility of memorizing any one of the rhythmic sequence owing to the test construction which consisted of 7 tests each one consisting of three rhythmic sequences. In this way their rhythmic ability and not their ability of learning rhythmic task was tested.

4.2.3 Variables for testing efficiency of dance structure performance

A criterion variable was a numerical grade as a result of the subjective evaluation of the subject teacher on the basis of the performance of three mandatory dance structures, one dance according to the teacher's choice and, since the practical part of the exams was taken in a group of five students, the examinee had to perform a chosen dance structure of the student who had preceded him/her. It made 8 dance structures altogether: three mandatory and 5 chosen. After the practical part of the exam was passed the student sat for the theoretical part, and on the basis of the scores gained at the practical and theoretical part of the exam got a numerical score which was then taken as a criterion variable = final score.

4.2.4 Evaluation of the dance knowledge

The evaluation of the practical and theoretical knowledge was elaborated according to the following parameters:

-   technique and style of the performance
-   characteristics of the dance zones
-   methodology of teaching dance

by the subjective evaluation of the teacher on the five-point scale.

4.3 Data processing

Predictor and criterion variables were processed by the standard descriptive procedure. Next, the intercorrelation matrix of the predictor variables and the matrix of the correlation of the predictor variables and criterion variable were elaborated. By the use of regression analysis the effect of rhythm on the dance performance was established. The SPSS - statistical package for social sciences and the ENTER model that is the classical method of regression analysis were used in data processing.

5. Results and discussion

Numerical values of the central and dispersion parameters are given in Table 1 - male and female students; Table 2 - male students; Table 3 - female students. The global analysis of the three tables shows the well-balanced system of the test results evaluation. The numerical values of the arithmetic means show normal distribution of scores within the five-point scale, which is evident in standard deviation values.

Table 1 Central and dispersion test parameters for the evaluation of rhythmic ability - male and female students

	MIN	XA	MAX	SIG
GRADE 1	1	3.856	5	1.136
GRADE 2	1	3.279	5	1.258
GRADE 3	1	2.587	5	1.334
RHYTHM	1	3.192	5	1.158
FINGRADE	2	3.365	5	.837

N of Cases = 104

Table 2 Central and dispersion test parameters for the evaluation of rhythmic ability - male students

	MIN	XA	MAX	SIG
GRADE 1	1	3.830	5	1.239
GRADE 2	1	3.319	5	1.385
GRADE 3	1	2.511	5	1.249
RHYTHM	1	3.213	5	1.141
FINGRADE	2	3.106	5	.814

N of Cases = 47

Table 3 Central and dispersion test parameters for the evaluation of rhythmic ability - female students

	MIN	XA	MAX	SIG
GRADE 1	1	3.895	5	1.030
GRADE 2	1	3.228	5	1.165
GRADE 3	1	2.649	5	1.408
RHYTHM	1	3.175	5	1.182
FINGRADE	2	3.561	5	.824

N of Cases = 57

The analysis of all tables shows systematic numerical values of arithmetic means of the variables GRADE 1, GRADE 2, GRADE 3. The values of the variable GRADE 1 are the highest, the values of GRADE 2 are slightly lower and the values of GRADE 3 are the lowest, thus substantiating the author's thesis that the principle "from easier to more difficult" in the test construction was observed. The stated relationship of the scores is evident in the sample of all students, in the sample of female students, and sample of male students.

The intercorrelation matrix of the predictor and criterion variables in Table 4 based on the whole sample (male and female students) may indirectly explain the intercorrelations of the predictor and criterion variables in each of the sub-samples (Tables 5 & 6). The intercorrelation of the predictor variable RHYTHM (Table 4) is extremely high. This is logical since the variable RHYTHM sub-summarizes the effects of the remaining predictor variables (GRADE 1, GRADE 2, GRADE 3).

The high correlation of the variables GRADE 1 and GRADE 2 (0.67) and slightly lower correlation of GRADE 2 and GRADE 3 (0.56) are founded in the structural similarities of the rhythmic sequences. In the sequence of the first and second variables the same measure (2/4) and the same note values (quarter notes and eighth notes) are only differently distributed in rhythmic sequences. With the incorporation of the sixteenth note with a dot, in other words shorter note values, the complexity increased, the rhythmic sequence became more difficult, and consequently the intercorrelation was lower which was evident in the variables of GRADE 3 and GRADE 1 (0.35).

Table 4 Intercorrelation matrix of predictor and criterion variables - male and female students

CORREL:	GRADE 1	GRADE 2	GRADE 3	RHYTHM	CRIT
GRADE 1	1				
GRADE 2	.661	1			
GRADE 3	.345	.556	1		
RHYTHM	.649	.836	.794	1	
CRIT	.066	.114	.354	.207	1

Table 5 Intercorrelation matrix of predictor and criterion variables - male students

CORREL:	GRADE 1	GRADE 2	GRADE 3	RHYTHM	CRIT
GRADE 1	1				
GRADE 2	.666	1			
GRADE 3	282	.520	1		
RHYTHM	.626	.850	.777	1	
CRIT	.212	.316	.523	.373	1

Table 6 Intercorrelation matrix of predictor and criterion variables - female students

CORREL:	GRADE 1	GRADE 2	GRADE 3	RHYTHM	CRIT
GRADE 1	1				
GRADE 2	.675	1			
GRADE 3	.430	.583	1		
RHYTHM	.690	.826	.810	1	
CRIT	-.055	-.024	.250	.117	1

The intercorrelation of the criterion variable and other predictor variables is particularly interesting. The intercorrelation of 0.70 with the variable GRADE 1 and 0.35 with the variable GRADE 3 suggests that the first rhythmic sequence must have been so easy that there wasn't much similarity with what it demanded and what was embodied in the criterion variable. This assumption can also be supported with higher values of the intercorrelation with variable GRADE 2 and the variable of GRADE 3 which is the most complex one.

On the basis of the above said it is possible to predict the performance with 35% by using the variable GRADE 3. It is to be believed that the remaining percentage of the dance performance is with the other motor abilities, knowledge and the elaboration of style. Tables 5 and 6 can be explained in a similar way.

The hypothesis of the constancy of the relationship of the rhythmic sequences and the dance performance is confirmed by the values of the multiple correlation of 0.38 (correlation of all the predictor variables and the dance performance) given in Table 7. Notwithstanding the significance of the multiple correlation with the rhythmic sequences only 14 % of the common variability can be explained (R Square = .14) whereas 86 % can be attributed to the mastered dance structures, their demonstrations and, finally, theoretical knowledge of the examinee.

Table 7 The regression of the dance performance in the space of rhythmic variables - male and female student

VARI-ABLES	B	SE B	BETA	T	SIG T
RHYTHM	-.15566	.19112	-.21545	-.814	.4173
GRADE 1	.03011	.09870	.04087	.305	.7609
GRADE 3	.32890	.10654	.52425	3.087	.0026
GRADE 2	-.01578	.12150	-.02371	-.130	.8969
(Constant)	2.94721	.28324		10.405	.0000

Multiple R	.37550
R Square	.14100
Adjusted R Square.	10630
Standard Error	.79103

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	10.16843	2.54211
Residual	99	61.94696	.62575
F = 4.06265		Signif F = .0043	

The regression of the dance performance in the space of rhythmic variables - female students

VARI-ABLES	B	SE B	BETA	T	SIG T
RHYTHM	.09107	.25272	.13062	.360	.7200
GRADE 1	-.10114	.15462	-.12636	-.654	.5159
GRADE 3	.20000	.13976	.34164	1.431	.1584
GRADE 2	-.17393	.17303	-.24592	-1.005	.3195
(Constant)	3.69777	.42429		8.715	.0000

Multiple R	.33698
R Square	.11356
Adjusted R Square.	.04537
Standard Error	.80522

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	4.31921	1.07980
Residual	52	33.71587	.64838
F = 1.66538		Signif F = .1721	

Table 9 The regression of the dance performance in the space of rhythmic variables - male students

VARI-ABLES	B	SE B	BETA	T	SIG T
RHYTHM	-.42947	.27543	-.60204	-1.559	.1264
GRADE 1	.10313	.11994	.15702	.860	.3948
GRADE 3	.50877	.15388	.78072	3.306	.0019
GRADE 2	.18701	.15996	.31821	1.169	.2489
(Constant)	2.19316	.36280		6.045	.0000

Multiple R	.56358
R Square	.31762
Adjusted R Square.	.25264
Standard Error	.70357

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	4	9.67742	2.41935
Residual	42	20.79067	.49502
F = 4.88743		Signif F = .0025	

The analysis of the individual impact of each predictor variable (RHYTHM, GRADE 1, GRADE 2, GRADE 3) shows that the variable GRADE 3 (BETA = 0.52) has the greatest and statistically significant impact on the dance performance. The fact may be explained by the complexity of the rhythmic test (the most difficult one in relation to the other two) - for example 2/4 and, finally, by its similarity as regards difficulty with the dance structures in the curriculum.

On the sample of female students no significant relationship of the predictor group of variables and the dance performance (Table 8) was found and it might be assumed that rhythmic sequences were probably "easier" for female than for male students as it was shown in Table 5.

The numerical values displayed in Table 9 show a relatively high correlation (0.56) of all predictor variables and the dance performance in male population with 32% of common variability, twice as much as in the whole sample (Table 7).

The analysis of the impact of each predictor variable is similar to the one in the whole sample. The variable GRADE 3 is statistically most significant as regards its relationship to dance performance (BETA = 0.78). Hence, it might be suggested that the applied rhythmic sequences were appropriate to students and good predictors for dance performance. However, one should take the results with caution since one could be misled by rhythmic abilities of female students in relation to the male population. More complex and situation-oriented tests should be used in future studies.

6. Conclusion

On the sample of 57 female and 47 male undergraduate physical education students who applied for and passed the entrance test in the academic year 1986/87, rhythmic ability was tested by using a battery of specially constructed rhythmic tests for the purpose of the entrance exam. The predictor group of variables consisted of 7 tests each consisting of 3 rhythmic sequences for the evaluation of the sense of rhythm. The criterion variable was a final score achieved in the course subject *Dance* on the basis of the practical and theoretical part of the exam.

The objective of the research was to establish the relation between rhythm as a musical component and dance performance in the subject course *Dance.* The relation between the predictor group of variables and the criterion variable was established by the regression analysis. The results showed the following results:

- intercorrelation values of the criterion variable and the predictor variables are governed by the complexity of the predictor variables: the more complex the variable, the lower the correlation;
- variable GRADE predicts 35% of the dance performance whereas the remaining percentage of dance performance is incorporated in other motor abilities, knowledge and stylistic elaboration;

- multiple correlation of 0.38 justifies the hypothesis on the relation of rhythmic sequences and dance performance, and explains 14 % of common variability. The remaining 86% can be attributed to the learnt dance structures, their demonstration and theoretical knowledge at the exam;
- statistically most responsible for the impact on the dance performance is the variable GRADE 3, the fact that can be explained by the complexity of rhythmic test and the similarity regarding the difficulty with dance structures included in the curriculum;
- there is a relatively high correlation of all the predictor variables and dance performance in male students with 32 % of common variability whereas in the female population significant correlation of the predictor group of variables and dance performance was not established.

The results of the analyses imply that the applied rhythmic sequences are more appropriate to male students and that they can be used as predictors of dance performance. However, to evade the possible misinterpretation in drawing conclusions on the rhythmic ability of female students, it is necessary to apply more complex situation-related tests in future research.

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