AMBIDEXTERITY INFLUENCING PERFORMANCE IN RHYTHMIC COMPOSITION – GENDER DIFFERENCES

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Abstract

The aim of the study was to analyze the relation between specific aesthetic motor skills and the performance of rhythmic composition, separately by gender. Three groups of variables were used in a sample of 88 Physical Education University female (N=32) and male (N= 56) students: 4 specific basic aesthetic variables (leap, balance, pirouette and flexibility) performed on both body sides as the first and second battery of predictors, and the calculation of the coefficients of asymmetry for specific aesthetic motor skills as the third battery of predictors, were defined for their predictability for a rhythmic composition performance. Three independent judges evaluated the performances of basic aesthetic elements and rhythmic composition by watching the videotaped material. Coefficients of asymmetry were calculated on the basis of the differences of performance on the dominant and non dominant support leg. Regression analysis indicated the battery of variables for assessing the specific basic aesthetic elements performed on the dominant and non-dominant side of body were a good predictor of rhythmic composition performance in both subject groups. The Cossack leap performed on the dominant leg with the female group of subjects (Beta = 0.49; $p<0.05$) and the pirouette with front leg horizontal (Beta = 0.36; $p<0.05$) and flexibility with body and leg horizontal (Beta = 0.31; $p<0.05$) performed on the non-dominant leg with the male group of subjects were significant predictors of their successful performance. The capability to use both sides of the body with equal skill effects the rhythmic composition performance only with the male group of subjects. Because of a lack of an expressive aesthetic component of performance, the male students' performances were defined with the second most important aesthetic movements characteristic – ambidexterity.

Key words*: aesthetic movements, coefficient of asymmetry, University students*

Introduction

Recently the tendency to chain regarding gender inequalities in sport, has introduced athletes of both genders to sports characterized by only one gender (European Parliament resolution n. A50167/2003). For example, Rhythmic Gymnastics has been an Olympic female sport since 1984. However, gender inequalities in University's curriculum is not appropriate especially in Physical Education University programs when Physical Education teachers often create PE classes for both genders.

The sport activities chosen are often due to masculinity and femininity rating, characterising the performance. Gender stereotypes influence the persistence of gender preferences, particularly for younger people. Still, there are not sufficient reasons for gender differentiating in Physical Education University programs. Ambidexterity is a person's capability to use both sides of his/her body (the right and the left hand and/or the right and left leg) with equal skill.

Previous investigations indicate that the level of this capability effects sport performance (Cavill & Bryden, 2003. Grouios et al, 2002.) in sport skill assessment especially with sports where the judges evaluate the level of motor skill performance, ambidexterity can be determined by applying coefficients of asymmetry. According to Jastrembskaia & Titov (1999), coefficients of asymmetry are calculated on the basis of the sports – specific element performance with the right and the left side of the body. Success in the most aesthetic sports is closely related to equally good manipulation on both sides of the body.

Therefore, establishing the ambidexterity factors among PE students along with their successful performance of aesthetic movement basic elements and rhythmic composition is an actual research issue. A current scientific literature review indicates the recent rise of participation in aesthetic sports has increased the studies about anthropometry, motor skills and visual-motor proficiency, as predictors of female attainment in this sport (Miletić et al, 2007., Miletić et al, 2004; Hume et al, 1993.).

Since the new entry of the male gender in RG competitions, anatomical and physical characteristics to select male athletes for some aesthetic sports, have to be found (Di Cagno et al, 2008. Šebić-Zuhrić et al, 2007.). The aim of the study was to identify the gender differences performing specific aesthetic motor skills (leap, balance, pirouette and flexibility performed on both body sides) in order to determine their impact on the success in performing rhythmic composition. In doing so we analyzed and compared the performance on both body sides for specific aesthetic motor skills calculated the coefficients of asymmetry for all the specific aesthetic motor skills defined their predictability for rhythmic composition results. We were of the opinion that the objectives we specified were not exclusively of scientific, but also of the practical importance, since possible gender differences will be of high applicability in adjusting the Physical Education curriculum, regularly performed at a university level all over the world.

Methods

Eighty-eight Physical Education Students (age 21±1 years), fifty-six male students and thirty-two female students, were recruited for this study. The participants took part in the aesthetic movement and rhythmic gymnastics University classes. All 88 subjects were obliged to perform the following four specific elements firstly with the dominant side of their body and then with the non-dominant side of body: (1) Cossack leap; (2) Balance with body and leg horizontal; (3) Pirouette with front leg horizontal; (4) Flexibility with body and leg horizontal. The authors selected elements which they consider to be adequate for PE. Officially, they are A and B difficulties (the easiest body techniques) according to the Code of Points of Rhythmic gymnastics.

The subjects performed four specific aesthetic elements, three times, and only the best performance was evaluated. The judges were previously educated to evaluate the specific rank of nine motor assessment levels. Basically, they evaluated the amplitudes and explicit forms of all the body elements, height of leaps, rotation of pirouettes, stability of balances and flexibilities. Coefficients of asymmetry calculation: Ambidexterity is a person's capability to use both sides of his/her body (the right and the left hand and/or the right and left leg) with equal skill. After the subject's specific element performance on the dominant side of the body, three judges evaluated their performance. Then the subjects performed the same element with the non-dominant side of the body.

The judges evaluated their performances and their scores were transformed in to formula according to Jastrembskaia and Titov, (1999): AS = D - ND/ D x 100, Where AS = coefficient of asymmetry; D = dominant side of body; ND = non-dominant side of body.

Rhythmic composition evaluation: The subjects' task was to learn to perform correctly a rhythmic composition without requisites. In order to avoid any subjective assessment, all the subjects' were firstly videotaped. Three independent judges evaluated afterwards the performances by watching the videotaped material. The authors tried to simplify the judging procedure, (according to Magill & Schoelfender-Zohdi, 1996. and Miletic at al, 2007.). A rhythmic composition was divided into 14 segments. The scoring was based on giving a 0, 1, or 2 for each of the 14 segments on skill. A 0 was given if a segment was missing from the performance. A score of 1 was given if the segment was performed incorrectly, while a score 2 was given if the segment was performed correctly. To establish an overall performance score for each trial, the 14 segment scores were totalled.

Thus, a final score could range from 0 to 28. Statistical analysis: The methods used on the data analysis included basic statistical parameters, the Kolmogorov-Smirnov (K-S) test for assessing the normality of distributions, analysis of variance (ANOVA) and multiple regression analysis. The basic variable parameters (mean ± SD and K-S), for each group of subjects (female and male) were calculated separately. One – way ANOVA was used to determine the differences between the genders. The standard linear regression analysis was performed to determine the relations between the specific aesthetic motor skills as predictors and success in performing a rhythmic composition as criteria. The BETA partial regression coefficient, the predictor to criterion correlation coefficient, i.e. multiple correlations (RO), and the significance of regression coefficients and multiple correlations are presented. For data processing the "Statistica 7" packages were used.

Results

As presented in Table 1, the male and female PE University students differ significantly in performing the basic aesthetic elements with the left and right side of their body (with the exclusion or exemption of pirouettes) and the rhythmic composition, where higher results are evident for the female group. The groups do not differ in the Coefficient of asymmetry results.

All data were analyzed for the normality of the distribution and Kolmogorov Smirnov test found no significant differences between the observed and expected normal distributions. When observing the descriptive statistic parameters, in the two studied groups, it is evident that the subjects from both groups achieved the highest scores when performing the balance elements.

Table 1. Basic descriptive parameters of motor variables in female and male students, Anova analysis (L – performed on left leg; R – performed on right leg; CA – coefficient of asymmetry)

Variable	FEMALE (N=32) Mean ± SD	K-S	MALE (N= 56) Mean ± SD	K-S	FA	pA
LEAP (L)	6.40 ± 2.09	.17	5.39 ± 1.43	.16	7.11	0.00
BALANCE (L)	6.60 ± 1.51	.13	5.63 ±1.34	.09	10.87	0.00
PIRUETTE (L)	5.18 ± 2.27	.10	4.15 ±1.16	.11	7.81	0.00
FLEXIBILITY (L)	5.24 ± 2.16	.14	3.76 ±0.95	.10	19.92	0.00
LEAP (R)	5.68 ± 1.95	.13	4.68 ±1.37	.13	7.89	0.00
BALANCE (R)	6.43 ± 1.59	.13	5.30 ±1.36	.09	12.33	0.00
PIRUETTE (R)	4.01 ± 1.85	.14	3.52 ±1.17	.10	2.28	0.13
FLEXIBILITY (R)	4.91 ± 2.08	.08	3.47 ±1.00	.10	19.07	0.00
LEAP (CA)	0.19 ± 0.17	.19	0.18 ±0.10	.11	0.14	0.71
BALANCE (CA)	0.12 ± 0.10	.13	0.14 ±0.09	.11	1.48	0.23
PIRUETTE (CA)	0.26 ± 0.18	.13	0.21 ±0.10	.06	3.09	0.08
FLEXIBILITY (CA)	0.14 ± 0.12	.16	0.18 ±0.12	.09	2.08	0.15
RHYTHMIC COMPOSITION	18.66 ± 4.99	.15	14.7 ±4.86	.08	12.90	0.00

FA - F test for ANOVA, pA - probability for ANOVA

Table 2. Regression analysis of basic motor skills performed on left and right leg, coefficient of asymmetry and success in performing composition

	Female		Male	
	Beta	p	Beta	p
performed on left leg				
LEAP	0.49	0.02	0.17	0.25
BALANCE	0.04	0.80	0.21	0.21
PIRUETTE	0.02	0.91	0.27	0.16
FLEXIBILITY	0.33	0.08	0.08	0.58
R	0.62	0.00	0.61	0.00
performed on right leg				
LEAP	0.18	0.32	0.00	0.99
BALANCE	0.25	0.13	0.12	0.44
PIRUETTE	0.34	0.07	0.36	0.03
FLEXIBILITY	0.14	0.54	0.31	0.02
R	0.47	0.00	0.66	0.00
coefficient of asymmetry				
LEAP	0.13	0.49	-0.11	0.39
BALANCE	-0.30	0.10	-0.24	0.06
PIRUETTE	0.22	0.22	-0.21	0.10
FLEXIBILITY	-0.23	0.23	-0.38	0.00
R	0.45	0.17	0.56	0.00

BETA = regression coefficient; RO = multiple correlation;

The lowest average score for males (Mean = 3.76) indicate the Flexibility with body and leg horizontal to be the difficult element for the males during the learning process. Generally, female students have significantly higher values in all measurements except for the coefficient of asymmetry when female and male students achieved statistically similar results. A significant prediction using the selected aesthetic elements performed with the left and right side of the body is observable in both groups of subjects (Table 2). On the basis of the values of the multiple correlation coefficients, it can be concluded that a strong linear connection exists between the five sets of predictor variables (with the exclusion of the coefficient of asymmetry for female students) and the criterion variable (rhythmic composition). On the basis of the regression coefficient analysis and its significance obtained from the values of BETA-coefficients, it can be concluded that the greatest influence on the criterion variable comes from the predictor variable for the performance of the Cossack leap (performed on the dominant side of the body) for the female group of subjects.

The variable for assessing performance of balance and flexibility with body and leg horizontal (performed on the non - dominant leg) had a significant positive predicative value (BETA coefficients), while the variable for assessing flexibility with body and leg horizontal coefficient of asymmetry had a significant negative predictive value on performing the rhythmic composition for the male group of subjects.

Discussion and conclusion

Female students performed better elements with large amplitudes as the selected aesthetic body elements were. Enhanced flexibility probably has a potentially positive influence on the faster progress and better motor learning of elements for all the four basic aesthetic elements on the left and right body side; and the harmonious, aesthetic component of performance, probably influenced the sophisticated, rhythmically most precisely, correctly performed rhythmic composition. The increased mobility in the joints and the muscles of the entire body which demand well-developed flexibility defines the proper performance of the large amplitude movements which are specifically scored in the rhythmic composition, and an enhanced flexibility along with the proper performance of other basic body elements (pivots and leaps) is a precondition for the proper performance of a rhythmic composition.

According to previous investigations in the basis of a basic aesthetic movements performance, besides flexibility, there is psychomotor speed, full-body coordination and especially coordination of the hands and feet. (Di Cagno et al, 2008.; Tsaklis et al, 2008.). A good performance of the Cossack leap seemed to be a good predictive body element on the dominant support leg, only for the female group of subjects, and performing well of the pirouette with front leg horizontal and flexibility with body and leg horizontal on the non-dominant support leg were good predictive body elements only for the male group of subjects. When leaping ability is considered, absolute strength differences between genders were eliminated (Bosco et al, 2002. Hoffman et al, 1979.). Further, previous investigations in male athletes showed that men had a greater stature, and skeletal segment length than women (Davis et al, 2006.).

High values of stature and lower limbs length seemed to be required to reach a high performance in the RG leaping ability (Douda et al, 2000.).

It is generally accepted that the musculature can be developed in its endurance status by two relatively independent means: anatomical development or hypertrophy, and functional development. Hypertrophy results in an increase of the energetic potential of the muscles, while functional development is a result of the increased biochemical tolerance of the working muscles and/or improved intra- and inter-muscular coordination. Both changes are relatively well documented in athletes, but later ones are more frequent in females because of the relative (compared to men) deficiency of the anabolic hormones, which directly limits the hypertrophy dynamics and potential (Wilmore et al, 1998. Sanborn et al, 1994.).

Limited hypertrophy as an aesthetic component of performance, higher leaps along with large amplitudes of movements was the basic of the “better performed“ elements. Generally, the male students performed the basic rhythmic elements with greater power and coordination abilities and the female students with enhanced flexibility and elegancy what seems to be an important factor for the judges’ evaluation. Multiple correlations in regression analyses between the coefficients of asymmetry and performing rhythmic components were significant only for the male group of subjects. The calculated coefficient of asymmetry for flexibility with body and leg horizontal had a significant negative predictive value (BETA coefficient) pointing to the correlation of asymmetry of difficult elements as a precondition for a proper rhythmic composition performance.

The capability to use both sides of the body with equal skill is a representative factor of successful performance in aesthetic sports for both genders. In this study, with a lack of expressive aesthetic component of performance, the male students’ performances were defined with the second most important aesthetic movements characteristic – ambidexterity. For aesthetic movement to be efficient, it has to be attractive and harmonious, which means that it should be properly graded and levelled in terms of the required motor abilities, specific movements with large amplitudes and capability of ambidexterity.

With the performance of rhythmic composition, various movements have to be integrated into a harmonious unity. According to the analyzed gender differences, ambidexterity is a precondition for successful performance in a group of male subjects.

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JEDNAKO KORIŠTENJE OBIJU STRANA TIJELA UTJEČE NA IZVOĐENJE GIBANJA U RITMIČKOJ KOMPOZICIJI – RAZLIKE PO SPOLU

Sažetak

Cilj ovog istraživanja bio je analiza relacija između specifičnih estetskih motoričkih sposobnosti i izvođenja ritmičke kompozicije, odvojeno po spolu. Uzorak od 88 studenata tjelesnog odgoja (32 ženskog spola i 56 muškog spola) opisan je sa tri grupe varijabli: 4 specifične temeljne varijable estetskih gibanja (skok, ravnoteža, pirueta i fleksibilnost) izvedenih na obje strane tijela kao prvi i drugi skup prediktora, a također i kalkulacija koeficijenata asimetrije za specifične motoričke sposobnosti a što je bio treći skup prediktora. Te su varijable definirane kao prediktori za izvođenje ritmičke kompozicije. Tri neovisna procjenitelja ocijenili su izvođenje temeljnih estetskih elemenata i ritmičke kompozicije pregledom video materijala. Koeficijenti asimetrije su izračunati na temelju razlike izvođenja dominantne i nedominatne noge. Regresijska analiza je pokazala da je skup varijabli za procjenu specifičnih estetskih gibanja izveden na dominantnoj i nedominantnoj strani tijela dobar prediktor izvođenja ritmičke kompozicije u obje grupe subjekata. Cossakov skok izveden na dominantnoj nozi u ženskom uzorku (Beta = 0.49; $p<0.05$), kao i pirueta sa prednjom horizontalnom nogom (Beta = 0.36; $p<0.05$) i fleksibilnost (Beta = 0.31; $p<0.05$) izvedeno na nedominantnoj nozi u muškom uzorku bili su značajni prediktori njihovog uspješnog izvođenja gibanja. Mogućnost korištenja obiju strana tijela s jednakim sposobnostima učinka izvođenja ritmičke kompozicije zabilježena je samo u muškom uzorku. Zbog manje mogućnosti izražaja estetske komponente izvođenja gibanja, izvođenje u muškom uzorku je bilo definirano drugom najvažnijom značajkom estetskih gibanja – sposobnošću realizacije gibanja s obiju strana tijela.

Ključne riječi*: estetska gibanja, koeficijenti asimetrije, studenti fakulteta*