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# Motor Abilities at Belly Dance in Elementary Female Schoolers

**Dodi Mihaljević, Ljerka Srhoj and Ratko Katić**

Faculty of Natural Sciences, Mathematics and Kinesiology, University of Split, Split, Croatia

**A B S T R A C T**

*The aim of the study was to determine the relation between motor abilities and belly dance performance in elementary school fifth- and sixth-grade female students. A battery of 19 motor tests was used in a sample of 96 students twice, i.e. at the beginning (initial measurement) and at the end (final measurement) of the academic year. On initial measurement, five factors were isolated by the motor space factor analysis: first factor of muscular-aerobic endurance; second factor integrating the strength of legs, coordination of foot and hand movement, and agility; third factor integrating explosive strength of the arms with speed and body coordination; fourth factor defined by flexibility (muscle tone regulation); and fifth factor integrating explosive strength of legs with equilibrium. On final measurement, five factors were isolated as well: first factor as a general one integrating coordination abilities, explosive strength of legs and flexibility; second factor defined by repetitive strength of the trunk and legs; third factor defined by rhythm coordination accompanied by flexibility; fourth factor predominantly defined by equilibrium (accompanied by explosive strength of throwing type and speed); and fifth factor predominantly defined by static strength of arms and legs (accompanied by arm movement frequency). On initial measurement, fourth factor responsible for muscle tone regulation and second factor integrating the strength of legs, coordination of movement frequency of arms and legs, and agility were found to be the best predictors of belly dance performance. In this setting, the tests of forward bow (flexibility) and sit-ups (repetitive strength of abdominal musculature) proved superior in differentiating high performance students and those less successful in belly dance. On final measurement, third factor named rhythm coordination (accompanied by muscle tone regulation) and second factor defined by repetitive strength of the trunk and legs were the best predictors of belly dance performance. In this setting, the tests of rhythm coordination, flexibility tests, tests of repetitive strength of the trunk and legs, and test of aerobic endurance proved superior in differentiating high performance and less successful students in belly dance.*

***Key words:*** *kinesiologic education, belly dance, motor status, elementary school female students*

## Introduction

Dance is an irreplaceable teaching tool in kinesiologic education of female subjects, from elementary school through university education because, among other qualities, it contributes to the development and maintenance of the basic motor abilities. Therefore, many teachers use dance as an unavoidable kinesiologic operator the transformation values of which clearly manifest in practice, as scientifically demonstrated by a number of studies[1–4]. These and other studies have found that the programs of dance aerobics have significant effects on changes in the morphological structure in terms of adipose tissue reduction, as well as on the development of flexibility and dynamic strength. In medicine, dance has a special role as a therapeutic instrument, where dance structures are used as kinesiologic operators in transformation and maintenance of the achieved levels of anthropological status functions[5–8].

In a sample of 11-year-old girls, Srhoj[2] analyzed the effect of motor abilities at performing the ciciliona folk dance and found the dance performance to be limited by the above-average psychomotor speed. That is why quality dancers make the audience admire their ease of performing high frequency movements (especially leg movements) synchronized with rhythm and with graceful body posture. It is emphasized that the ciciliona dance expresses artistic creativity, and harmony of movement and rhythm, representing a blend of classic and modern

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dance. In a sample of university students, Srhoj et al.[4] found latent structure of the ciciliona and pašavijen folk dances to be predominated by coordination, while the social dance rock'-n'-roll was predominated by explosive strength, and cha-cha-cha by explosive strength and speed. These authors conclude that overall dance performance in university students depended mostly on coordination, then on explosive strength, and to a lesser degree on speed (movement frequency). Following reports on the value of dance as a kinesiologic operator[2,4,9–12], Viskić-Štalec et al.[13] investigated utility of a program consisting exclusively of dance structures in the form that would maximally correspond with all the requirements posed by the physical education curriculum and syllabus. The varied program composed of folk dances and social dances, various types of aerobics and elements of rhythmical gymnastics, with due quality of performance, was found to exert complex and significant impact on the morphological-motor status of high school female students. The experimental program had greatest influence on agility/coordination. Coordination is an ability that integrates various movements and/or routines into a unique structure, and it is just what is required to perform different movement structures in dance, aerobics, and rhythmical gymnastics[14]. The dance-aerobics training also has considerable influence on aerobic endurance, meaning that the volume of work was sufficient to provoke changes and development of this basic motor ability[15]. This was followed by the significant effect of the experimental program on the ability of rhythm as a specific coordination integrating different routines and music into a harmonious and esthetic movement structure. In comparison with agility/coordination, rhythm and aerobic endurance, the experimental program had a less pronounced yet significant effect on repetitive strength, flexibility and explosive strength. Such a pattern was expected considering the relation of the proportion of particular transformation operators in the treatment as well as the sensitivity of particular motor abilities in this sample. The motor changes induced by treatment reflected in changes of the morphological status as well, as indicated by the significant reduction of body weight and adipose tissue percentage, thus leading to the formation of the desirable morphological structure of the students. Accordingly, the program of dance, aerobics and rhythmical gymnastics influenced the relevant motor abilities, i.e. coordination (agility and rhythm coordination), aerobic endurance, strength (repetitive and explosive), and flexibility, as well as the morphological status in terms of excess adipose tissue reduction.

Belly dance has recently been increasingly chosen by women when deciding on recreational dance activities. In addition to young women, ever more middle aged women join dance programs of this type. The Eastern and Western dance forms generally differ in the former, Oriental dance being »muscle dance«, whereas the latter mostly includes »step dances«. Although modern belly dancers use music that has to a certain extent been influenced by the West, the rhythmical influences of the Near East and Middle East music have created a music form which is fundamentally different from the one developed in the West.

Oriental dance is specifically designed for female body with emphasis on abdominal muscle, and hip and breast movements. It is firm, ground-bound dance, characterized by smooth, flowing, complex, sensual movements alternating with shaking, winding movements. The dance tempo is led by characteristic music, which is highly emotional, stimulating movements. The basic elements of belly dance are stretching, isolation of ribs, isolation of upper extremities, isolation of palms, hip circle, hip bounce, horizontal figure 8, vertical figure 8, Egyptian shimmy, and shoulder shimmy.

Belly dance is mostly practiced as a recreational activity in which the choice of elements and performance should not be strictly defined, so that attendants can at the same time improve or maintain a satisfactory level of their anthropological status and achieve emotional relief. The awareness of one's own body frequently entails emotional reaction, i.e. women with low self-esteem begin to appreciate their own body, whereas those with excess weight start accepting their figure and variation from the rooted stereotypes that have been imposed as a modern ideal of female beauty.

Graceful hip movements and »waves« produced by the volitional control of body muscles have a favorable impact on the following:

- abdominal musculature, pelvis, neck muscles and spine,
- improve circulation, and
- improve gastrointestinal function.

In contrast to ballet that may potentially cause skeletal changes and deformities, and to some other dances based on unnatural body posture, belly dance is based on movements that are normal for and harmonious with female body. On performing belly dance, the body moves in different directions, thus exercising appropriate body weight distribution and equilibrium. These exercises strengthen bone structure and contribute to the prevention of osteoporosis.

Having presented results on the effect of some typical programs of dance and rhythmical structures on the selected anthropological characteristics of elementary school, high school and university female students, the aim of this study was to investigate the impact of a new program of belly dance (Oriental dance) on the motor status of elementary school female fifth- and sixth-graders. The age of 11–12 years is considered appropriate for the use of belly dance (Oriental dance) adjusted to this population.

## Subjects and Methods

### *Subject sample*

Study subjects were selected from a population defined as clinically healthy female students attending elementary school fifth and sixth grade, aged 11–13, and able to attend physical training classes. A total of 96 stu-

dents were divided according to the performance of belly dance elements into two subgroups: superior group (n=48) and inferior group (n=48).

According to the experimental procedure schedule, kinesiologic treatment with dance structures mostly deriving from belly dance was performed during physical training classes throughout the academic year, for 66 periods in total. Of these, 6 periods were used for initial and final measurement (3 periods each).

### *Variable sample*

Motor variables were so chosen as to provide the best possible assessment of the basic motor abilities considered relevant for dance performance[15–18]. The following variables were employed on motor status evaluation: polygon backward (POLB) and sidesteps (SS) (coordination); hand tapping (HTAP) and foot tapping (FTAP) (movement frequency); non-rhythmic tapping (NRTAP) and hand and foot tapping (HFTAP) (rhythm coordination); forward bow (FB) and bench touch-toe (BTT) (flexibility); bench standing – eyes closed (BSEC) and bench standing – eyes open (BSEO) (equilibrium); standing jump (SJ), 20-m run (R20M) and medicine ball supine throw (MBST) (explosive strength); sit-ups (SU), prone sit-ups (PSU) and crouch (CR) (repetitive strength); bent arm hang (BAH) and lever hang (LH) (static strength); and 6-min run (R6MIN) (functional ability, i.e. aerobic endurance).

The following 4 variables were used on assessment of the belly dance motor skills: 3 variables based on performance scores for three arms, trunk and hip elements each, and fourth variable defined by average performance score for all belly dance elements. Three independent evaluators (professors of kinesiology) ranked performance of 9 belly dance elements on a 1–5 scale by analysis of video records.

### *Statistical analysis*

Factor analysis was used to determine factor structure in the sample of motor variables (with calculation of the following variables: V1 – significant varimax factors according to Guttman-Kaiser criterion of $\lambda > 1$, Lambda – characteristic values, and Variance % – percentage of variance explained by each latent dimension). Regression correlation analysis was employed to determine correlation between the set of motor variables and each individual criterion variable, with calculation of the regression coefficient ($\beta$), coefficient of multiple correlation of the set of predictors with the criterion ($\rho$), and level of significance of multiple correlation. Analysis of variance was used to determine differences in motor abilities between the groups of students, based on total score for 9 belly dance elements. The F-test for ANOVA ($F^A$) and significance for ANOVA ($p^A$) were calculated.

## Results

In order to provide comprehensive information on the latent structure of belly dance in the space of motor abilities, results of the factor analysis of the variables recorded on initial and final measurement are presented first (Table 1), followed by relations of thus formed latent motor variables with belly dance criteria at initial and final measurement (Table 2).

On initial measurement, factor analysis in the motor space isolated five factors. First factor showed high projections of the tests for assessment of the muscle and aerobic endurance, and of the trunk repetitive strength. As the abilities of the length of energy mobilization contributed most to the definition of this factor, it can be termed factor of muscle-aerobic endurance.

Three tests exerted highest projections on the second factor: crouch (leg strength), hand and foot tapping (coordinated performance of hand and foot movements), and sidesteps (agility). Thus, the second factor integrated the strength of legs, coordination of hand and foot movements, and agility.

Third factor was defined by the test of explosive strength of throwing type, tests of movement frequency (speed), test of whole body coordination, and test of equilibrium with the eyes closed. So, the third factor integrated explosive strength of the arms with body speed and coordination.

Fourth factor was defined by flexibility tests that are based on muscle tone regulation, whereas fifth factor was defined by the explosive strength of running and jump type, and the test of equilibrium with the eyes open, indicating that this factor integrated explosive strength of legs and equilibrium.

On final measurement, five factors were isolated again; however, they were more clearly defined. First factor was general, integrating coordination abilities, explosive strength of legs and flexibility; second factor was defined by the basic strength of the trunk and legs; third factor was defined by rhythm coordination in association with flexibility; fourth factor was predominantly defined by equilibrium (along with explosive strength of throw type and movement frequency – speed); and fifth factor was mostly defined by static strength of the arms (along with hand movement frequency).

A series of regression correlation analyses were used on initial and final measurement to determine relations between the latent motor variables and criterion variables (Table 2). On initial measurement, the following factors proved to be best predictors of belly dance performance: fourth factor responsible for muscle tone regulation; and second factor integrating leg strength, coordination of foot and hand movement frequency, and agility.

Results yielded by the analysis of variance (Table 3) showed the tests of forward bow (flexibility) and sit-ups (repetitive strength of abdominal musculature) to be superior in differentiating high performance students from those less successful in belly dance performance.

Results of regression analysis on final measurement indicated the isolated factors to be by far better criterion predictors as compared with initial measurement (Table 2). Thus, third factor named rhythm coordination, which is associated with flexibility, i.e. muscle tone regulation,

**TABLE 1**
RESULTS OF FACTOR ANALYSIS (V) OF VARIABLES ASSESSING MOTOR ABILITIES (N=96)

| Variable | Measurement 1 | | | | | Measurement 2 | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | V1 | V2 | V3 | V4 | V5 | V1 | V2 | V3 | V4 | V5 |
| POLB# | –0.33 | –0.24 | –0.57 | 0.18 | –0.17 | –0.59 | –0.03 | 0.32 | –0.38 | –0.25 |
| SS# | –0.02 | –0.66 | –0.18 | –0.13 | –0.10 | –0.78 | –0.25 | –0.01 | –0.13 | 0.08 |
| HTAP | 0.11 | 0.41 | 0.68 | –0.12 | –0.01 | 0.15 | –0.00 | 0.12 | 0.47 | 0.64 |
| FTAP | 0.22 | 0.40 | 0.60 | –0.15 | –0.16 | 0.33 | 0.09 | –0.29 | 0.60 | 0.14 |
| NRTAP | 0.15 | 0.13 | –0.27 | 0.67 | 0.16 | 0.00 | 0.03 | 0.81 | 0.11 | 0.23 |
| HFTAP | 0.10 | 0.68 | –0.05 | 0.35 | 0.07 | 0.07 | 0.13 | 0.76 | 0.16 | 0.01 |
| FB | 0.19 | –0.11 | 0.32 | 0.65 | –0.16 | 0.51 | 0.18 | 0.67 | 0.02 | 0.03 |
| BTT# | 0.09 | –0.26 | 0.04 | –0.76 | –0.12 | –0.61 | –0.14 | –0.40 | –0.21 | 0.08 |
| BSEC | –0.02 | 0.09 | 0.57 | 0.06 | 0.20 | 0.11 | 0.33 | 0.26 | 0.74 | –0.02 |
| BSEO | –0.25 | 0.17 | 0.09 | 0.04 | 0.71 | 0.12 | 0.09 | 0.37 | 0.73 | 0.05 |
| SJ | 0.40 | –0.08 | 0.31 | 0.09 | 0.51 | 0.51 | 0.31 | 0.17 | 0.23 | 0.34 |
| R20M# | –0.35 | –0.13 | –0.01 | –0.08 | –0.74 | –0.69 | –0.09 | –0.19 | 0.06 | –0.32 |
| MBST | 0.16 | –0.08 | 0.72 | 0.14 | 0.03 | 0.01 | 0.09 | 0.06 | 0.63 | –0.01 |
| BAH | 0.73 | 0.03 | 0.11 | –0.02 | 0.03 | 0.02 | 0.14 | 0.06 | –0.09 | 0.79 |
| R6MIN | 0.65 | 0.34 | 0.16 | 0.06 | –0.08 | 0.28 | 0.49 | 0.10 | –0.01 | 0.42 |
| SU | 0.61 | 0.09 | 0.20 | 0.38 | 0.12 | 0.21 | 0.67 | 0.38 | 0.15 | 0.24 |
| PSU | 0.66 | 0.51 | 0.02 | 0.03 | 0.16 | 0.24 | 0.60 | 0.11 | 0.09 | 0.39 |
| LH | 0.35 | 0.43 | 0.13 | 0.11 | 0.06 | 0.04 | 0.75 | 0.09 | 0.11 | –0.01 |
| CR | 0.24 | 0.68 | 0.24 | –0.11 | 0.12 | 0.13 | 0.81 | –0.07 | 0.20 | –0.03 |
| Lambda | 2.57 | 2.48 | 2.46 | 1.87 | 1.55 | 2.68 | 2.67 | 2.48 | 2.45 | 1.79 |
| Variance % | 13.56 | 13.06 | 13.00 | 10.00 | 8.11 | 14.11 | 14.05 | 13.05 | 12.90 | 9.42 |

#variable with opposite metric orientation, V – significant varimax factors, Lambda – characteristic values, Variance % – percentage of variance explained by a particular factor, POLB – polygon backward, SS – sidesteps, HTAP – hand tapping, FTAP – foot tapping, NRTAP – non-rhythmic tapping, HFTAP – hand and foot tapping, FB – forward bow, BTT – touch-toe, BSEC – bench-standing-eyes closed, BSEO – bench standing-eyes open, SJ – standing jump, R20M – 20-m run, MBST – medicine ball throw, BAH – bent arm hang, R6MIN – 6-min run, SU – sit-ups, PSU – prone sit-ups, LH – lever hang, CR – crouching

**TABLE 2**
RESULTS OF REGRESSION ANALYSIS BETWEEN THE SET OF PREDICTOR MOTOR VARIABLES AND INDIVIDUAL CRITERION VARIABLES (N=96)

| Variable | General β | Arms β | Trunk β | Hips β |
|---|---|---|---|---|
| Initial measurement | | | | |
| Muscle aerobic endurance | 0.01 | 0.02 | 0.07 | –0.05 |
| Foot strength-speed-agility | 0.15 | 0.25[b] | 0.09 | 0.04 |
| Arm explosive strength and speed | 0.15 | 0.07 | 0.10 | 0.19[a] |
| Flexibility | 0.35[b] | 0.35[b] | 0.29[b] | 0.25[b] |
| Leg explosive strength | 0.11 | 0.19[a] | –0.01 | 0.10 |
| ρ | 0.43[b] | 0.48[b] | 0.33[a] | 0.34[a] |
| Final measurement | | | | |
| Agility-leg explosive strength-flexibility | 0.11 | 0.09 | 0.13 | 0.11 |
| Basic strength of trunk and legs | 0.28[b] | 0.23[a] | 0.27[b] | 0.27[b] |
| Rhytm coordination | 0.50[b] | 0.49[b] | 0.45[b] | 0.44[b] |
| Equilibrium | 0.01 | 0.07 | –0.02 | –0.01 |
| Muscle endurance | 0.01 | 0.06 | 0.01 | –0.02 |
| ρ | 0.58[b] | 0.55[b] | 0.54[b] | 0.53[b] |

[a]$p<0.05$, [b]$p<0.01$, General – general dance performance,  – regression coefficient, ρ – multiple correlation

was found to be best predictor of belly dance performance, followed by second factor defined as repetitive strength of legs and trunk.

The considerably higher criterion prediction on final measurement relative to initial measurement (ρ, multiple correlation) resulted in the inclusion of a greater number of predictors on criterion determination. This led to a significantly higher integration of the belly dance specific motor skills and abilities into the motor system of the study students. Thus, the tests of rhythm coordination, flexibility, repetitive strength of the trunk and legs, and aerobic endurance significantly discriminated high performance students from those less successful in belly dance performance (Table 3)

## Discussion

Study results showed the belly dance program to have certain influence on the motor functioning in elementary school female fifth- and sixth-graders. This influence manifested as changes in isolated dimensions between the initial and final measurement. Belly dance performance influenced formation of appropriate motor structures in elementary school students. This is clearly demonstrated by comparison of the results presented in Tables 1–3. On initial measurement, the factor of flexibility underlain by the mechanism of muscle tone regulation predominantly determined performance of all belly dance elements, whereas the isolated factor integrating repetitive strength of legs, rhythm coordination in terms of harmonious performance of movement frequency of upper and lower extremities and agility significantly determined only dance elements performed by the arms.

On final measurement, a motor structure was formed that integrated basic motor abilities of rhythm coordination and flexibility, and predominantly determined belly dance performance. In addition, the obtained motor factor of repetitive strength of legs and trunk significantly determined performance of all belly dance elements. Accordingly, the motor abilities that were most influenced by the treatment were the major determinants of belly dance performance.

It should be noted that a motor structure (first varimax factor) integrating the mechanisms underlain by cortical movement regulation, force regulation and muscle tone regulation was also isolated on final measurement. Thus defined motor structure as a general factor of motor efficiency will probably limit the achievement of top belly dance performance in the next treatment phases.

**TABLE 3**
RESULTS OF ANALYSIS OF VARIANCE IN MOTOR ABILITY TESTING BETWEEN STUDENT GROUPS ACCORDING TO DANCE PERFORMANCE

| Variable | Initial measurement | | | | Final measurement | | | |
|---|---|---|---|---|---|---|---|---|
| | $X_1$ (n=48) | $X_2$ (n=48) | $F^A$ | $p^A$ | $X_1$ (n=48) | $X_2$ (n=48) | $F^A$ | $p^A$ |
| Polygon backward# | 15.33 | 15.86 | 0.44 | | 14.69 | 13.48 | 4.12 | a |
| Sidesteps# | 11.81 | 11.61 | 0.28 | | 12.37 | 12.99 | 2.24 | |
| Hand tapping | 24.71 | 23.63 | 3.05 | | 24.92 | 24.90 | 0.00 | |
| Foot tapping | 19.89 | 19.75 | 0.02 | | 20.27 | 21.00 | 1.26 | |
| Non-rhythmic tapping | 7.29 | 6.41 | 1.54 | | 9.18 | 5.53 | 15.30 | b |
| Hand and foot tapping | 6.24 | 5.90 | 0.28 | | 8.05 | 4.46 | 24.79 | b |
| Forward bow | 88.22 | 72.69 | 14.71 | b | 87.27 | 76.51 | 14.92 | b |
| Touch-toe# | –0.25 | 0.98 | 1.30 | | –0.16 | 3.54 | 8.82 | b |
| Bench-standing-eyes closed | 3.59 | 3.16 | 1.26 | | 3.55 | 2.57 | 4.82 | a |
| Bench standing-eyes open | 5.48 | 3.91 | 3.66 | a | 4.74 | 3.34 | 5.87 | a |
| Standing jump | 152.38 | 149.54 | 0.43 | | 157.90 | 149.05 | 4.81 | a |
| 20-m run# | 4.01 | 4.18 | 3.48 | | 4.09 | 4.17 | 0.52 | |
| Medicine ball throw | 131.57 | 130.44 | 0.01 | | 151.95 | 132.83 | 1.88 | |
| Bent arm hang | 13.05 | 11.94 | 0.21 | | 17.63 | 15.04 | 1.18 | |
| 6-min run | 989.58 | 907.92 | 3.34 | | 1022.2 | 855.87 | 13.67 | b |
| Sit-ups | 37.44 | 29.48 | 5.92 | a | 36.62 | 28.48 | 15.72 | b |
| Prone sit-ups | 26.60 | 22.81 | 1.96 | | 29.02 | 25.48 | 2.47 | |
| 0Lever hang | 35.55 | 33.07 | 0.42 | | 45.77 | 32.93 | 7.24 | a |
| Crouching | 31.76 | 31.09 | 0.01 | | 45.88 | 30.12 | 10.67 | b |

#variable with the opposite metric orientation, $^a p<0.05$, $^b p<0.01$, $X_1$, $X_2$ – means for initial and final measurement, $F^A$ – F-test for ANOVA, $p^A$ – probability for ANOVA

Study results indicated the manifestation of coordination to be most pronounced only when other relevant motor abilities saturating coordination have reached a satisfactory level of development[14,18–20]. Obviously, the result in any kinesiologic activity including belly dance depends on the function of the general motor mechanism that integrates and regulates functions of all other mechanisms (in terms of information and energy components of movement)[2,3,14,18,21].

Because of their beauty and wealth of movements as well as the great variety of forms and rhythms, dances provide great opportunities for the development of esthetic awareness and sense for the beautiful[22].

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## REFERENCES

1. SRHOJ LJ, MILETIĆ Đ, Dance structures (Abel International, Split, 2000). — 2. SRHOJ LJ, Coll Antropol, 26 (2002) 539. — 3. MILETIĆ Đ, KATIĆ R, MALEŠ B, Coll Antropol, 28 (2004) 727. — 4. SRHOJ LJ, KATIĆ R, KALITERNA A, Coll Antropol, 30 (2006) 335. — 5. WIGAEUS E, KILBORM A, Eur J Appl Physiol, 45 (1980) 177. — 6. PIGEON P, OLIVIER I, CHARLET JP, ROCHICCIOLI P, American J Sports Med, 25 (1997) 243. — 7. SMITH RA, WRISBERG CA, Motor learning and performance (Human Kinetics, Champaign, 2000). — 8. MIŠIGOJ-DURAKOVIĆ M, MATKOVIĆ BR, RUŽIĆ L, DURAKOVIĆ Z, BABIĆ Z, JANKOVIĆ S, IVANČIĆ-KOŠUTA M, Coll Antropol, 25 (2001) 585. — 9. LAPOINTE-CRAMP J, JOPERD, Journal of Physical Education Recreation and Dance, 77 (2006) 3. — 10. CÔTÉ P, JOPERD, 77 (2006) 24. — 11. TO WW, WONG MW, LAM IY, J Pediatr Adolesc Gynecol, 18 (2005) 337. — 12. LUNDY H, MCGUFFIN P, J Child Adolesc Psychiatr Nurs, 18 (2005) 135. — 13. VISKIĆ-ŠTALEC N, ŠTALEC J, KATIĆ R, PODVORAC Đ, KATOVIĆ D, Coll Antropol, 31 (2007) 259. — 14. KATIĆ R, SRHOJ LJ, PAŽANIN R, Coll Antropol, 29 (2005) 711. — 15. KATIĆ R, PEJČIĆ A, BABIN J, Coll Antropol, 28 Suppl. 2 (2004) 357. — 16. KATIĆ R, Biol Sport, 12 (1995) 251. — 17. KATIĆ R, MALEŠ B, MILETIĆ Đ, Coll Antropol, 26 (2002) 533. — 18. KATIĆ R, Coll Antropol, 27 (2003) 351. — 19. KATIĆ R, BONACIN D, BLAŽEVIĆ S, Coll Antropol, 25 (2001) 573. — 20. KATIĆ R, PEJČIĆ A, VISKIĆ-ŠTALEC N, Coll Antropol, 28 (2004) 261. — 21. KATIĆ R, GRGANTOV Z, JURKO D, Coll Antropol, 30 (2006) 103. — 22. LEWIS RN, SCANELL ED, Percept Mot Skill, 81 (1995) 155.

*R. Katić*

*Faculty of Natural Sciences Mathemathics and Kinesiology, University of Split, Teslina 12, 21000 Split, Croatia*
*e-mail: katic@pmfst.hr*

## MOTORIČKE SPOSOBNOSTI U TRBUŠNOM PLESU KOD UČENICA OSNOVNE ŠKOLE

## SAŽETAK

Cilj ovog istraživanja je utvrditi međusobnu determiniranost motoričkih sposobnosti i uspjeha u trbušnom plesu kod učenica petog i šestog razreda osnovne škole. U tu svrhu je na uzorku od 96 učenica primijenjen skup od 19 motoričkih testova dva puta i to na početku školske godine – prvo mjerenje i na kraju školske godine – drugo mjerenje. U prvom mjerenju faktorskom analizom motoričkog prostora izolirano je pet faktora i to: prvi kao mišićno-aerobna izdržljivost, drugi integrira snagu nogu, koordiniranost pokreta ruku i nogu i agilnost, treći integrira eksplozivnost ruku s brzinom i koordinacijom tijela, četvrti definira fleksibilnost (regulacija mišićnog tonusa), a peti faktor integrira eksplozivnost nogu s ravnotežom. U drugom mjerenju izolirano je također pet faktora i to: prvi je generalni i integrira koordinacijske sposobnosti, eksplozivnost nogu i fleksibilnost, drugi definira repetitivna snaga nogu i trupa, treći definira koordinacija u ritmu što prati fleksibilnost, četvrti dominantno definira ravnoteža (koju prati eksplozivnost tipa bacanja i brzina), dok peti dominantno definira statička snaga ruku (koju prati frekvencija pokreta rukom). U prvom mjerenju najbolji prediktori uspjeha u trbušnom plesu su: četvrti faktor odgovoran za regulaciju mišićnog tonusa, te drugi faktor koji integrira snagu nogu, koordiniranost frekvencije pokreta ruku i nogu i agilnost. Ovdje testovi pretklon raskoračno (fleksibilnost) i dizanje trupa (repetitivna snaga trbušnih mišića) najviše razlikuju uspješne od manje uspješnih učenica u trbušnom plesu. U drugom mjerenju najbolji prediktor uspjeha u trbušnom plesu je treći faktor nazvan koordinacija u ritmu (koju prati regulacija mišićnog tonusa), te drugi faktor kojeg definira repetitivna snaga nogu i trupa. Ovdje testovi koordinacije u ritmu, testovi fleksibilnosti, testovi repetitivne snage nogu i trupa, te test aerobne izdržljivosti, najbolje razlikuju uspješne od manje uspješnih učenica u trbušnom plesu.