THE EFFICIENCY OF A DANCE TRAINING ON SOME MOTOR ABILITIES OF FOLK DANCERS

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Abstract
The purpose of this research was to determine how additional training of dance aerobics influences the motor abilities of folk dancers (test subjects were members of the professional folk dance group Lado). 15 male and 17 female dancers in perfect condition aged from 18 to 45 years participated in the research. Motor abilities were researched with a combination of 14 tests covering coordination, rhythm, balance, frequency of movements, flexibility, explosive power and general power. The experiment lasted 3 years and 7 measurements in different time periods were made. The additional training process was carefully planned and performed daily, except when on tours or on vacation (about 95 days a year). According to Guttman-Kaiser criterion, 3 latent dimensions were determined with factor analysis. The first dimension is especially important, because it is defined by the most relevant factors of successful dancing (explosive power, coordination, frequency of movement). Discriminant analysis during individual measurements has shown that discrepancies occur especially between the initial state and the first 4 measurements, meaning that quantitative progress was made in frequency of movement, balance and explosive power. The last measurements have shown some regression probably on account of low motivation of dancers for measurements.

Key words: folk dance, motor abilities, dance aerobics, practice planning

Introduction
Dance, and specifically folk dance, is a relatively unknown field. Because it is not a competitive sport (no competitions are held), the training process is usually adapted to preparations for performances and the development of motor skills is neglected. Moreover, group leaders often don't possess the adequate knowledge for motor abilities practice. An additional planned practice of dance aerobics was included in the training process of professional folk dancers with the purpose of improving the development of those motor abilities, which are the most important for a successful performance. The test subjects were part of a specific population, all of whom members of the folk dance group LADO. They have never before used such a training process. We strived to keep the exercises close to the original activities of the dancers, and on the other hand, to make the exercises also special and different from what they usually do in order to make the work process interesting. Changes made by dance aerobics depend on the laws of the training process, meaning that a work program and a list of goals will bring results. The use of dance aerobics (continuous movement following the rhythm of music according to a specific choreography) as an aerobic activity turned out to be an ideal training process as it also allows to control the dosage, which was important considering that the dancers were aged from 18 to 45 years. It is important to stress that all dancers regardless of age have the same workload when performing on stage or on concerts. Only few researches regarding transformational effects of dance aerobics on motor abilities exist. Bezjak (1971) determined that there is a distinctive statistical correlation between dance aerobics and dance. Brennan (1980) compared three groups of trained females (dance aerobics, gymnastics, other sports) with untrained females on the basis of results of the 14 tests of motor abilities (power, balance, flexibility, rhythm) and found out that there is a distinctive statistical difference between trained and untrained females. Čačija (1985) exposed the usefulness of dance aerobics for an increase in flexibility, balance, leg coordination and muscular endurance based on a sample of 140 schoolgirls. Vankova, Tomova and Vankov (1986) used a dance aerobics program in the experimental group and a conventional program in the controlled group of female students of the University of Sofia and came to a conclusion that there is a distinctive difference regarding motor abilities between the experimental and control group. Oreb (1989) researched correlations between primary motor abilities and criteria of dance evaluation and found out that coordination, rhythmical structures, balance and explosive power determine successful dance performances. Moreover, Oreb and Kilibarda (1996) researched relations between rhythmical abilities and successful dance performances on a sample of 104 students of Faculty of Sport in Zagreb and came to a conclusion that on the basis of rhythmical abilities, dance performances can be relatively precisely determined. Other factors include motor and general dance abilities. Blarežina (1993) established a positive influence of dance aerobics on some motor abilities on a sample of 100 students of the Faculty of Arts in Zagreb.
A month of dance aerobics training proved that the program triggered distinctive statistical changes of variables for evaluation of rhythmical abilities, frequency of movement, explosive power, flexibility and coordination. Oreb and Marušič (1994) researched the effect of dance aerobics on dance training process on a sample of 17 female folk dancers. Six basic motor abilities tests were used for the evaluation of the effects at the beginning and at the end of the training process. They concluded that the program triggered distinctive statistical changes regarding the explosive power, the ability to feel the rhythm and flexibility. The present research is a part of a research project to determine the effects of the training process in dance training. As such, its basic goal is to determine the factors of motor abilities, which are relevant for successful dance performances, and later to analyze the effectiveness of the training process in seven different training periods. It was assumed that the most important motor abilities for dancing are coordination, speed, explosive power and balance, and that repeated measurements will show progress of dancers as time passes.

Methods

Participants and instruments
Test subjects (15 male, 17 female) were members of the folk singing and dancing group LADO. They were physically healthy professional dancers aged from 18 to 45 years, all being able to perform on stage or in concerts. Motor abilities were researched with a combination of 14 tests covering coordination, rhythm, balance, frequency of movement, flexibility, explosive power and muscular endurance. The chosen tests had a record of reliable measurements (Metikoš, Hofman, Prot, Pintar & Oreb, 1989). The following tests were chosen for the evaluation of motor abilities: - coordination: MAGKUS – side steps; MAGONT – agility on the floor; MAGOSS – running in a figure of eight; -rhythmical structures: MKRBNR – drumming with feet and hands; -balance: MBAU1Z – standing on a foot on the balance bench with eyes closed; -movement frequency: MBFTAP – hand tapping; MBTAN – foot tapping; -flexibility: MFLISK – lunge; MFLPRK – sit and reach; - explosive power: MFESDM – standing long jump; MFESVM – Sergeant test; MFE20V – 20m standing start sprint; -muscular endurance: MRCDTT – body lifting with weights. The basic kinesiological exercises comprised of dance aerobics. The additional training lasted 3 years (60 minutes daily, between 9 and 10 a.m., except on concert days and during tours and vacation). The exercises were meticulously planned and had 3 parts: preparation, main part and finish. Exercises were meant to improve the basic physical form. Preparation (3-5min) consisted of basic movement exercises, so that the body would be prepared for the main part. Joints, and in particular knees and ankles, were given extra attention. The main part (35-45 min) consisted of dance aerobics (dancing steps and choreography), which eventually became more complicated and where special attention was given to the balanced load of the muscle groups on the left and right side of the body and to alternating (high/low) intensity. The goal in the finishing part (10-15min) was to stabilize and calm down the body. In order to achieve this, relaxation and stretching exercises according to the topological principle were used. In addition to the quality exercises, suitable load and variety in the training process was achieved with music selection: preparation 100-120 BPM, main part 118-180 BPM and in the finishing part instrumental music with slow tempo, which helped with relaxation. The music selection enabled a permanently interesting training process and music was also a great motivation. Various accessories (weights, elastic bands) that were added to the interval and circular trainings complemented towards increased variety. Dance aerobics was combined with strength exercises.

Data Processing Methods
The data was analyzed with the statistical software package STATISTICA FOR WINDOWS. The basic descriptive parameters were determined. Factor analysis (Guttman-Kaiser criterion, 1963) was used to analyze the latent structure of motor abilities. The discriminant analysis was used to determine the different effects of the training process in various time periods.

Results and discussion
Table 1 shows that the tests are good, because they tend not to deviate from normal distribution. Especially reliable are the coordination tests (MAGKUS – side steps, MAGONT – agility on the floor, MAGOSS – running in a figure of eight) and rhythm tests (MKRBNR – drum beating with hands and feet). Only the explosive power (MFE20V – 20m standing start sprint) and muscular endurance (MRCDTT – body lifting with weights) tests show an unusual level of asymmetry. In the case of the explosive power, this is probably the result of some dancers being naturally more explosive than others and in the case of the muscular endurance, it is a result of the excellent overall physical shape.

Table 1. Central and dispersive parameters for motor the skills evaluation of the dancers at all seven points in time

<table>
<thead>
<tr>
<th></th>
<th>AM</th>
<th>SD</th>
<th>MIN</th>
<th>MAX</th>
<th>SKEW</th>
<th>KURT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAGKUS</td>
<td>10.06</td>
<td>1.36</td>
<td>7.30</td>
<td>15.0</td>
<td>.60</td>
<td>.49</td>
</tr>
<tr>
<td>MKRBNR</td>
<td>14.89</td>
<td>4.43</td>
<td>3.0</td>
<td>30.0</td>
<td>.32</td>
<td>.39</td>
</tr>
<tr>
<td>MFLISK</td>
<td>33.79</td>
<td>10.67</td>
<td>15.0</td>
<td>51.3</td>
<td>-.22</td>
<td>-1.69</td>
</tr>
<tr>
<td>MFESVM</td>
<td>20.10</td>
<td>2.85</td>
<td>12.1</td>
<td>28.6</td>
<td>.19</td>
<td>.11</td>
</tr>
<tr>
<td>MFESVM</td>
<td>39.24</td>
<td>8.82</td>
<td>22.0</td>
<td>63.0</td>
<td>.51</td>
<td>-.12</td>
</tr>
<tr>
<td>MFESVM</td>
<td>13.44</td>
<td>6.07</td>
<td>1.3</td>
<td>26.2</td>
<td>-.12</td>
<td>-.98</td>
</tr>
</tbody>
</table>

Arithmetic mean (AM), standard deviation (SD), minimal (MIN) in maximal (MAX) values in coefficient of asimetricity (SKEW) and skewness (KURT)

The factor analysis with the use of Guttman-Kaiser criterion gives three latent factors. The variance of the whole factor space (GK lambda greater than or equal to 1) is 65%. The first factor takes 40.55% of the whole variance, whereas the other two factors have only a small percentage of information (first 16.52%, second 8.43%).
Table 2: Eigenvalues, percent of variance explained, cumulative percent of factor analyses of motor tests

<table>
<thead>
<tr>
<th>Eigenvalues</th>
<th>% total Variance</th>
<th>Cumulative eigenvalues</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>factor 1</td>
<td>5.67</td>
<td>40.54</td>
<td>40.54</td>
</tr>
<tr>
<td>factor 2</td>
<td>2.31</td>
<td>16.52</td>
<td>57.07</td>
</tr>
<tr>
<td>factor 3</td>
<td>1.18</td>
<td>8.43</td>
<td>65.50</td>
</tr>
</tbody>
</table>

The first factor is defined by the explosive power, coordination and movement frequency parameters, as seen in table 3. This was expected, as these are the most important motor abilities for successful dancing.

Table 3: Factor Structure (F 1-30 factors)

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>F 1</th>
<th>F 2</th>
<th>F 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>S7MAGKUS</td>
<td>-54</td>
<td>.03</td>
<td>-63</td>
</tr>
<tr>
<td>S7MAGONT</td>
<td>-65</td>
<td>.26</td>
<td>-31</td>
</tr>
<tr>
<td>S7MKRBNR</td>
<td>-30</td>
<td>-02</td>
<td>.71</td>
</tr>
<tr>
<td>S7MFLPRK</td>
<td>-00</td>
<td>-87</td>
<td>-05</td>
</tr>
<tr>
<td>S7MBFTAP</td>
<td>.71</td>
<td>.12</td>
<td>.12</td>
</tr>
<tr>
<td>S7MBTAN</td>
<td>.31</td>
<td>.27</td>
<td>-18</td>
</tr>
<tr>
<td>S7BAU1Z</td>
<td>.03</td>
<td>.16</td>
<td>-18</td>
</tr>
<tr>
<td>S7MFESDM</td>
<td>.91</td>
<td>.08</td>
<td>.14</td>
</tr>
<tr>
<td>S7MCDTT</td>
<td>.52</td>
<td>.10</td>
<td>.09</td>
</tr>
<tr>
<td>S7FLISK</td>
<td>.19</td>
<td>.37</td>
<td>.73</td>
</tr>
<tr>
<td>S7MAGOSS</td>
<td>.83</td>
<td>.05</td>
<td>-08</td>
</tr>
<tr>
<td>S7MFESVM</td>
<td>.73</td>
<td>.29</td>
<td>.31</td>
</tr>
<tr>
<td>S7FES20V</td>
<td>-.78</td>
<td>.16</td>
<td>-17</td>
</tr>
<tr>
<td>S7FLEXI</td>
<td>-.06</td>
<td>-.90</td>
<td>-17</td>
</tr>
</tbody>
</table>

It is essential to stress that such results were gained on a sample of dancers of folk dances, which demand extraordinary explosiveness (high jumps), coordination (various steps and rhythmical combinations) and fast performance of choreographies. The second factor takes just 16.5% of the whole variance and is defined by the negative values of the MFLPRK (sit and reach) and FLEXI (flexibility) variables. The results are unsurprising as it is not essential to be extremely flexible in folk dancing. The third factor is defined by the variables of rhythm, balance and flexibility and takes just 8% of the whole variance. Although unexpected at first glance, the results can be justified by the fact that the basic condition for people to begin dancing is their archetypal connection with rhythm and balance, which are certainly genetically based and can be continuously developed and improved. Once more it is important to stress that the test subjects were professional dancers, so it is understandable that there are no big differences in motor abilities. Moreover, some tests may not have been difficult enough for greater differences in variable values to arise. The transformational effects of the motor abilities training with dance aerobics were analyzed using discriminant analysis. The analysis enabled the selection of the variables, which show the difference between individual tests of the same test subjects at 7 points in time during the 28 months of research (February, June, October first year, July, September, December second year, July third year). Data processing revealed two distinctive statistical discriminant functions (D1 and D2).

In order to determine the difference in motor abilities conditions between various individual measurements, (G1-G7) the discriminant functions were drawn in a graph. The state of individual measurements on D1 and D2 was determined by inputting their centroids (the arithmetical mean of the results of individual measurements) in the figure 1.

Figure 1. Plot of discriminant functions

The figure 1. shows that the state of the first measurements (G1) in the first quadrant (D1 and D2 are positive) is determined by the movement frequency, explosive power, balance and coordination (Table 4). It can be concluded, that the whole group improved in those categories. The reason is probably the rich choreography of the dance aerobics, which changed from practice to practice and demanded agility and coordination in regard to changes of directions of movement and orientation in space. Moreover, such a training process is completely different from the usual dance practice (repeating choreographies with fixed movement). Various dance steps, levels of difficulty and tempo also added to a higher frequency of movement.

Table 4. Discriminant functions

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>D1</th>
<th>D2</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAGKUS</td>
<td>.00</td>
<td>.48</td>
</tr>
<tr>
<td>MAGONT</td>
<td>.01</td>
<td>.08</td>
</tr>
<tr>
<td>MKRBNR</td>
<td>-.09</td>
<td>.38</td>
</tr>
<tr>
<td>MFLPRK</td>
<td>-.02</td>
<td>-.13</td>
</tr>
<tr>
<td>MBFTAP</td>
<td>.06</td>
<td>-.36</td>
</tr>
<tr>
<td>MBTAN</td>
<td>.93</td>
<td>-.13</td>
</tr>
<tr>
<td>BAU1Z</td>
<td>.03</td>
<td>.21</td>
</tr>
<tr>
<td>MFESDM</td>
<td>.03</td>
<td>.03</td>
</tr>
<tr>
<td>MCDTT</td>
<td>-.00</td>
<td>-.09</td>
</tr>
<tr>
<td>FLISK</td>
<td>-.01</td>
<td>-.08</td>
</tr>
<tr>
<td>MAGOSS</td>
<td>.02</td>
<td>.06</td>
</tr>
<tr>
<td>MFESVM</td>
<td>.00</td>
<td>.00</td>
</tr>
<tr>
<td>FES20V</td>
<td>.02</td>
<td>.07</td>
</tr>
<tr>
<td>FLEXI</td>
<td>-.04</td>
<td>-.06</td>
</tr>
</tbody>
</table>

The second measurement G2 (D1=2.30 and D2=-0.33) is located in the second quadrant and is defined by the frequency of movement, explosive power, balance, coordination, rhythm, flexibility and muscular endurance. A significant quantitative progress concerning those motor abilities that are relevant for successful dancing is seen in this time period.
It is interesting that a progress is seen in those abilities which are genetically based, meaning that they can't develop much (just to a certain endogenous barrier (Oreb, 1992). This phenomenon can be explained by the fact that the previous practices of the group did not include physical training. The initial state of motor abilities was relatively low, so it was relatively easy to trigger a progress in motor abilities. The same can be said for the measurements G3 and G4, both of them also being in the second quadrant (D1 positive, D2 negative). The same tests were used, which means that the group improved only some strictly specific abilities. The first four measurements showed positive changes and confirmed that progress was made. All of the last three measurements (G5, G6, G7) showed changes. D1 was becoming increasingly negative and indicated weaker effects of the training process in the categories of rhythm, movement frequency, flexibility, muscular endurance, coordination and balance. A regressive trend in the G5 measurement can be attributed to the fact that the measurements were made after a month-and-a-half long break (September second year – vacation) and that it was only the start of the dancing season. The next two measurements, which also showed a regressive trend in motor abilities, were also made during holidays or vacation, which was probably a negative motivation.

**Conclusion**

The goal of the research, which was a part of a broader project of determining effects of the training processes on dancers, was to analyze the factor structure of motor abilities, which are relevant for successful dancing. Moreover, it tried to analyze the effectiveness if the training process in seven different time periods. On a sample of 15 male and 17 female dancers, various motor abilities were measured in order to determine how additional training of dance aerobics coupled with some fitness exercises influences the motor abilities of folk dancers. The additional training process lasted three years and was performed daily except on vacation and on tours. The factor analysis showed that the practice regime could focus on explosive power, coordination and movement frequency. Positive effects, which were analyzed using discriminant analysis, appeared especially in the first and second year of the additional training. Low motivation and bad timing of measurements were the reason behind the worse results in the last year. A progress in the most dance-important motor abilities can be attributed to carefully planned additional practices, which were new to dancers. It can be concluded that the most important motor abilities in dancing are rhythmic abilities, coordination, speed, explosive power and balance and that the training process developed in the research is good and also recommended to all dancers.

**Table 5. Centriods of individual measurements:**

<table>
<thead>
<tr>
<th>GROUP</th>
<th>POINT 1</th>
<th>POINT 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>G.1.1</td>
<td>2.65</td>
<td>1.35</td>
</tr>
<tr>
<td>G.2.2</td>
<td>3.20</td>
<td>-3.3</td>
</tr>
<tr>
<td>G.3.3</td>
<td>3.81</td>
<td>-0.9</td>
</tr>
<tr>
<td>G.4.4</td>
<td>3.43</td>
<td>-0.6</td>
</tr>
<tr>
<td>G.5.5</td>
<td>4.95</td>
<td>-4.1</td>
</tr>
<tr>
<td>G.6.6</td>
<td>-4.43</td>
<td>2.5</td>
</tr>
<tr>
<td>G.7.7</td>
<td>-3.73</td>
<td>-9.0</td>
</tr>
</tbody>
</table>

**Literature**


UČINKOVITOST PLESNOG TRENINGA NA NEKE MOTORIČKE SPOSOBNOSTI PLESAČA NARODNOG PLESA

Sažetak
Cilj rada je bio utvrditi utjecaj sistematskog treninga plesne aerobike na promjenu motoričkih sposobnosti plesača i plesača narodnog plesa-članova ansambla nrodnih pjesama i plesova LADO. U eksperiment je bilo uključeno 15 plesača i 17 plesačica starosne dobi 18-45 godina, koji su bili sposobni za izvršavanje svojih obveza na nastupima i koncertima. Motorički prostor je procijenjen baterijom od 14 testova za procjenu motoričkih sposobnosti, kojima je bio pokriven prostor koordinacije, ritma, ravnoteže, frekvencije pokreta, fleksibilnosti, eksplozivne snage i ukupne snage. Eksperiment je trajao tri godine , mjerenja su bila provedena u 7 vremeniskih točaka. Proces treninga plesnog aerobika je bio precizno planiran te je provođen svakodnevno uz izuzetke nastupa i godišnjih odmora (cca 95 dana godišnje). Faktorskom analizom ekstrahirane su tri latentne dimenzije od kojih je prva definirana prostorom eksplozivne snage, koordinacije i frekvencije pokreta, odnosno dimenzijama za koje je bilo predviđeno da su relevantne za plesnu uspješnost. Diskriminacijskom analizom utvrđene su dvije diskriminacijske funkcije kojima je utvrđena razlika između inicijalnog stanja i prva 4 mjerenja te je utvrđen kvantitativni napredak u sposobnostima frekvencije pokreta, ravnoteže i eksplozivne snage. U zadnjim mjerenjima je došlo do pada razine motoričkih sposobnosti koje je moguće pripisati prije svega padom motiviranosti za mjerenje kod plesača.

Ključne riječi: narodni ples, motoričke sposobnosti, plesna aerobika, plan treninga