

Original empirical article

**BALANCE ABILITY LEVEL AND SPORT PERFORMANCE
IN LATIN-AMERICAN DANCES**

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Abstract. *Our intention is to examine five Latin-American dance couples (10 athletes) by using the FiTRO Sway check stabilographic system (Hamar et al., 1993) for balance ability evaluation of Latin-American dancers and expert evaluation of sport performance in individual Latin-American dances. Research measurements of posture stability after routine and special loading conditions confirm the positive changes in static balance (in the 3rd measurement after the fitness preparation, an improvement of static balance occurred at a significant level ($p < 0.10$) between the 2nd and 3rd measurement), in dynamic balance (improvement after the fitness preparation was statistically significant at the level ($p < 0,01$) between the 2nd and 3rd measurement). The most important findings in our research are the measured values of static balance after the specific loading – five Latin-American dances at the level ($p < 0.01$) between the 2nd and the 3rd measurement. The most significant changes were observed in a measurement after an experiment consisting of a fitness and gymnastics program. This program was added to the fitness preparation of dancers at the expense of special dancing preparation reduction for a period of three months. Improvement of both static and dynamic balance levels was observed as well as dance efficiency enhancement, especially in the criteria "balance".*

Key words: *sport performance, Latin-American dances, balance*

INTRODUCTION

Chren (2005) objectified the physiological loading in sport performance of dancers at international competitions in Latin-American dances. The research sample consisted of two couples with the highest performance class S – upper-advanced. The values of pulse

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frequency during competition were measured using a sport-tester and it was performed only for men due to the aesthetic reasons. The pulse frequency monitoring during the sport performance of dancers indicated that during the official competition the pulse frequency ranged from 189.0 to 206.0 pulses per minute. The highest values were measured during the cha-cha and jive dances and the lowest value was for the rumba. On the basis of lactate in the blood (Chren, 2008), we found that the sport performance in Latin American dances is within the aerobic-anaerobic zone. In such loading, at the end of the dance there was fine coordination loss as well as balance loss which appeared even earlier. When the dancers were able to feel it, it was already visible to the judges. Dařena and Odstrčil (2006) found out that if dance couples do not have a sufficient fitness levels, their performance for 1.5 minutes cannot be of a high quality standard in a number of consecutive competition rounds in all dances.

Competition time from the reel to the finals could last one or two days, which requires high fitness levels and preparedness, strictly speaking, the ability to perform a dance of higher quality for longer time. According to Kostić (2001), it leads to the higher activation of cardiovascular and respiratory systems. The results of the research indicated that certain characteristics do have a significant influence on the successful performance of dance structures (Kostić, Jocić, Uzunović, 1999; Wyon et al., 2006), as well as success at dance competitions (Kostić, Zagorc, & Uzunović, 2004; Uzunović & Kostić, 2005; Uzunović, 2008).

The regular and adequate stimuli contributing to fitness preparation improvement must be included in the training process. However, on the basis of our own knowledge from the sport preparation of dance couples in Latin American dances in the Slovak Republic (Chren, 2008), we found out that only special dance means are used to enhance fitness levels.

Today, according to Komora (2002) and Štiavnický (2004), movement dynamics with fast changes in direction during competition dancing is characteristic for sport performance in Latin American dances. Rhythmical movement changes, unexpected standstills and multiple rotations are typical. Dances must have an optimal level of both static and dynamic balance. According to Strešková (2005), it could be improved with exercises for vestibular apparatus training development, exercises of postural muscles isometric strengthening and complex balance exercises. Strešková, Zemková & Böhmerová (2003) monitored the centre of gravity movement after a specific loading and discovered that the adult representatives in sport gymnastics (six women and four men aged 23 ± 1.4) had better levels of static balance after repeated rolls and 360° turns in hanging headlong from the rings than 38 FTVŠ students of similar age and various sport specializations.

Dinušová (2005) found out, studying the folk dance group Gymnic FTVŠ UK, that ten female dancers in the experimental group with an average age of 16.2, achieved a significant improvement in their vestibular apparatus training level after specific dance and gymnastic stimuli were applied, in comparison to ten female dancers of the control group, who only performed dance preparations. This improvement was manifested in posture stability improvement after the research finalization and consequently in the rotary techniques of individual monitored folk dances.

In addition, Lackovičová (2007) obtained similar results when monitoring 18 dancers of the folk group Lipa (nine women and nine men of aged $20,5 \pm 2,2$). She discovered that dancers had the best posture stability after various stimuli in the solo positions. They had the best indexes of static and dynamic balance after the vestibular apparatus stimulation.

Our research has a pilot study character in Slovakia as we previously have not performed any research on the static and dynamic balance level in Latin American dances.

The aim of our research was to determine the impact of fitness preparation on the level of routine and special efficiency of motion, and primarily, on the sport performance of dance couples in Latin-American dances. This aim we intend to achieve by increasing the general fitness preparation rate at the expense of special dance means of expression rate. We assumed that the means of fitness and aerobic gymnastics, which form the fitness preparation contents in our research group, would be significantly manifested in the static and dynamic balance indicators. Therefore, we expected the improvement would be positively manifested in the expert's assessment of sport performance of dancers in Latin-American dances.

METHOD

Participants

For experimental purposes we created a research group of 10 dancers, i.e. of five Latin-American dance couples. The selected couples were from two dance clubs in Bratislava: Uni-Dance Bratislava and Interklub Bratislava. The period of their active dancing carrier varies from 7-13 years. The dance couples had achieved the performance class B-A-S. The research group consisted of the Latin-American dancers. The age of our dancers was 20.8 ± 2.8 years. The research group body height was: for men 180.1 ± 5.04 cm and for women 163.7 ± 3.44 cm, body weight: for men 73.7 ± 4.97 kg and for women 56.16 ± 5.01 kg. The research implementation and experimental group establishment was fairly problematic in the Slovak dance sport environment, considering the limited number of successfully performing dance couples.

Instruments

In the measurement section of our research (realized as a part of Grant UK/88/2008), we used the FiTRO Sway check stabilographic system (Hamar et al., 1993) to evaluate balance ability of Latin-American dancers. This system provides an exact measurement of the centre of gravity movement using a dynamometric disc. This measurement was used in many sports that require a high level of co-ordination and shows a high validity, Strešková, Zemková, and Böhmerová (2003). Posture stability was recorded with and without a specific loading after five Latin-American dances.

During dynamic balance testing, the stabilographic system FiTRO Sway check was repeatedly used. The system was placed on the balance board with a hemisphere-shaped bottom. For the purpose of result evaluation, we used a special program for stabilographic parameters analysis.

For dynamic balance evaluation we chose the centre of gravity movement speed parameter, measured for 30 seconds.

Expert evaluation of sport performance in individual Latin-American dances was based on the following 8 evaluation criteria: rhythm (timing), balance, technical skill, body alignment and posture, lower limbs dynamics, movement process and dynamics, dance characteristics and artistic skill.

The overall mark of each of the three judges consisted of eight partial marks. The total overall mark for the competing couple was defined as the average of the judges' marks in all five dances. We ensured the reliability evaluation regarding our research purposes by using the so-called *blind evaluation*. It was based on the randomly assigned mark to each dancer and couple without any further information whether it is a DVD recording from the beginning, the process or following the finalization of the experiment.

Experiment Description

A one-group experiment was performed in the original conditions of sport preparation over a six-month period. It was centered on the change in the technical preparation rate as the fitness preparation was missing from the sport preparation of the dancers. The technical preparation was reduced from 100% to 62.5%. From the total amount of hours, 32.5% formed the fitness preparation. Movement contents were comprised of fitness and aerobic gymnastics. They were applied in 36 fitness training units for a total duration of 72 hours.

All measurements of general movement efficiency as well as an expert evaluation of dance efficiency were performed at the beginning of the experiment (1st measurement), after a 3-month dance preparation period without fitness preparation (2nd measurement) and after a 3-month application of the fitness program that was an experimental factor (3rd measurement).

RESULTS

An average value of postural stability (static balance) for all of the dancers in the 1st measurement was 10.80 mm/s. In the 2nd measurement, we found a decrease in comparison to the 1st measurement. The average value for all dancers in the 2nd measurement was 11.39 mm/s. In the 3rd measurement, following the fitness preparation, an improvement in static balance occurred at a significant level ($p < 0.10$), where the average centre of gravity movement speed measured for 30 seconds reached a value of 9.87 mm/s.

In the 2nd measurement no impact of the special dance means of expression on the static balance parameter of the test was found. In fact, a decrease was measured in the parameters observed in the experimental group. In the 3rd measurement we discovered some significant changes in comparison to both the 1st and the 2nd measurement. Regarding the accuracy of the measurements, we could give the opinion that these positive changes in the static balance were an outcome of the application of the gymnastics program. The results for static balance for the 1st, 2nd and 3rd measurement are shown in Figure 1, which represents the average values measured for 30 seconds for all dancers.

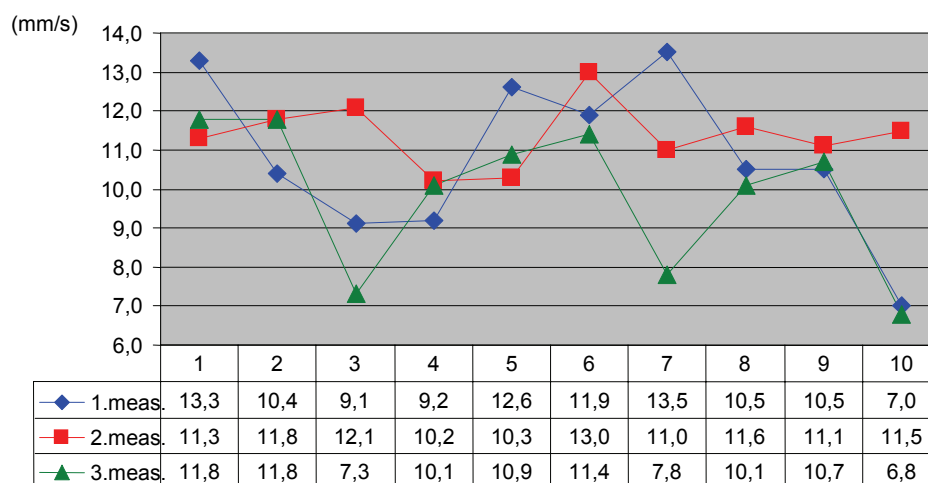


Fig. 1. Average values of centre of gravity movement speed in the test of static balance measured for 30 sec.

On the basis of these results we assume that such a desirable improvement in static balance was a result of the exercises applied within our fitness program.

We agree with Strešková (2005) about the need for exercise for strengthening of the postural muscles that will ensure body position stability in the static position.

At the same time, we think that the obtained values were a result of the high endurance of the vestibular analyzer. The Latin-American dancers in our research group achieved better results in all three measurements of our static balance test than the folk dancers (10 dancers) from the folk group Gymnic FTVŠ UK Bratislava, whose average value in 15 seconds was 12.96 mm/s and 11.47 mm/s (Dinušová, 2005). These findings support the fact that the input values of dancers with mature performance in Latin-American dances are higher than the values of folk group dancers.

In the 1st measurement of dynamic balance, we measured an average value of 187.7 mm/s. In the 2nd measurement there was a slight improvement with an average value of 169.7 mm/s for all dancers. In the 3rd measurement, we observed the lowest average value of 126.10 mm/s for all dancers. The dynamic balance improvement after the fitness preparation was statistically significant on the level ($p < 0,01$) between the 2nd and 3rd measurement and ($p < 0,01$) between the 1st and 3rd measurement. This finding represents a significant improvement in the monitored parameter of dynamic balance and we assume it was a result of the means applied in our fitness program. We would also like to mention the fact that the tendency of positive change in the tests of both static and dynamic balance between the 1st and 3rd measurement was identical. This supports a well-known observation that the static balance level affects the dynamic balance level.

The overall course and differences in the centre of gravity movement speed in the 1st, 2nd and 3rd measurement of dynamic balance are shown in Figure 2, which documents changes in the monitored parameters among individual measurements.

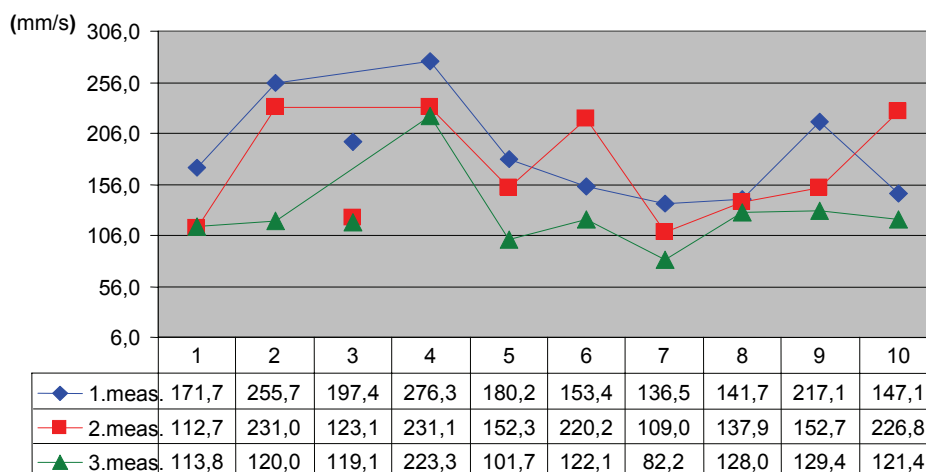


Fig. 2. Average values of the centre of gravity movement speed in the test of dynamic balance

The most important findings in our research are the measured values following the specific loading – five Latin-American dances. It was a simulated competition condition along with the pulse frequency monitoring. Average values of the centre of gravity movement speed were monitored just after the completion of the five Latin-American dances. In the first measurement, the groups' average values for the centre of gravity movement were 19.91 mm/s, in the second measurement the average values of the centre of gravity movement were almost the same. After the fitness preparation, there were some significant changes observed in the third measurement: the value was 15.94 mm/s. This improvement proved to be statistically significant at the level ($p < 0.01$) between the 2nd and the 3rd measurement (before and after the experiment). Accordingly, changes at the level ($p < 0.01$) were also statistically significant between the 1st and the 3rd measurement. Considering that there is no monitoring of posture stability after the specific loading which was represented by five Latin-American dances in the simulated competition, we cannot compare our research results with other authors. We consider this methodology as a contribution which records a subtle accelerating or calming in the breathing and also monitors the isometric body stabilization.

Following the five Latin-American dances and fitness program, a decrease in the posture stability from 19.54 mm/s in the first measurement to 15.94 mm/s occurred, which represents an improvement of 3.60 mm/s. We consider this test suitable for dancers, as the duration of the centre of gravity stability monitoring after 5 dances was 120s. At the same time, the level of training is also measured. The level of training is represented with a faster calm down and a breathing stabilization within 2 minutes.

The highest – maximum value in the 1st measurement was 25.5 mm/s, the lowest – minimum value was 15.5 mm/s. After the 2nd measurement, the lowest value even decreased to 13.8 mm/s; however, the highest value increased to 30.4 mm/s. In the 3rd measurement, the centre of gravity movement speed declined, which could be observed in both the maximum: 23.9 mm/s as well as the minimum value: 13.0 mm/s (Figure 3).

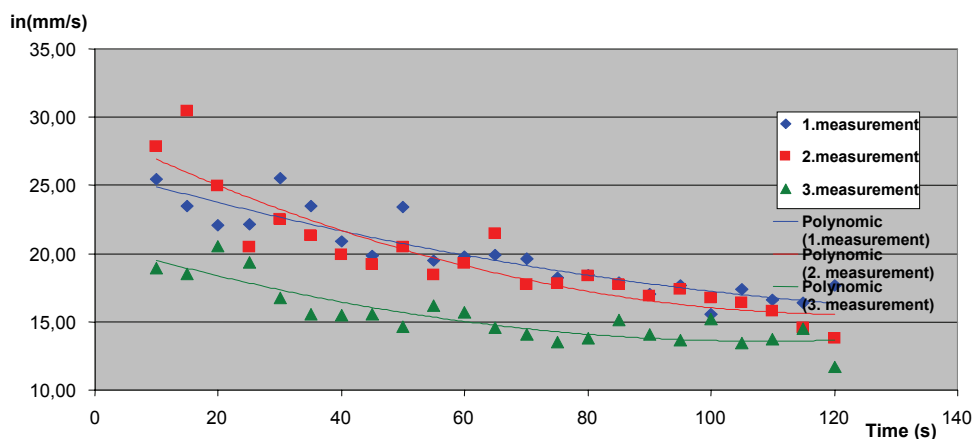


Fig. 3. Centre of gravity movement speed after 5 Latin-American dances

DISCUSSION

We tested an impact of loading conditions on the loss of either balance or subtle coordination in our experimental group using tests of balance after the specific loading. We agree with the opinion of Dařena and Odstrřil (2006) that the balance loss of Latin-American dancers is evident before the dancers could feel it but that it was already obvious to the judges. This balance disruption usually comes at the end of each dance, which has a great impact on the overall movement of the dance couple as well as the decline in the dance technical parameters.

We allow ourselves to declare that the postural stability test measures not only the parameters of balance which is assured by the postural (balance) muscles strength, but that it is also sensitive to the minimum changes of the centre of gravity movement change following accelerated breathing that is a manifestation of the fitness level of anaerobic-aerobic endurance (Chren 2005, 2008).

Postural stability data recorded after five Latin-American dances could be considered as the values in which the individual fitness levels of the experimental group dancers were manifested. We observed some important changes in postural stability following the fitness preparation in the third measurement after the five Latin-American dances. This observation enhances the need of fitness build-up as well as the need for efficiency of the means used in our experiment.

At the same time, these results are in a compliance with the pulse frequency monitoring of a dancer J.P., whose first value in the first measurement after five dances was 193 beats per minute and after a simulated loading in the third measurement, it dropped to 182 beats per minute. Scanned values of pulse frequency for a dancer K.L. were as follows: after the first measurement: 203 beats per minute and after the last dance in the third measurement with the same loading this value dropped to 190 beats per minute.

Pulse frequency monitoring in our research confirms the observations of řtrbová (2002) and Chren (2005) that the performance in a dance competition is anaerobic. We supported this observation also in the entry measurement of lactate after the dancing of five Latin-American dances before the experiment started. The values for our dancers were within the interval of 9.3 to 9.7 mmol.l⁻¹. For dancing five consecutive competitive dances the performance was within the combined aerobic-anaerobic range.

Although neither the monitoring nor the evaluation of pulse frequency levels in five consecutive Latin-American dances were the subject of our research, we present them as a result of individual fitness improvement after our experimental fitness program. Therefore, we document the similarity between the results of improvement in the indicators of postural stability after dancing the five Latin-American dances (1st – 3rd measurement) and the improved values of pulse frequency (1st – 3rd measurement).

Expert evaluation of dance efficiency in five Latin-American dances

The research measurements and the experiment were performed under natural conditions of a dance couples' sport preparation without any interference into the training process. The primary goal of our research was sport practice improvement, a target which basically all research in this area should strive to achieve. We consider the fact that our fitness program contributed to the quality of the sport performance in the individual Latin-American dances in the first place the most important part of our research monitoring, in addition to its contribution to the improvement in the evaluation criteria:

rhythm (timing), balance, technical skills, body alignment and body posture, lower limbs dynamics, dance characteristic and artistic skill. After all, these criteria are critical for success in dance competitions. Therefore, we considered dance efficiency as the backbone of our research.

Our prior concern was whether the changes of performance in the presented dances would be detectable in the international class judges' decisions in Latin-American dances. The couples were not compared to one another, but the performance of each couple was evaluated individually. The judges' evaluation was almost identical. It is affirmed by differences in the assigned values that were not statistically significant.

Results for static and dynamic balance improvement were also expressed in the sport performance evaluation criteria. With respect to the presentation of the results regarding static and dynamic balance improvement, we present only the results for the criteria "balance" in our paper. In the first measurement of this criterion, we observed the highest average value of 2.4. This value consequently decreased in each measurement by an average of 0.3. In the second measurement, the average of all the marks in five dances of the dance couples reached an average value of 2.1. In the third measurement, the marks mean improved to 1.8. The improvement between the first and the third measurement was at a significant level ($p < 0.10$). We point out the fact that the improvement in this balance criterion in all of the dances has the same tendency as was observed in the tests of both static and dynamic balance.

Our prepared and applied fitness program has also positively influenced the specific parameters of dance efficiency, mostly in the performance of individual Latin-American dances, which we presented in another paper (Chren and Strešková, 2008).

CONCLUSION

Our research results confirm the contribution of a fitness program in the sport preparation of Latin-American dance couples. We applied the means of fitness gymnastics, isometric and isotonic strengthening with stretching, jump rope exercises, bosu exercises and dance and fitness aerobic. Our advice is to perform these exercises as the independent training units as well as the fitness units at the end of training. The changes in the technical preparation in proportion to the fitness preparation positively influenced the fitness-coordination components of the dance performance. We observed an improvement in both the static and the dynamic balance parameters. Such positive aspects were consequently manifested in the expert evaluation of dance performance, in the criterion of balance in particular.

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NIVOI SPOSOBNOSTI RAVNOTEŽE I SPORTSKO IZVOĐENJE U LATINO-AMERIČKIM PLESOVIMA

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Naša namera je da pregledamo pet parova Latino-američkih plesača (10 atleta) korišćenjem FiTRO provere njihanja stabilografik sistemom (Hamer et al., 1993) za evaluaciju sposobnosti ravnoteže latino-američkih plesača i izvršimo ekspertsku evaluaciju sportskog izvođenja u pojedinačnim latino-američkim plesovima. Istraživačka merenja telesne stabilnosti nakon izvođenja i specijalni uslovi opterećenja potvrđuju pozitivne promene u statičkoj ravnoteži (u trećem merenju nakon fitnes pripreme, poboljšanje u statičkoj ravnoteži se desilo na značajnom nivou $p < 0.10$ između drugog i trećeg merenja), u dinamičkoj ravnoteži (poboljšanje nakon fitnes pripreme je statistički značajno na nivou $p < 0.01$ između drugog i trećeg merenja). Najvažnije otkriće u našim istraživanjima su merene vrednosti statičke ravnoteže nakon specifičnog opterećenja pet latino-američkih plesova na nivou ($p < 0.01$) između drugog i trećeg merenja. Najznačajnije promene su uočene u merenju nakon eksperimenta koji obuhvata fitnes i program gimnastike. Ovaj program je dodat u fitnes pripremu plesača na štetu redukcije specijalnih priprema plesača u periodu od tri meseca. Poboljšanja i u statičkim i dinamičkim nivoima ravnoteže su uočeni kao i poboljšanja efikasnosti plesa, posebno u kriterijumu "ravnoteže".

Ključne reči: *sportsko izvođenje, latino-američki plesovi, ravnoteža*