

Damir Sekulić*
Gordana Furjan-
Mandić**
Miran Kondrić***

INFLUENCE OF STEP AEROBICS TRAINING PROGRAMME ON CHOSEN DIMENSIONS OF MORPHOLOGICAL STATUS IN MALES

VPLIV TRENAŽNEGA PROGRAMA STEP AEROBIKE NA NEKATERE RAZSEŽNOSTI MORFOLOŠKEGA STATUSA MOŠKIH

(Received: 28. 03. 2000 – Accepted: 27. 06. 2001)

Abstract

The aim of the research was to establish the transformational effects of step aerobics programme on selected morphological parameters among 26 male subjects, participants of the programme. The programme consisted of 25 step aerobics training sessions and lasted for nine weeks. The subject of analysis was changes in four variables concerning the thickness of skin fold and four circumferences of corresponding parts of the body. Multivariate analysis of variance revealed a satisfying level of significance of differences in morphological dimensions, which can be represented by noteworthy changes in two selected variables (abdominal skin fold and thigh skin fold). We assume that changes in circumferences of selected body parts did not reach the satisfying level of significance because of minor muscle hypertrophy, which compensated the decrease caused by reduction of the subcutaneous fatty tissue.

Key words: step aerobics, males, morphology, programme, transformational effects

Izveček

Z raziskavo smo ugotavljali vpliv programa step aerobike na posamezne morfološke mere. Vzorec je predstavljalo 26 merjencev, ki so sodelovali v programu. Vadba je obsegala 25 vadbenih enot step aerobike, ki so jih merjenci izvajali v obdobju devetih tednov. Analizirane so spremembe na štirih spremenljivkah za oceno ugotavljanja količine podkožnega maščevja in štirih pripadajočih obsegov telesa. Multivariatna analiza variance je pokazala ustrezno raven značilnosti nastalih sprememb v morfološkem prostoru, kar je vidno iz ugotovljenih statistično značilnih sprememb na dveh posameznih spremenljivkah (kožna guba trebuha in kožna guba stegna). Domnevamo, da spremembe obsegov izbranih delov telesa niso bile statistično značilne zaradi blage hipertrofije mišičevja, kar je v meri obsegov nadomestilo izgubo, ki je povzročena z zmanjšanjem velikosti kožnih gub.

Ključne besede: step aerobika, moški, morfologija, vadba, program, spremembe

*University of Split – Faculty of Natural Sciences, Mathematics and Education, Split, Croatia

** University of Zagreb – Faculty of Physical Education, Zagreb, Croatia

*** University of Ljubljana, Faculty of Sport, Ljubljana, Slovenia

Contact address

Damir Sekulić
 University of Split – Faculty of Natural Sciences, Mathematics and Education, Split, Croatia
 Teslina 12
 HR-21000 SPLIT
 Phone: +385 21 385 102
 Fax: +385 21 385 431
 E-mail: damir.sekulic@yahoo.com

INTRODUCTION

Nowadays modern aerobics is one of the most popular organised forms of recreational exercising. One of the reasons of fast development of this sports-recreational activity is undoubtedly a vast variety of its forms (Metikoš, Zagorc, Prot, Furjan-Mandić, & Zaletel, 1997; Zagorc, Zaletel, & Ižanc, 1996). Despite the discrepancies, existing forms of aerobics can in the first place be characterised by possibility of relatively precise dosing the effort that is of basically aerobic or slightly anaerobic intensity (Williford, Scharf-Olson, & Blessing, 1989; Sekulić, 1995, 1997, 1999). Work intensity of this kind enables relatively long and discontinued training that, besides the content of the training and realisation of earlier defined intensity, is the main precondition for reaching the already confirmed results of this kind of activity, which among others include:

- Enhancement of the efficiency of respiratory system – increased oxygen uptake (Berry, Cline, Berry, & Davis, 1992; Williford et al., 1998);
- Changes in the body structure – decrease of subcutaneous fatty tissue (Thomsen, & Ballor, 1991).

Most of the researches however concentrate on the influence of different kinds of aerobics on women, particularly young ones (McCord, & Patterson, 1989) and on elderly participants (Shimamoto, Adachi, Takahashi, & Tanaka, 1998). Remarkably, a small number of studies deal with the programme of aerobic created for male subjects (Scharff-Olson, Williford, Blessing, & Brown, 1996). Therefore the amount of information about potential effects of different kinds of aerobics on male participants is insufficient. The source of this situation lies in the fact that most of the population taking part in such kinesiological programmes are women. Nevertheless, the growing number of men participating in various forms of aerobics elicits the need of exploring the transformational effects of these programmes also on the male population.

Aims of the Research

The aim of the research was to analyse the quantity and quality of changes that appeared as an effect of the training programme of still more popular, in Croatia as in the world, step aerobics, in male participants of the programme. Analysis of the anthropometrical - morphological characteristics involved four variables concerning the circumferences of body parts and four variables of the thickness of skin fold in corresponding areas.

METHODS

Sample of subjects

The sample consisted of 26 male students of Faculty of Technical and Mathematical Sciences, and Peda-

gogy of University in Split, Croatia, aged 20 in the average. All subjects were in good health condition.

Sample of variables

Experiment included the analysis of changes in four variables estimating the amount of subcutaneous fatty tissue and four variables estimating the circumferences of selected parts of the body («Morphological anthropometrics in sport», Mišigoj-Duraković, 1995) such, as:

1. Upper arm skin fold –AKNN
2. Abdominal skin fold –AKNT
3. Thigh skin fold –AKNAT
4. Calf skin fold –AKPO
5. Upper arm circumference (relaxed) –AOPN
6. Abdominal circumference –AOPT
7. Thigh circumference –AONT
8. Calf circumference –AOPOD

Course of experiment

Before the training programme started, the subjects had taken part in initial measurement of analysed variables.

After the initial measurement, the training process has started. Programme consisted of 25 training sessions scheduled three times a week and lasted for 9 weeks. First 30 to 35 minutes out of each 60-minutes-long-training were prescribed for the classic step cardio programme (average heart rate value in this part of the training was 155 beats per minute). This part of the training was followed by 15-minutes-long power training of separate parts of the body (three minutes for each listed part: abdomen, legs, loin area of the back, hands and shoulder girdle). Each session at its end included a stretching programme (5 to 10 minutes). The final testing had taken place after the completion of all 25 trainings. Final measurement included the same variables as the initial.

Methods of data processing

To attain the exact indicators of changes in the period between the initial and final testing, data gathered during the two measurements were processed by following statistical procedures:

1. Estimation of descriptive statistical parameters from initial and final measurement (arithmetical mean, standard deviation, minimal and maximal results of measurement);
2. Multivariate and univariate analysis of variance of the results of initial and final measurement.

RESULTS

Table 1.: Descriptive statistical parameters of initial and final measurement

| Variable | Initial measurement | | | | Final measurement | | | | MANOVA |
|----------|---------------------|------|-------|------|-------------------|------|------|------|--------------------------------|
| | mean | min | max | SD | mean | min | max | SD | |
| AKNN | 6.13 | 3.47 | 10.33 | 2.07 | 6.09 | 3.8 | 9.6 | 1.94 | Wilks Lambda = 0.1 P = 0.04 |
| AKNT | 8.45 | 5.13 | 14.8 | 2.77 | 6.8*** | 4 | 10 | 1.96 | |
| AKNAT | 10.21 | 4.8 | 18.27 | 3.36 | 9.54* | 4.8 | 16.4 | 2.99 | |
| AKPO | 10.06 | 5 | 16.93 | 3.4 | 9.78 | 4.6 | 14.6 | 2.9 | |
| AOPN | 29.7 | 25.6 | 36.4 | 2.87 | 28.8 | 25.5 | 31.7 | 1.83 | |
| AOPT | 78.92 | 72.3 | 86.4 | 3.47 | 78.09 | 71.9 | 83.6 | 2.81 | |
| AONT | 54.55 | 49.3 | 60.2 | 3.98 | 55.19 | 49.7 | 61 | 3.21 | |
| AOPD | 36.93 | 33.3 | 41 | 2.91 | 36.67 | 32 | 40.6 | 2.61 | |

Legend: Mean - arithmetic mean;

Min - minimal result;

Max - maximal result;

SD - Standard deviation

Multivariate analysis of variance (Wilks Lambda, statistical significance – p)

Univariate analysis of variance (**p=0.00; *p < 0.05)

Figure 1.: Graphic presentation of results distribution (Min – Max) and arithmetical mean for analysed variables

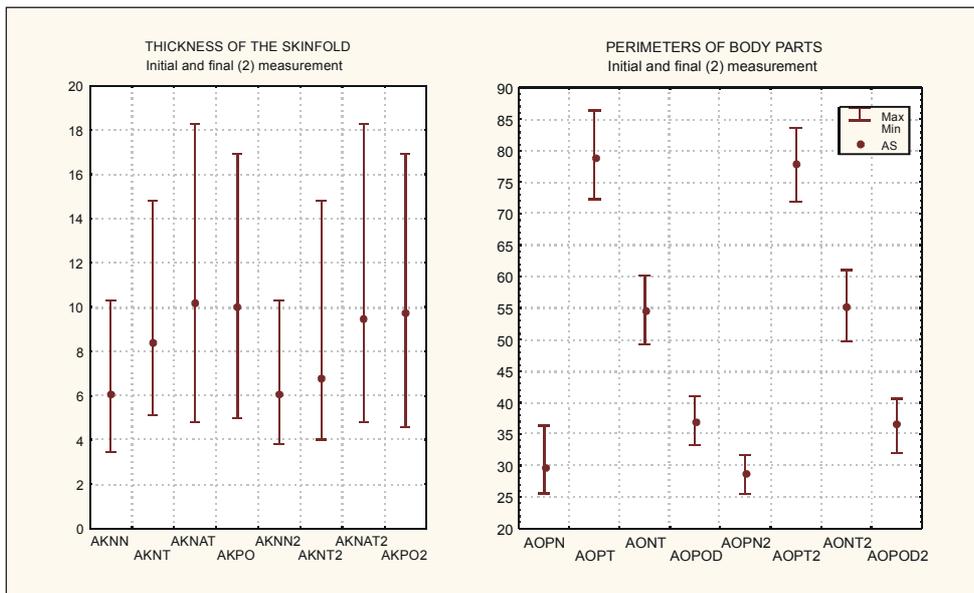


Table 1 and Figure 1 present the results obtained during initial and final measurement on the chosen sample.

Analysing the global degree of changes by multivariate analysis of variance (MANOVA) we can estimate the level of statistical significance (Wilks Lambda = 0.1 at $p = 0.04$) as satisfying. Therefore we can conclude that the step aerobics programme caused significant changes in anthropometrical characteristics of the subjects.

Univariate analysis of variance revealed two significant changes in the thickness of the skin fold: abdo-

minimal skin fold – AKNT ($p = 0.00$) and thigh skin fold – AKNAT ($p = 0.05$). In case of both variables a considerable decrease was observed. There were no statistically significant changes (neither decrease nor increase) in any other analysed variable.

Considering the results from Table 1 and Figure 1, we can notice an inconsistency in changes of circumference. For instance, in case of variable »abdominal circumference« we can observe a slight decrease of numeric value of arithmetical mean between the initial and final testing (from 78.92 to 78.09) and also considerable decrease of maximal result of the mea-

surement (from 86.4 to 83.6). We can conclude that the state of the subjects with the highest values of abdominal circumference changed the most significantly in direction of the decrease of the value.

In case of the thigh circumference – AOPN, we can observe the opposite trend. In spite of no statistical significance of differences, we can notice the growth of numeric value of arithmetical mean and also of minimal and increase of maximal results of initial and final measurement, although, considering statistically significant decrease of the skin fold value in the same body area – AKNAT, it was hard to expect. Similar illogical transformations can be observed also in other analysed variables (e.g. calf).

DISCUSSION

The interesting fact is that we could not observe any noticeable changes among any of the variables concerning the circumference of body parts, although they could be expected taking into account changes of the thickness of the skin fold in selected body areas.

We assume that the reasons of this phenomenon may be as follows: Step aerobics exerts a positive influence on the reduction of the quantity of subcutaneous fatty tissue among the participants of the programme. This fact is confirmed by current as well as earlier researches that were carried out mostly on women (Kravitz, Cisar, Christensen, & Setterlund, 1993). Changes can be represented by decrease of skin fold value in selected parts of the body. Meanwhile, the functional loading of certain muscle groups (mainly the legs) causes possible minor hypertrophy in chosen areas. Therefore, because of simultaneous reduction of subcutaneous fat and growth of muscle tissue, we cannot notice statistically significant changes of neither direction, among the variables concerning the circumference of the body parts.

On the base of obtained results we can conclude that step aerobics programme induced in students – participants of the programme, a positive transformation in the form of decrease of subcutaneous fat. Statistically significant changes were observed in the variables concerning the parameters of abdominal skin fold and thigh skin fold. There were no significant changes among the variables concerning the circumference of selected parts of the body. We can speculate that the problem lies in simultaneous decrease of skin fold values and mild hypertrophy of the muscles in same body areas, which is the reason for relatively steady circumference values in analysed body parts.

CONCLUSIONS

The aim of current research was to establish the significance of changes in anthropometrical measures of

circumference and skin fold in selected body areas, under the influence of 25 step aerobic training sessions conducted during nine weeks.

Multivariate analysis of variance revealed sufficient statistical significance of differences between the initial and final measurement of variables of morphological – anthropometrical status. Hence it proved the positive transformational effects of the step aerobics programme.

Univariate analysis of variance exposed satisfactory significance of two variables of skin fold estimation (abdominal skin fold and skin fold of the thigh). The reason of relatively small number of single significant differences probably lies in insufficient duration of the experiment. This assumption can be supported by the fact that that the studied sample consisted of male students, who have relatively small skin fold parameters in contrast to females – main subjects of comparable researches (Williford et al., 1989; Kravitz et al., 1993; Shimamoto et al., 1998).

Considering the changes in the circumference of chosen parts of the body we can notice a total lack of significance of differences in single variables. We assume that during the course of the training programme the functional loading in analysed areas caused slight temporary hypertrophy. Because of simultaneous decrease of the skin fold thickness, the significant changes among the analysed variables of circumference cannot be noticed.

REFERENCES

- Berry, M.J., Cline, C.C., Berry, C.B., & Davis, M. (1992). A comparison between two forms of aerobic dance and treadmill running. *Medicine and Science in Sports and Exercise*, 24(8), 946-951.
- Mc Cord, P., & Patterson, N.P. (1989). The effect of low impact dance training on aerobic capacity, submaximal heart rates and body composition of college-aged females. *Journal of sports medicine and physical fitness*, 29(2), 184-188.
- Metikoš, D., Zagorc, M., Prot, F., Furjan-Mandić, G., & Zaletel, P. (1997). Rasprava o mogućim činiteljima razvoja suvremene aerobike. [A discussion about possible factors of development of the modern aerobics]. In *Proceedings of scientific - expert convention »Modern Aerobics«* (pp. 4–19). Zagreb: Faculty of Physical Education.
- Mišigoj–Duraković, M. (1995). *Morfološka antropometrija u sportu* [Morphological anthropometrics in sport]. Zagreb: Faculty of Physical Education.
- Kravitz, L., Cisar, C.J., Christensen, C.L., & Setterlund, S.S. (1993). The physiological effects of step training with and without hand-weights. *Journal of Sports Medicine and Physical Fitness*, 33(4), 348-358.
- Scharff-Olson, M., Williford, H.N., Blessing, D.L., & Brown, J.A. (1996). The physiological effects of bench/step exercise. *Sports Medicine*, 21(3), 164-175.
- Sekulić, D. (1995). *Procjena nekih indikatora energetske opterećenja kod izvođenja kretnih struktura u step aerobiku* [Evaluation of chosen indicators of energy work-load during the performance of movement structures in step aerobics]. Unpublished Bachelor's thesis. Faculty of Physical Education, Zagreb, Croatia.

8. Sekulić, D. (1997). Procjena nekih indikatora energetske opterećenja kod izvođenja kretnih struktura u power-step aerobiki. [Evaluation of chosen indicators of energy work-load during the performance of movement structures in power-step aerobics]. In *Proceedings of international scientific - expert convention »Modern Aerobics«* (pp. 118 – 121). Zagreb: Faculty of Physical Education.
9. Sekulić, D. (1999). *Utjecaj različitih oblika aerobike na promjene nekih antropoloških obilježja vježbača i vježbača* [Influence of different forms of aerobics on selected anthropometrical characteristics in male and female participants]. Unpublished Master's thesis. Faculty of Physical Education, Zagreb, Croatia.
10. Shimamoto, H., Adachi, Y., Takahashi, M., & Tanaka, K. (1998). Low impact aerobic dance as a useful exercise mode for reducing body mass in mildly obese middle-aged women. *Applied Human Science*, 17(3), 109-114.
11. Thomsen, D., Ballor, D.L. (1991). Physiological responses during aerobic dance of individuals grouped by aerobic capacity and dance experience. *Research Quarterly of Exercise and Sport*, 62(1), 68-72.
12. Williford, H.N., Scharff-Olson, M., & Blessing, D.L. (1989). The physiological effects of aerobic dance. A review. *Sports Medicine*, 8(6), 335-345.
13. Williford, H.N., Richards, L.A., Scharff-Olson M., Brown, J., & Blessing, D., Duey, W.J. (1998). Bench stepping and running in women. Changes in fitness and injury status. *Journal of Sports Medicine & Physical Fitness*, 38(3), 221-226.
14. Zagorc, M., Zaletel, P., & Ižanc, N. (1996). "Aerobika" [Aerobics]. Ljubljana: Faculty of Sport.