

NEW DANCE PROGRAMME AND BALANCED NUTRITION FOR CIVILISATION DISEASE PREVENTIONLUCIA MIKUŠOVÁ¹ - MIROSLAV BOBRÍK² - LUCIA ONDRUŠOVÁ² - ERNEST ŠTURDÍK¹¹Department of Nutrition and Health Assessment²Department of Physical Education

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ABSTRACT

Regular physical activity and a nutritionally balanced diet are recommended as a cornerstone of a healthy and high quality life. Since adherence to an exercise programme on a regular base is often problematic, a new dance programme Bellylatinofit, based on steps from popular latin and oriental dance, was designed. The effectiveness and health beneficial potential of the programme was tested together with nutritionally balanced diet and cereal fibre drink consumption in a 4 month long intervention study. The study group was created from women in the age 19-34 years, healthy, non smokers with body fat percentage above 29%. They were assigned into 3 intervention groups: Bellylatinofit, Bellylatinofit + Diet, Diet and a Control group. Bellylatinofit, a moderate intensity dance exercise, was attended three times a week (75 min. lessons). After 4 month of dance intervention, a trend in improvement of lipid parameters such as total and LDL cholesterol decrease was seen, although it was not statistically significant compared to a control group. A significant decrease was seen in the total weight, WHR and BMI index ($p < 0.05$). Moreover, the incorporation of nutritionally balanced diet and cereal fibre drink consumption had a synergic effect on most evaluated parameters, including total and visceral fat mass loss and atherogenic index decrease ($p < 0.01$).

Acknowledgement: The work was supported by The Agency of the Ministry of Education, Science, Research and Sport of the SR for the Structural Funds in the frame of the Project ITMS 26240220040, by the APVV under the contract No. VMSP-II-0024-09 and by the young STU researchers grant No. 1324. Authors would like to thank Essentia, Ltd. Company for producing Actiglucane fibre drink and Mgr. Martin Križan, PhD. for his help with EUROFIT tests.

Key words: dance programme, prevention, nutrition, intervention study

INTRODUCTION

Regular physical activity and a nutritionally balanced diet are regarded as cornerstones of a healthy and high quality life. Adherence to an exercise programme on a regular basis is often low, which is the reason why the effect of physical activity is not seen in many intervention studies (Mikušová et al., 2009). Therefore, a new dance programme called "Bellylatinofit", based on steps from popular Latin and Oriental dance, was designed. The effectiveness and potential health benefits of the programme was tested together with nutritionally balanced diet (adaptation period). To enhance the effect of the healthy diet, a cereal fibre drink which increases satiety and reduces hunger (Mikušová et al., 2011), was implemented during the main part of the intervention study.

METHODS**Participants and experimental study design**

Potential female participants aged between 19 and 34 were recruited through flyers and study presentations. Eligible subjects were screened for body fat percentage and questionnaires were filled out to check their medical history. 30 generally healthy women (age: ~28.7 yrs; height: ~171.0 cm; weight: ~79.3 kg; BMI: ~27.0 kg/m²) with higher body fat percentage (<29%) were chosen to participate in the study. Additional inclusion criteria were: interest in regular exercise activity (dance), no smoking and no intake of medication that could affect analysed variables. Participants were divided into two groups – dance exercise (E) and dance exercise with diet intervention (DE). Participants, who were personally motivated to change their eating habits during the study, were assigned to the DE group. Due to the fact that no statistically significant changes in anthropometric or biochemical baseline parameters were observed between all participants, it was assumed that no inaccuracy was caused by avoiding randomisation of the participants. In addition to the two groups mentioned above, a third group called the control group (C) was created, comprising of ten women of the same age, but with normal body fat percentage (<26%), adherence to healthy lifestyle and regular physical activity for more than one year. E group was instructed not to change their eating habits and C group was advised not to change their lifestyle at all. The four month long study period was divided into two parts- preparation part (dance exercise; plus diet counselling in DE group) and main part of the study, where cereal fibre drink was included into the diet regime of DE group to enhance the effect of nutritionally balanced diet, while exercise regime remained unchanged. Before participation, volunteers were fully informed of the nature and purpose of the study and signed a written informed consent. The experimental protocol was approved by a local ethic committee, and all subjects were found to be diseases free according to physical examinations, medical history and laboratory testing (performed in Slovak Medical University (SMU), Bratislava).

Dance classes "Bellylatinofit"

Both intervention groups (E, DE) attended, three times a week, 75 minutes long dance classes called Bellylatinofit (moderate aerobic dance exercise combined with short strength training at the end of the class) under dance instructor supervision. The dance program was aimed not only to reduce body fat, but also to improve coordination, strength, flexibility and general physical fitness level of participants. Bellylatinofit class was divided into: 10 minutes of warm-up including stretching, rotation, and isolation moves; 45 minutes of main dance part (steps from Oriental and Belly dance, Cha-cha, Merengue, Salsa, Samba, Bollywood and Mambo); end of the class consisted of short strength training (10 minutes) and cool down, relaxation and stretching (10 minutes). Since the participants were all overweight; dance exercise was adjusted to their baseline physical fitness level and was designed to be regardful to their joints. Music tempo used in the dance part of the class was at an average of 134 beats per minute. Dance steps and moves were easy to follow with visual and spoken instructions and technically not difficult in order to ensure active subjects participation without difficulties.

Diet protocol

E and C group participants were instructed not to change their eating habits at all. Random diet record analyses were performed to prove the compliance with the instructions. Subjects of DE group underwent dietary counselling; consisting of one group meeting session every two weeks and one individual counselling per month. They were instructed and encouraged to achieve nutritionally balanced diet by lowering consumption of high energy and high saturated fat food, enhancing consumption of fruit and vegetables, including whole grain cereal food instead of a refined one, as well as controlling their daily portions (size plus frequency). Food records were collected electronically each week, where the most representative "good and bad" day (evaluated subjectively) was tagged to check a compliance with the diet regime. Diet analyses were completed using nutrition software Alimenta (Institute for Food Research, Bratislava, Slovak Republic).

After first two months, cereal fibre drink called Actiglucane was added into the diet of DE group, to enhance the effect of nutritionally balanced diet by its satiating ability. The tested drink was prepared in two flavours (apple and pineapple) by Essentia, Ltd Company, (Banská Bystrica, Slovak Republic), according to their own recipe. Actiglucane (average composition of basic nutrients/daily dose: 0.6g proteins, 0.1g fats, 30.2g sugars, 3.2g dietary fibre, 111 kcal) (Mikušová et al., 2012) was consumed twice a day, added to a midmorning and afternoon snack. The daily dose (2 x 45g of concentrate diluted in 250-500 ml of water) comprised of 3g β - of glucan fibre, which is a minimal effective dose for cardiovascular disease prevention by lowering total and maintaining LDL cholesterol (EFSA, 2011).

Anthropometric and biochemical analysis

For all anthropometric measurements a direct segmental multi – frequency bioelectrical impedance method was used (body composition analyser In body 230, Biospace Ltd., USA). Subjects were asked to fast and restrain from the use of intense physical activity for 12 hours prior to the examination. Upon the arrival in the SMU at 7.00 AM, blood samples were drawn from antecubital vein (main part of the study only) and analysis of body composition, using In Body analyser, was done (both parts of the study). The anthropometric measurements were repeated after the completion of both study parts (every 8 weeks). Blood analyses were repeated after completion of the main study part. Biochemical analyses of lipid profile, such as triglycerides, total and HDL cholesterol and VLDL were performed using standard laboratory methods on an automatic analyser Vitros 250 (Johnson & Johnson, USA). LDL cholesterol was calculated according to Friedewald formula (Friedewald et al., 1972). Atherogenic index (cardiovascular risk parameter) was calculated as a ratio of total cholesterol and HDL cholesterol (Krajcovicova-Kudlackova, et al., 2004).

Physical fitness measurements

EUROFIT tests (physique and motor fitness tests for adults), designed to objectively compare the level of health-related fitness and to assess the impact of exercise programs were conducted before, in the middle and at the end of the study. Modified versions of Flamingo balance test (single leg balance test with closed eyes and use of a beam), Sit-and-Reach flexibility test (with zero mark placed 15 cm above the feet level), Sit- Ups in 60 seconds and 20 m endurance shuttle run test were evaluated (Moravec, et al., 2002).

Statistical analyses

All analyses were performed using Statgraphics software for Windows 3.0. Normality of data was tested using Kolmogorov-Smirnov test as a goodness of fit test. Paired student's t-test was used to compare significance of the change before and after the treatment for each parameter in all groups. One-way ANOVA and multiple range tests were used for each parameter to test the specific differences between the groups.

RESULTS

Anthropometric parameters of participants from both intervention groups such as weight, fat mass, body mass index (BMI), and waist to hip ratio (WHR) were monitored before the study, after the adaptation period, as well as after main part of the study. The achieved changes are summarized in the Table 1.

Table 1 Anthropometric parameter changes in the study population after first 2 months (preparation part- diet and dance exercise regime adaptation) and second 2 months (main part- addition of the β - glucan fibre drink into the diet of DE group) of the study

Baseline difference	after first 2 months		after second 2 months	
	DE group	E group	DE	E group
Δ Weight (kg)	-0.4 \pm 0.5	-1.1 \pm 0.5	-2.6 \pm 0.5*	-1.5 \pm 0.5*
Δ Fat mass (kg)	-0.6 \pm 0.7	-1.3 \pm 0.4*	-2.5 \pm 0.7*	-1.0 \pm 0.4
Δ Visceral fat area (cm ²)	-2.6 \pm 2.0	-3.4 \pm 2.1	-9.5 \pm 1.1*	-5.5 \pm 3.0
Δ Body mass index (kg/m ²)	-0.13 \pm 0.17	-0.38 \pm 0.18	-0.88 \pm 0.16*	-0.48 \pm 0.16*
Δ Waist to hip ratio	0.000 \pm 0.004	-0.001 \pm 0.002	-0.011 \pm 0.003*	-0.009 \pm 0.003*

DE group- nutritionally balanced diet/ plus cereal fibre drink with BLF exercise (moderate intensity dance exercise „Bellylatinofit“); E group – BLF exercise without any diet regime change; *statistically significant difference at the 95% confidence level (paired student's t-test)

Adaptation to the dietary regime (nutritionally balanced diet) and/or Bellylatinofit dance programme alone (8 weeks) didn't show significant differences in the main anthropometric parameters except for the fat loss of 1.3 \pm 0.4 kg achieved in the E group. The addition of cereal β -glucan fibre drink into the diet of DE group caused changes in the dietary intake of participants. Significant drop was seen in the total fat consumption which resulted into reduced 24 hours energy intake in the main study part (Table 2). No changes in the diet composition were observed in E and C group during the whole study (data not shown).

Table 2 Diet composition changes in the DE group during 4 month study period

Diet composition changes (baseline difference)	DE (pp)	p (pre/post)	DE (mp)	p (pre/post)
	after first 2 months		after second 2 months	
Δ Protein (g/day)	-0.6	0.655	-26.6	0.068
Δ Carbohydrate (g/day)	7.2	0.646	-45.9	0.163
Δ Total fat (g/day)	8.8	0.373	-24.0	0.017
Δ Dietary fibre (g/day)	-2.9	0.809	0.8	0.806
Δ Energy (kcal/day)	174	0.383	-268	0.049

DE (pp)- preparation part of the study (first 2 months)- participants were advised to: avoid high fat food and sweets, control size and frequency of portions, and include whole grain cereal food instead of a refined one; DE (mp)- main part of the study (second 2 months)- fibre drink was included into the balanced diet, added twice a day to a midmorning and afternoon snack; exercise regime (moderate intensity dance „Bellylatinofit“) was constant throughout the 4 month period; p- paired student's t-test

Regular exercise and consumption of high β -glucan cereals is related with beneficial effects on blood lipid profile. The lipid variables differences during the main part of the study - 2 months intervention of nutritionally balanced diet, Actiglucane consumption and Bellylatinofit dance programme are shown in Figure 1.

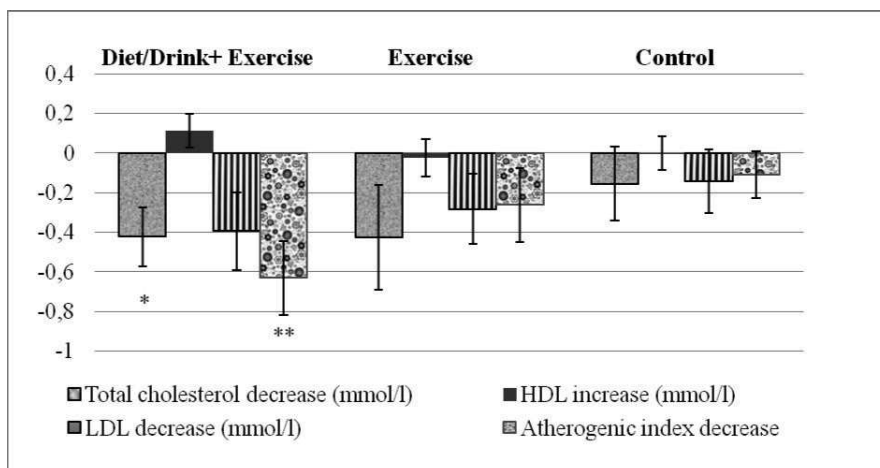


Figure 1

Changes in lipid profile during the main study part. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (significant changes before and after intervention)

Atherogenic index, known also as total cholesterol to HDL ratio, which is an important cardio-vascular disease risk factor, did differ significantly in the DE group compared to the control group (C). No statistically significant difference was seen between DE vs. E and E vs. C itself at the 95% confidence level.

The EUROFIT Test Battery has been developed for the purpose of evaluating health-related physical fitness. Implementation of Bellylatinofit dance programme was aimed not only to reduce the body fat but also to improve the general fitness level of participants, including strength, coordination, endurance and flexibility. Changes during the study in all the mentioned components are shown in the Table 3.

Table 3 Changes in participants' physical fitness level using EUROFIT tests, covering balance, flexibility, strength, speed and endurance; difference is shown after each part of the study

Eurofit testing battery (baseline change)	Preparation part (2 months)		Main part (2 months)		Whole study (4 months)	
	E	DE	E	DE	E	DE
ΔFlamingo balance test (No. ¹)	1.4	-1.6	-1.8	0.2	-0.4	-1.3
ΔSit-Ups in 60 seconds (No. ²)	1.8	2.9	0.5	4.4*	2.3	7.3*
ΔSit-&-Reach flexibility test (cm)	2.8*	2.1	4.3*	3.4*	7.1*	5.4*
Δ20m endurance shuttle run (No. ³)	0.1	2.1*	0.1	-1	0.3	1.1

1-the total number of falls or balance losses plus one (number of tries to keep balance) during 60 seconds; 2 – DE group- nutritionally balanced diet/plus cereal fibre drink with BLF exercise (moderate intensity dance exercise „Bellylatinofit“); E group– BLF exercise without any diet regime change; * statistically significant difference at the 95% confidence level (paired student's t-test).

The score of Flamingo test (evaluation of motor fitness) did not change after completion of the study. Significant increase was recorded in number of performed sit-ups in DE group in the main part of the study as well as in the whole study (after 4 months). Significant improvement in flexibility measured by sit-and-reach test of both dance intervention groups was noticed in the main intervention part and after the whole study completion. Functional capacity observed via endurance shuttle run test was significantly improved in the first two months in DE group. No change was observed in other periods and in E group.

DISCUSSION

Evaluating the results from anthropometric measurements in the adaptation period of the study, the two month long dietary counselling combined with dance exercise is not efficient enough to achieve statistically significant changes in DE group. Implementations of cereal fibre drink led to a significant drop of fat consumption (37 %) and a decline in 24 hours energy intake (12%) of a DE group as well as an increase of the fibre consumption, which was below the daily recommended intake at the beginning of the study. Dance programme alone led to the changes in fat mass (first two months), and total weight decrease, reflected in BMI and WHR (second two months). Four month long regular dance intervention resulted in significant fat decrease (-1.8%) and WHR drop (-0.01), positively influencing the body shape of participants, and playing a notable role in the obesity prevention. A decreasing trend was seen in lipid profile variables of E group such as total, and LDL cholesterol, although these changes were not statistically significant most probably due to the short duration of the intervention and small experimental group. Implementation of the cereal fibre drink into the balanced diet coupled with regular dance exercise had synergic effect in the modulation of blood lipids, resulting in the decrease of total cholesterol, well reflected in atherogenic index drop, which is an important factor for cardiovascular prevention. Moreover, regular exercise positively influenced the physical fitness of participants such as abdominal muscles endurance and flexibility of the trunk and lower part of the body. Increase of the functional capacity was noticed only in the first two months, which might be due to the lack of air-conditioning in the sport hall where the shuttle run tests were performed (+10 degrees at the end of the study). Subjective perception of physical fitness level (asked in short questionnaires) was evaluated as "improved" in the majority of the dance programme participants.

CONCLUSIONS

After 4 month of dance intervention, significant decrease of fat mass, BMI and WHR indices was achieved. A trend in improvement of lipid parameters such as total and LDL cholesterol was seen, although it was not statistically significant compared to a control group. Significant improvement was observed in the flexibility of the trunk and lower part of the body as well as the endurance of the abdominal muscles. Moreover, the incorporation of nutritionally balanced diet and cereal fibre drink into the diet had a synergic effect on most evaluated parameters, including total and visceral fat mass loss, cholesterol and atherogenic index, playing an important role in the obesity and cardiovascular disease prevention.

REFERENCES

- EFSA Panel on Dietetic Products, N. a. A. (2011). Scientific Opinion on the Substantiation of Health Claims Related to Beta-Glucans from Oats and Barley and Maintenance of Normal Blood Ldl-Cholesterol Concentrations (Id 1236, 1299), Increase in Satiety Leading to a Reduction in Energy Intake (Id 851, 852), Reduction of Post-Prandial Glycaemic Responses (Id 821, 824), and "Digestive Function" (Id 850) Pursuant to Article 13(1) of Regulation (Ec) No 1924/2006. *EFSA Journal* 9, 21pp.
- Friedewald, W. T., Levy, R. I. and Fredrickson, D. S. (1972). Estimation of the Concentration of Low-Density Lipoprotein Cholesterol in Plasma, without Use of the Preparative Ultracentrifuge. *Clin Chem*, 18, 499-502.
- Krajcovicova-Kudlackova, M., Blazicek, P., Spustova, V., Valachovicova, M. and Ginter, E. (2004). Cardiovascular Risk Factors in Young Gypsy Population. *Bratisl Lek. Listy*, 105, 256-259.
- Mikusova, L., Penesova, A., Valachovicova, M., Holubkova, A., Mikus, L. and Sturdik, E. (2012). Cereal B-Glucan Fibre Drink as a Part of Nutritionally Balanced Diet Alters Lipid Profile: An Intervention Study. *Asian Journal of Plant Sciences*, 11, 153 -156.
- Mikušová, L., Šturdík, E. and Holubková, A. (2011). Whole Grain Cereal Food in Prevention of Obesity. *Acta Chimica Slovaca*, 4, 95-114.
- Mikušová, L., Šturdík, E., Mošovská, S. and Bobřík, M. (2009). Biochemical Aspects of Exercise in Prevention of Overweight and Obesity. *Acta Chimica Slovaca*, 2, 97-119.
- Moravec, R., Kampmiller, T., Sedláček, J. and al., (2002). Eurofit Physique and Motor Fitness of the Slovak School Youth. Bratislava, Slovak Scientific Society for Physical Education and Sports.