# ORGINAL SCIENTIFIC PAPER

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**UDK: 796.015.6**
DOI: 10.7251/SIZ0117005B

## EFECTS OF DIFFERENT FITNESS PROGRAMS TO THE INTENSITY AND CALORIE CONSUMPTION

**Summary**

*Aim of this research is to establish influence of different fitness programs to intensity and calorie consumption. Participants in the research were 14 women, seven who practiced program of fitness dance Zumba and seven who practiced fitness with additional load. The results were obtained using POLAR pulse meter for the purpose of monitoring heart frequency and pedometer for measuring calorie consumption, and the results suggested that the programs differ in intensity and hence the calorie consumption, number of steps and total distance. However, both programs proved to be equally useful regardless of the intensity and consumption of energy potential.*

***Key words:*** *intensity, zumba, kcal, polar, pedometer, activity*

## 1. INTRODUCTION

Physiological load in the course of fitness program may be determined with great precision because physiological manifestations can be recorded (Hottenrott, 2006.). Possibility to precisely monitor the workout load is an important aspect of dosage, control and determination of intensity zones (Aubert, Spes & Beckers, 2003). Load is usually followed up by monitoring the heart rate (HR) which in non-invasive technique for evaluation of auto-immune impact to the heart (Akselrod, Gordon, Ubel, Shannon, Berger & Cohen, 1981; Thompson, 2011). Depending on the physical activity, cardio-vascular response depends of the type, intensity and workout volume. Heart rate was analyzed in various types of endurance in the course of activity: stationary intensity state (Tulppo, Makikallio, Takala, Seppanen, & Huikuri, 1996 ; Sumi, Suzuki, Matsubara, Ando, & Kobayashi, 2006) and incremental increase of certain values (Anosov, Patzak, Kononovich & Persson, 2000; Sarmiento, 2008). If we take Zumba into consideration, we find wide scope of values of physiological impact with regard to this workout program (Otto, Maniguet, Peters, et al., 2011; Luettgen, Foster, Doberstein, Mikat, & Porcari, 2012; Barene, Krustrup, Brekke & Holtermann, 2014; Barene, Krustrup, Jackman, Brekke & Holtermannn, 2014). That can be explained by three main factors: whether the training is individual or in the group, the choice of instructor and choreography and psychological characteristics of the participants.

Positive results of regular workout are well recorded in the literature. Increased physical activity is favorable for increase in energy consumption, suppressing the appetite, regular functioning of the metabolism, decrease in muscle loss and positive influence on coronary risk factors closely connected to obesity and weight issues (Brownell & Stunkard, 1981; Brownell, 1982; Thompson,

Jarvie, Lahey, and Cureton, 1982). Physical activity is defined as body movement in production of skeletal muscles which leads to energy consumption. Energy consumption can be measured in kilo calories (kcal). Recommendations for energy consumption are at least 300 kcal per training and achieving moderate intensity which is 40-60% of heart rate reserve (HRR) in duration of at least 150 minutes per week (ACSM, 2013). Main reason behind the study of fitness program are the effects of exercising in form of voluntary energy consumption (Bray, 1976). Any form of exercise requires energy in form of calories as fuel which definitely depends on body weight, gender, personal fitness abilities as well as the intensity and, duration and kind of exercise. Group fitness programs are a form of programmed exercise of women with the aim of health improvement and aesthetic benefits in physical appearance. Zumba is practiced by more than 12 million people at 110.000 locations in 125 countries around the world (Zumba fitness, 2012). Also, Zumba has recently taken the 9$^{th}$ place as a trend in the fitness world for 2012 (Thompson, 2011). Zumba has similar or slightly lower results in terms of energy consumption in comparison to other fitness programs, to be more precise 6.6–9.5 kcal/minute (Otto, et al., 2011; Luettgen, et. al, 2012). Any physical activity leads to certain changes in the body and different exercising programs allow recreational practitioners to choose which activity to pursue. If we observe fitness programs which use extra load in form of weights, we find that effects on energy consumption and intensity are completely different. Nonetheless, such programs are expected to cause some hypertrophy of muscle fibers, which is not the case with Zumba dance. Exercising with weights helps the preservation of muscle mass and strength which improves physical and functional abilities of female practitioners (Kryger, & Andersen, 2007).

Pedometers proved to be very economical and reliable manner of monitoring physical activity (Hendelman, Miler, Baggett, & Freedson, 2000; Leenders, Sherman, & Nagaraja, 2000). Pedometers proved good validity in measuring moderate intensity of movement in controlled laboratory conditions (Washburg, Chin, & Montoye, 1980; Hatano, 1993; Schneider, Crouter, & Bassett, 2004; Tudor, Williams, Reis & Pluto, 2002). Aim of this research is establishing the influence of different fitness programs to intensity and calorie consumption.

## 2. METHOD

### 2.1 Sample

Research was conducted on the sample of 14 female participants aged 32-35. Seven participants attended program of fitness dance Zumba and the remaining seven attended fitness load training with fitness toning weights. For the purpose of this research the sample consisted of participants who regularly attended fitness programs without missing classes. All the participants were familiar with choreographies and exercise programs.

### 2.2 Variables

For the purpose of comparison of the differences between Zumba fitness program and fitness program with additional load following variables were used:

- Variables for monitoring heart frequency in the course of program:

**HRB**- pulse before activity; **HRM** – maximum pulse in the course of activity; **HRA** – average value of pulse in the course of activity; **HRR** – value of pulse after 3 minutes of rest from the activity.

- Variables for determining calorie consumption in the course of program:

**KCAL**- calorie consumption during the Fitness class; **STEP**- number of steps in the course of program; **KMAC** – kilometers passed in the course of program.

### 2.4 Measuring instruments

For the purpose of monitoring the heart frequency was used the instrument POLAR - FT2 together with the belt for detection of heart beat. Information on calorie consumption, number of steps and the distance were measured by pedometer OMRON Walking style X.

## 3. RESULTS AND DISCUSSION

U Table 1 and Table 2 is an overview of baseline parameters of monitoring the heart rate in the course of program. Descriptive statistics were presented separately for the Zumba program and fitness program. In the beginning of the table are information on the number of participants (N=7), minimum and maximum result for each variable, mean values and standard error.

***Table 1.*** Descriptive Statistics, monitoring HR, ZUMBA

| | N | Min. | Max. | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **HRB** | 7 | 69 | 90 | 78.20 | 8.871 |
| **HRM** | 7 | 174 | 226 | 197.60 | 20.900 |
| **HRA** | 7 | 144 | 176 | 155.60 | 15.388 |
| **HRR** | 7 | 84 | 99 | 90.00 | 5.874 |
| **Valid N (list-wise)** | 7 | | | | |

**HRB-**pulse before activity; **HRM-**max value of pulse during activity; **HRA-** average value of pulse during activity; **HRR-** value of pulse after 3-minute break from the activity.

Comparative analysis of the tables shows there are no greater deviation in heart frequency values before the start of program which proves that the participants had not taken part in some of the programs prior to this one nor had they been under any form of load. Pulse in stationary state for untrained person is between 60 and 80 beats per minute (Papišta, 2013), which is confirmed by our results from the tables for both programs. Values of HR in stationary state get lower after years of taking physical activity primarily because of increase in beat volume, i.e. the volume of left heart chamber. These values measured as morning pulse may go up to b/min (Hoffman, & Maresh, 2000). If we consider the maximum values which can be up to 210b/min, we get a clear picture of the degree of adaptation of KVS to this quality of maximum stress.

***Table 2.*** Descriptive Statistics, monitoring HR, FITNES

| | N | Min. | Max. | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **HRB** | 7 | 67 | 88 | 77.40 | 8.444 |
| **HRM** | 7 | 166 | 180 | 172.40 | 6.348 |
| **HRA** | 7 | 122 | 134 | 129.20 | 4.550 |
| **HRR** | 7 | 79 | 92 | 84.40 | 5.505 |
| **Valid N (list-wise)** | 7 | | | | |

**HRB-**pulse before activity; **HRM-**max value of pulse during activity; **HRA-** average value of pulse during activity; **HRR-** value of pulse after 3-minute break from the activity.

Significant differences in intensity of the programs compared are observed in the values of maximum pulse with 46 beats difference at Zumba programs in comparison to fitness. However, average value of pulse (HRA-Average HR) plays crucial role in determining the intensity of a program.

In accordance with that we can clearly draw a conclusion that, in terms of intensity, Zumba program is at higher level than fitness program. Hypothetically speaking, such difference was expected if we bear in mind that it is the dance structure of Zumba, with greater choice of choreographies and continuous body movement in space which has the influence on body composition, i.e. the reduction of body fat and body mass which is a priority to women included in the program (Bjelica, Ćeremidžić, Fulurija, et al., 2016). In fitness, intensity is lower and it has more influence on strength and flexibility in comparison to Zumba. Recovery after program witnesses normal physiological state and drop in the intensity curve as well as the normalization of systems of organs to the state prior to the activity.

In Table 3 are presented baseline parameters for calorie consumption in the course of program Zumba, as well as in Table 4 with the same information about fitness program. Using the pedometer, we obtained the information about calorie consumption, number of steps during program and distance in kilometers.

***Table 3.*** Descriptive Statistics, calorie consumption, ZUMBA

| | N | Min. | Max. | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **KCAL** | 7 | 296 | 463 | 393.20 | 68.664 |
| **STEP** | 7 | 4763 | 6495 | 5543.40 | 782.642 |
| **KMAC** | 7 | 3.62 | 4.94 | 4.2160 | .59526 |
| **Valid N (list-wise)** | 7 | | | | |

**KCAL**- calorie consumption during Zumba class; **STEP**- number of steps during Zumba class; **KMAC**- distance in kilometers during Zumba class

Fitness programs unite basic principles of aerobic interval training with strength exercises which improves calorie consumption, functioning of cardio-vascular system and overall body strength (Perez, & Greenwood-Robinson, 2009).

***Table 4.*** Descriptive Statistics, calorie consumption, FITNESS

| | N | Min. | Max. | Mean | Std. Deviation |
|---|---|---|---|---|---|
| **KCAL** | 7 | 197 | 315 | 271.20 | 45.801 |
| **STEP** | 7 | 2978 | 4569 | 3867.60 | 586.981 |
| **KMAC** | 7 | 2.26 | 3.48 | 2.9420 | .44991 |
| **Valid N (list-wise)** | 7 | | | | |

**KCAL**- calorie consumption during Fitness class; **STEP**- number of steps during Fitness class; **KMAC**- distance in kilometers during Fitness class

Calorie consumption at Zumba program has higher value in approximately 122 kcal, which verifies greater intensity of the program. Bearing in mind the age category of female participants, main motivator is weight loss which marks Zumba program as more efficient in burning calories.

***Table 5.*** Independent Samples Test, differences between programs ZUMBA and FITNESS

| Variable | Levene's Test | | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Diff. | 95% Confidence Interval of the Diff. | |
| | | | | | | | | Lower | Upper |
| **HRB** | .106 | .753 | .146 | 8 | .887 | .800 | 5.477 | -11.831 | 13.431 |
| | | | .146 | 7.981 | .887 | .800 | 5.477 | -11.836 | 13.436 |
| **HRM** | 2.081 | .187 | 2.786 | 8 | **.024** | 25.200 | 9.045 | 4.341 | 46.059 |
| | | | 2.786 | 4.864 | **.040** | 25.200 | 9.045 | 1.751 | 48.649 |
| **HRA** | 4.308 | .072 | 4.288 | 8 | **.003** | 26.400 | 6.156 | 12.204 | 40.596 |
| | | | 4.288 | 4.967 | **.008** | 26.400 | 6.156 | 10.543 | 42.257 |
| **HRR** | .002 | .965 | 1.556 | 8 | .158 | 5.600 | 3.600 | -2.702 | 13.902 |
| | | | 1.556 | 7.967 | .159 | 5.600 | 3.600 | -2.708 | 13.908 |
| **KCAL** | .949 | .358 | 3.305 | 8 | **.011** | 122.000 | 36.912 | 36.881 | 207.119 |
| | | | 3.305 | 6.971 | **.013** | 122.000 | 36.912 | 34.644 | 209.356 |
| **STEP** | 1.709 | .227 | 3.830 | 8 | **.005** | 1675.800 | 437.510 | 666.900 | 2684.700 |
| | | | 3.830 | 7.418 | **.006** | 1675.800 | 437.510 | 652.965 | 2698.635 |
| **KMAC** | 1.648 | .235 | 3.818 | 8 | **.005** | 1.27400 | .33369 | .50451 | 2.04349 |
| | | | 3.818 | 7.446 | **.006** | 1.27400 | .33369 | .49442 | 2.05358 |

**HRB**-pulse before activity; **HRM**-max pulse during activity; **HRA**- average value of pulse during activity; **HRR**- value of pulse after 3-minute break from the activity; **KCAL**- calorie consumption during Zumba/fitness class; **STEP**- number of steps during Zumba/fitness class; **KMAC**- distance in kilometers during Zumba/fitness class; value of T-test (**t-value**); degrees of freedom **(df)**; statistical significance **(Sig.)**.

Insight into the results presented in Table 5 and the use of T-test for independent samples provided for statistically significant differences in variables for maximum pulse and average value of pulse during the program. Pulse before the activity and after the completion of the program had no significant differences, which means that the adaptation of the organism was similar for the stress after each program. Heart rate is a tool used for the analysis of heart autonomous modulation, as well as the indicator of autonomous nervous system (Trevizani, Benchimol-Barbosa & Nadal, 2012). Other values used for measuring calorie consumption in the course of programs were in favor of Zumba dance. Greater calorie consumption and more steps in the course of training are the parameters which are the response of intensity and load volume of the program. Aerobic training and strength exercise are a good way to increase calorie consumption, functioning of cardio-vascular system and strength of whole organism (Perez, & Greenwood-Robinson, 2009). Aerobic activities are a recommendation in prevention as well as maintaining physical activity at optimal level. The recommendation is minimum 40-60 minutes of regular activity (Saris, Blair, van Baak, Eaton, Davies, Di Pietro, et al., 2003).

## 4. CONCLUSION

Group fitness programs are a form of programmed body exercise for women with the aim of improving health and physical appearance. Beyond any doubt, aerobic training causes energy consumption, activates lipolysis and affects reduction in body mass, which is a priority to women

involved in such program. According to the research results we can draw a conclusion that the tested programs differ in intensity and therefore total calorie consumption, number of steps and total distance. However, both programs are equally beneficiary regardless of the intensity and use of energy potentials. Benefits of exercise are well known as is their influence on the body so any choice of program is personal satisfaction. It would be interesting to test long term influence of the program and effects to body composition and obtain viable data.

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Received: April 3, 2017
Revision received: May 15, 2017
Accepted: May 20, 2017

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