



THE EFFECT OF A 24-WEEK GREEK TRADITIONAL DANCES PROGRAM ON THE CARDIORESPIRATORY FITNESS OF ADULT PEOPLE

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Abstract:

The aim of the present study was to examine the effects of a Greek traditional dances program on adult people cardiorespiratory fitness. For this purpose, 40 sedentary healthy adults, 23 women and 17 men, aged 35-55 years, who didn't participate in any group or individual exercise, physical activity or dancing program for the past six months, were randomly chosen and separated to an experimental and a control group. The subjects of the experimental group (n=20, 12 women and 8 men) attended a Greek traditional dances program of moderate intensity, at a frequency of three training sessions per week, for 60 minutes each, while the subjects of the control group (n=20, 11 women and 9 men) were asked to continue their daily habits for the same period. Maximal aerobic capacity (VO₂max) was assessed for both groups before and after the 24-week period by the implementation of the Rockport one-mile walk test. Before and after the 24-week period, resting heart rate (RHR), diastolic blood pressure (DBP), and systolic blood pressure (SBP) were, also, measured. For the statistical analysis the Statistical Package for Social Sciences ver. 23.0 for windows was used. No significant difference was found in the baseline measures between the two groups. After the participation in the 24-week Greek traditional dances program, VO₂max of the experimental group increased significantly from 35,95±4,3 ml/kg/min to 38,91±3,7 ml/kg/min (t=-6,204, p<0,001). Changes in DBP and SBP to the desirable direction were found. More specifically, DBP decreased from 79,4±7,6 mmHg to 78,8±7,6 mmHg (t=0,399, p>0,05), and SBP decreased from 125,6±7,7 mmHg to

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122,6±7,7 mmHg ($t=2,198$, $p<0,05$). No significant difference was found after the 24-week period for the control group. The results allow us to use Greek traditional dances as an alternative and, also, effective form of physical activity that may help in improving aerobic capacity and may bring favorable changes in cardiorespiratory status of adult people.

Keywords: folk dance, aerobic capacity, VO₂max, blood pressure

1. Introduction

Dance is a very common leisure activity (McCord, & Patterson, 1989) and an alternative form of exercise of mild to moderate intensity (Mavrovouniotis et al., 2010; Wyon, & Redding, 2005). As an alternative form of exercise versus traditional exercise for many is an enjoyable choice and offers unique opportunities to develop new skills in a team environment (Lobo, & Winsler, 2006). Furthermore, dance is a safe form of exercise with a low chance of injuries compared to other types of exercise (Anagnostopoulou et al., 2017; Malkogeorgos et al., 2010; Malkogeorgos et al., 2011a).

Participation in dance is popular and people dance for fun, recreation, social reasons and more and more for better health (Costa et al., 2013; Keogh et al., 2009; Pilch et al., 2015). Dancing is an excellent way to promote physical, psychological and social benefits (Burkhardt, & Brennan, 2012; Caldwell et al., 2005; Malkogeorgos et al., 2011b; Mavrovouniotis, & Argiriadou, 2008).

Psychological and social benefits include better overall health and an improved sense of well-being (Costa et al., 2013; Keogh et al., 2009; Pilch et al., 2015). Berrol et al. (1997) ascertained that the participation in dancing programs, of 45 min duration, once a week, for five months, improved the psychological state of old people who suffered from stroke, traumatic brain injury and cerebral vascular accidents. Berryman-Miller (1988) found out that the 8-month application of a dancing program in individuals aged 55 to 85 years old, affected self-esteem and well-being positively and led to mood state improvement. In addition, other authors suggest that dancing causes anxiety and neuromuscular tension reduction, and, also, causes psychological and physical calm (Garnet, 1974; Keuttel, 1982; Leste, & Rust, 1984; Payne, 1992; Stanton-Jones, 1992; Steiner, 1992).

In addition to the psychological benefits, dance has been shown to improve significantly aerobic capacity, cardiorespiratory endurance, strength, balance, strength of the lower limbs, flexibility and agility of the body, walking stride, and to contribute to the reduction of body fat (Hopkins et al., 1990; Foulds et al., 2014; Keogh et al., 2009; Mavrovouniotis et al., 2013). Dance was found to be similar in cardiorespiratory fitness benefits and in calorie output levels with uncompetitive physical activities such as walking, running (Ribeiro-Nunes et al., 2007), as well as with sports such as football or tennis in a non-competitive level. In addition, in the case of dance, where alternating intense action moments with intervals that require precision and skill are observed, the

participants benefit from improving aerobic capacity (Allen, & Wyon, 2008; Hui et al., 2009).

Moreover, significant higher mean values have been found in $VO_2\text{max}$ of dancers, beginners or advanced, compared with sedentary people (Chatfield et al., 1990; Beck et al., 2018; Novak et al., 1978; Prashobhith, 2015). Thus, dancers demonstrate significantly higher values in $VO_2\text{max}$ than sedentary individuals (Angioi et al., 2009; Chmelar et al., 1988; Dahlstrom et al., 1996; Guidetti et al., 2008; Malkogeorgos et al., 2013; Martyn-Stevens et al., 2012; Twitchett et al., 2010). As for middle-aged participants in dance-based exercise programs, they showed significantly better aerobic capacity, balance, strength, body fat and flexibility after the participation in the program compared to sedentary control group (Chatfield et al., 1990; Gupta et al., 2004; Murrock, & Gary, 2010; Koutedakis, & Jamurtas, 2004).

However, on reviewing the literature, it seems that there is a lack of research efforts noted regarding the effectiveness of Greek traditional dances on improving cardiorespiratory fitness. Thus, the aim of the present study was to examine the effects of a 24-week Greek traditional dances program on the cardiorespiratory fitness of healthy adult men and women.

2. Material and Methods

2.1 Sample

From the lists of the members kept in a Cultural Club of Moudania City in Halkidiki-Greece, forty-six members, men and women, that fulfilled the inclusion criteria, that is age 35-55 years old, no participation in any group or individual exercise, physical activity or dancing program for the past six months, and no health problem, permanent medication, or any form of diet, were randomly chosen. Subsequently, a communication/invitation to each chosen member, in regard to the research was made. After that, a total of forty-three men and women volunteered to participate in the research.

A written informed consent for the participation in the research was obtained from each subject. All the subjects had to agree that they will not participate in any other group or individual exercise, physical activity or dancing program for the duration of the experiment, that is a 24-week period. After that, forty sedentary healthy adults, 23 women and 17 men, volunteered to participate in the research. The subjects separated randomly to an experimental group ($n=20$, 12 women and 8 men) and a control group ($n=20$, 11 women and 9 men).

2.2 Procedure

An approval for conducting the research was given from the committee of the Cultural Club, after the aim and the treaties of the research were described. Procedures were in agreement with the ethical standards of the Declaration of Helsinki of the World Medical Association (2000). In addition, a description of general requirements, as well as of the

aim of the research was given to the participants, without any briefing relative to previous research findings.

Subsequently, the subjects of the experimental group participated in a 24-week group program of Greek traditional dances performance of moderate intensity, at a frequency of three training sessions per week, for 60 minutes each. Each Greek traditional dances session included the warming up for 8-12 min which contained dances of low intensity, the main part for 40-45 min which contained dances of moderate to high intensity and the cool-down for 5-7 min which contained dances of low intensity for recovery. Concerning the main part, the dances intensity ranged from 60% to 75% of the maximum HR, which corresponds to 40-60% of $VO_2\max$ (moderate intensity) (Swain et al., 1994; Tanaka et al., 2001; Uth et al., 2004). There were frequent rhythm alternations so that the subjects could keep dancing continuously throughout each dance session. The performed Greek traditional dances were from different areas of Greece. The program contained a variety of dances, regarding the rhythm, the kinetic repertoire and the style. All participants attended at least 80% of Greek traditional dances sessions.

At the same 24-week period, the subjects of the control group were asked to continue their daily habits without any changes as it was recorded at the beginning of the research. Measurements and each session of Greek traditional dances were conducted by a single, male investigator, teacher of physical education with extensive practical experience in Greek traditional dances.

2.3 Measurements

A. Anthropomorphological Measurements

Measurements of body mass (weight) and height were taken place once, before the 24-week Greek traditional dances program, for both groups. Body mass was measured using a Microlife WS80 electronic scale with a precision of 0.1 kg. Body height was measured with a precision of 0.5 cm using a Seca 216 height measuring.

B. RHR

RHR was measured with a Polar - Sport Tester (M 400).

C. Blood pressure

SBP and DBP were measured with an electronic blood pressure monitor (Omron M6 comfort).

RHR, SBP and DBP measurements were carried out with each subject in a resting position for at least 10 min, in the morning, between 8.00 and 10.00 before noon, after 12 hours of caffeine consumption avoidance. RHR, DBP, as well as SBP for the subjects of the experimental group were measured before and after the 24-week Greek traditional dances program, while for the subjects of the control group before and after the 24-week period.

D. $VO_2\max$

For the evaluation of $VO_2\max$ of the subjects of both groups, the Rockport one-mile walk test was used. The Rockport one-mile walk test is suitable for ages 30-69 years, with a

reliability of over 93% (Kline et al., 1987; Hageman et al., 2001; Pober et al., 2002). The Rockport equation for the evaluation of VO₂max is:

$$VO_{2max} = 132,853 - 0,0769W - 0,3877A + 6,315G - 3,2649T - 0,1565H$$

Where: W=weight in pounds, A=age in years, G=gender and as for women G=0, while for men G=1, T= time in minute, and H= heart rate in beats per minute measured immediately after the end of walking.

For VO₂max evaluation, the subjects of the experimental group performed the Rockport one-mile walk test before and after the 24-week Greek traditional dances program, while the subjects of the control group before and after the 24-week period.

2.4 Statistical analysis

For the statistical analysis the statistic packet SPSS/PC Version 23.0 for windows was used. The collected data were analyzed by computing mean and standard deviation. All dependent variables, namely VO₂max, RHR, SBP, and DBP were found to be normally distributed using the Kolmogorov-Smirnov tests of normality. Independent samples t-tests were used to determine if significant mean differences existed in baseline measurements between participants of the two groups. Paired t-tests and ANOVA with repeated measures were used to determine if significant pre- to post-test differences existed (before and after the Greek traditional dances program as for intervention group, and before and after the 24-week period as for control group). The level of significance was set to $p < 0,05$.

3. Results

In Table 1 the anthropomorphological characteristics of experimental group that attended the Greek traditional dances program, and control group are presented. Independent samples t-tests showed that there was no significant difference between the two groups, concerning the anthropomorphological characteristics.

Table 1: Anthropomorphological characteristics of experimental and control group

Parameters	Experimental Group Mean±SD	Control Group Mean±SD
Age (years)	41,7±5,5	41,85±7,3
Height (m)	1,73±0,1	1,72±0,09
Body mass (kg)	78,77±18,5	81,90± 17,8

Descriptive statistics for VO₂max assessed prior to and following the 24-week Greek traditional dances program for the experimental group and prior to and following the 24-week period for the control group, as well as the significance of any demonstrated change are shown in Figure 1 and Table 2.

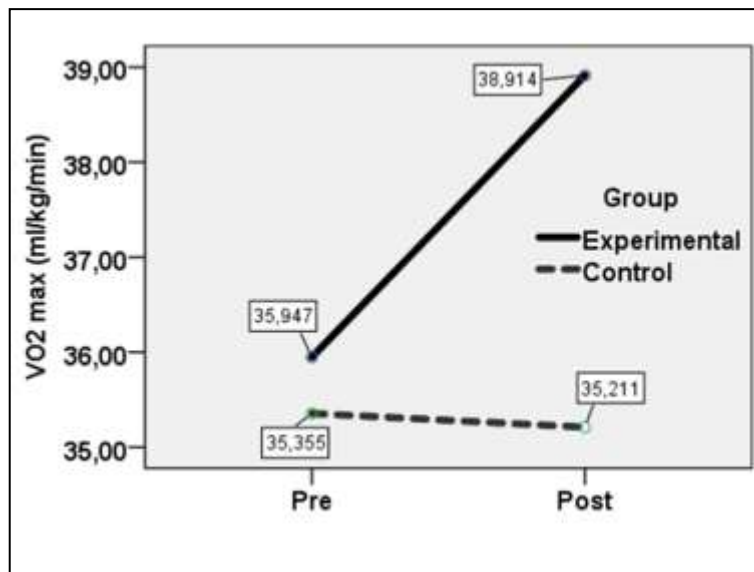


Figure 1: VO₂max for Greek traditional dances group and control group before and after the 24-week period

As it is observed, there was a significant increase in VO₂max (8,23%) for the experimental group after the participation in the 24-week Greek traditional dances program. On the contrary, there was observed a slight decrease in VO₂max for the control group after the 24-week period (Figure 1, Table 2).

Descriptive statistics for RHR assessed prior to and following the 24-week Greek traditional dances program for the experimental group and prior to and following the 24-week period for the control group, as well as the significance of any demonstrated change are shown in Figure 2 and Table 2.

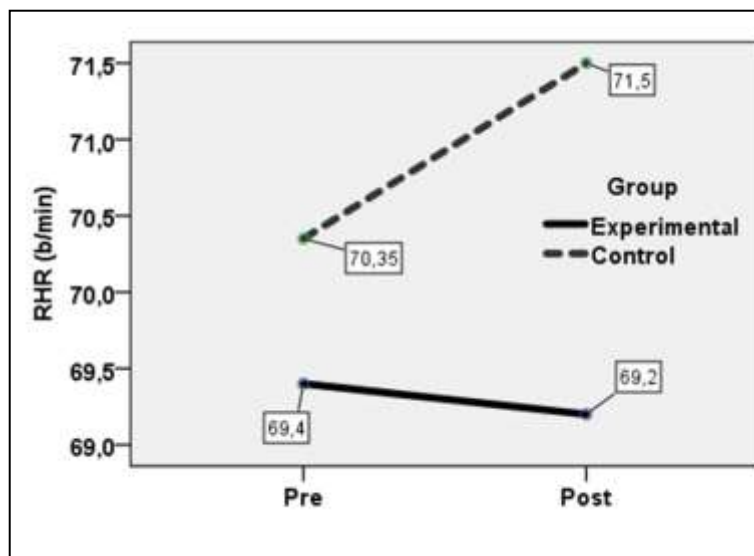


Figure 2: RHR for Greek traditional dances group and control group before and after the 24-week period

It is obvious that RHR was almost unchangeable for the experimental group after the participation in the 24-week Greek traditional dances program, while there was observed a slight increase in RHR for the control group after the 24-week period (Figure 2, Table 2).

Descriptive statistics for SBP assessed prior to and following the 24-week Greek traditional dances program for the experimental group and prior to and following the 24-week period for the control group, as well as the significance of any demonstrated change are shown in Figure 3 and Table 2.

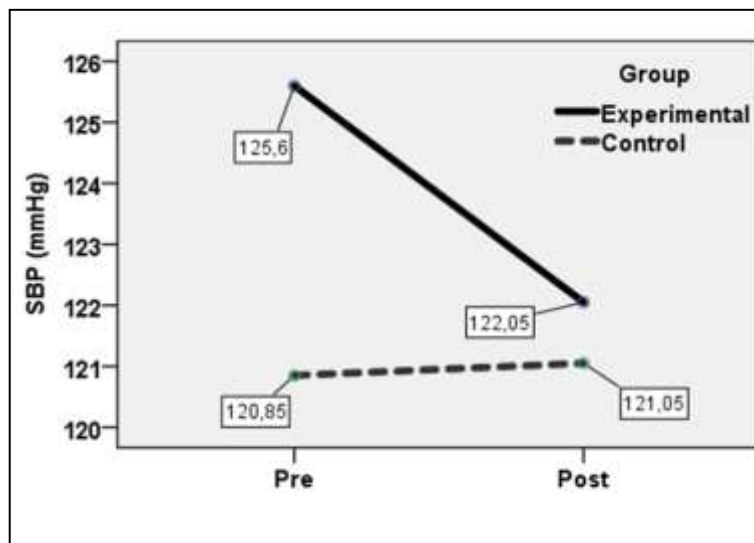


Figure 3: SBP for Greek traditional dances group and control group before and after the 24-week period

As it is observed, there was a significant decrease in SBP (2,8%) for the experimental group after the participation in the 24-week Greek traditional dances program. On the contrary, there was observed a slight increase in SBP for the control group after the 24-week period (Figure 3, Table 2).

Moreover, descriptive statistics for DBP assessed prior to and following the 24-week Greek traditional dances program for the experimental group and prior to and following the 24-week period for the control group, as well as the significance of any demonstrated change are shown in Figure 4 and Table 2.

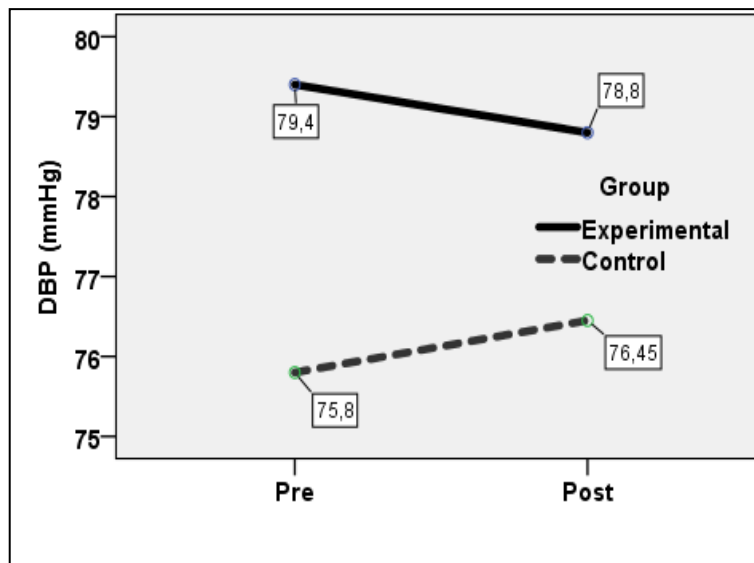


Figure 4: DBP for Greek traditional dances group and control group before and after the 24-week period

As it is observed, there was no significant difference in DBP in both groups after the 24-week period. However, Greek traditional dances group presented a tendency for reduction in DBP from 79,4 to 78,8 mmHg (0,8%), while control group presented a slight increase in DBP (Figure 4, Table 2).

Table 2: Descriptive data, and degree of change of cardiorespiratory variables of experimental and control group

	Group	Pre 24 weeks M±SD	Post 24 weeks M±SD	t & p	Change
VO₂max (ml/kg/min)	Experimental	35,95±4,3	38,91±3,7	t=-6,204 p<0,001	↑
	Control	35,36± 6,8	35,21± 6,4	NS	↓
	t & p	NS			
RHR (beats/min)	Experimental	69,4±9,4	69,2± 8,3	NS	↓
	Control	70,4± 9	71,5±8,4	NS	↑
	t & p	NS			
SBP (mmHg)	Experimental	125,6± 7,7	122,05± 8,7	t=2,198 p<0,05	↓
	Control	120,85±10,8	121,05±11,2	NS	↑
	t & p	NS			
DBP (mmHg)	Experimental	79,4±7,6	78,8± 7,6	NS	↓
	Control	75,8± 9	76,45± 7,4	NS	↑
	t & p	NS			

The results of the independent samples t-tests showed that at the baseline there was no significant difference between the two groups for all dependent variables, showing that the two groups are similar. In addition, the results of the paired t-tests and repeated measures ANOVAs, didn't demonstrate any significant difference for the control group between the two measures, pre- and post-the 24-week period. However, concerning Greek traditional dances group, the results of the paired t-tests and repeated measures

ANOVAs, demonstrated significant differences between the two measures, pre- and post-the 24-week Greek traditional dances program, for the cardiorespiratory parameters. Finally, these results show that after the participation in the Greek traditional dances program, all the measured cardiorespiratory variables were changed to the desirable direction, as there were observed an increase in $VO_2\text{max}$, and decreases in RHR, SBP, as well as in DBP (Table 2).

4. Discussion

The results of the present research showed that the individuals of the experimental group after their participation in the Greek traditional dances program increased significantly their aerobic capacity. More specifically, the $VO_2\text{max}$ of the participants in the 24-week Greek traditional dances program was increased from $35,95\pm 4,3$ ml/kg/min to $38,91\pm 3,7$ ml/kg/min, which corresponds to an 8,23% increase. In agreement, concerning traditional dances, it has been found that traditional dances bring about positive effects on the cardiorespiratory fitness of the participants. More specifically, Tai Chi, a Chinese traditional form of dance that like the Greek traditional dances can be performed in pairs or in a line (Judge, 2003; Li et al., 2001) may improve cardiovascular system function (Petrillo, 2000). In addition, the participation in Turkish traditional dances can lead to improvements in fitness (Eyigor et al., 2009). Similarly, Korean traditional dances have a positive impact on participants' functional status (Song et al., 2004). Moreover, subjects who participated in an ancient tradition Sardinian folk dance, Ballu Sardu, increased their aerobic capacity (Cugusi et al., 2015).

As for Greek traditional dances, a research of Mavrovouniotis et al. (2018) provides evidence for the effectiveness of the participation in a 12-week Greek traditional dances program at a frequency of three sessions per week, 50 minutes each, in improving cardiorespiratory fitness of postmenopausal women, aged 55-68 years. In similar results were led Denazi et al. (2013), who implemented a 14-week training program in Greek traditional dances at a frequency of three sessions per week, for 50 minutes each in women 60-78 years old. More specifically, the researchers found that the participants in the Greek traditional dances program improved significantly their aerobic endurance as measured by "the 6-minute walk" task, while no significant improvement was observed in the control group. In addition, Tsimaras et al. (2010) found that the participation in a 12-week Greek traditional dances program improved significantly the aerobic capacity of adults with hearing loss.

Moreover, in the present study after the participation in Greek traditional dances program SBP and DBP showed a desirable decreasing trend. In agreement with our study, Fearheller et al. (2014) presented similar findings after 6 months of aerobic exercise training in African Americans. More specifically, after the six-month training the subjects increased significantly $VO_2\text{max}$. However, aerobic exercise training did not alter significantly SBP and DBP. Nevertheless, there was observed that Zumba dance reduced significantly the blood pressure in hypertensive patients. It is worth mentioning that the

best types of exercise for lowering blood pressure include walking, jogging, cycling, swimming, dancing, Zumba dance (Maciejczyk, & Feć, 2013).

Thus, it could be said that dancing and in particular Greek traditional dance is an effective form of physical exercise that helps to improve aerobic capacity (McCord, & Patterson, 1989). Besides, the participation in activities such as traditional dancing requires a great deal of physical effort (Maciejczyk, & Feć, 2013; Jitesh, & Devi, 2016). Greek traditional dances, particularly, include a big total of performed steps, a variety of simple kinetic patterns performed with appropriate intervals and frequent rhythm alternations. Moreover, it has been found out that during the one hour Greek traditional dances session, which is a typical duration for the programs of Greek traditional dances, the mean performed steps were $4721,29 \pm 469,094$ and the mean travelled distance was $1,414 \pm 0,15$ km, as they were measured by the Omron pedometers. However, when dancing Greek traditional dances many other movements, such as foot skips, arsis, etc., except clear steps as well as hand movements are performed that, probably, cannot be measured (Argiriadou et al., 2013). Consequently, it could be said that a Greek traditional dances session includes a great amount of performed movements, indicating that they, indeed, constitute a physical activity that may contribute to the improvement of physical fitness (Argiriadou et al., 2013; Argiriadou, 2018; Balady, & Weiner, 1987; Byrne, 1991; Klissouras, 2004; Papanikolaou, 1993).

Regarding intensity, other forms of dance such as ballet sets or modern dance class are between low and moderate intensities and within the aerobic training zone (60-90%HR max) (Rodrigues-Krause et al., 2014; Wyon et al., 2004). As for Greek traditional dances, exercising in them has increased old and middle-aged people's HR significantly and approximately 63%-65% and 77,4% of their HRmax, respectively, was activated (Argiriadou et al., 2013; Argiriadou, 2018; Mavrovouniotis et al., 2010; Mavrovouniotis et al., 2018). In agreement, in the present study, the intensity of Greek traditional dances sessions was ranged to 40-75% of VO_2 max or to $69,9\% \pm 7,5\%$ of HRmax. Thus, Greek traditional dances constitute a physical activity of moderate intensity, of approximately 3-5 METs (Argiriadou et al., 2013; Argiriadou, 2018; Balady, & Weiner, 1987; Byrne, 1991; Klissouras, 2004; Papanikolaou, 1993). This exercise intensity can develop and maintain middle-aged people's cardiorespiratory fitness (American College of Sports Medicine, 1995). It is worth mentioning that according to the Guidelines for Exercise Testing and Prescription individuals should perform exercise between 64% to 94% of HRmax or 40% to 85% of VO_2 max to improve cardiovascular fitness (Thompson et al., 2010; Garber et al., 2011). It can be said that the physical load caused from the Greek traditional dances is within the exercise benefit range for middle-aged people (Argiriadou et al., 2013; Argiriadou, 2018; Mavrovouniotis et al., 2010). Consequently, Greek traditional dances are an aerobic form of exercise with physiological effects (Argiriadou, 2018). This effect of Greek traditional dances is very important, because the improvement of cardiorespiratory fitness seems to result in easier execution of daily activities and thereby in the improvement of the quality of life (Argiriadou et al., 2017; Lindheim et al., 1994).

Besides high cardiorespiratory fitness level is associated with lower mortality (Farrel et al., 2002).

5. Conclusion

Greek traditional dancing is a very common, pleasant and socializing activity for middle-aged people, and it is an alternative and, also, effective form of physical exercise that helps improving aerobic capacity. The participation in Greek traditional dances requires an appropriate level of physical effort and may lead the cardiorespiratory variables into changes to the desirable direction. With this way dancers may approach an appropriate level of fitness. The wide variety of Greek traditional dances, concerning technique, rhythm, and duration, allows the design of sessions with a variety of dances mild to intense, aiming on the best possible benefits in cardiorespiratory fitness. Consequently, Greek traditional dances constitute an alternative and, also, effective form of physical activity that may help in improving aerobic capacity and may bring favorable changes in cardiorespiratory status of adult people.

Conflicts of interest

The authors declare that there are no conflicts of interest.

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