

PHYSICAL CONDITION AND HEALTH OF PRACTICING DANCERS AND SCHOOL- GIRLS

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ABSTRACT

The practice of dancing requires the harmonious development of different motor capacities, nevertheless there is a lack of knowledge about the physical ability of ballerinas. So, the aim of this investigation was to evaluate the physical condition of classical ballerinas, dancers without classical formation and students, looking forward to find differences in the motor development among these respective groups. The study was carried out in the city of Bauru, in São Paulo state, with 83 young people aging from 12 to 17 years old and divided in three groups as follow: i) classic dancers (27); ii) dancers without classical formation (19) and iii) students that participate in regular physical education classes (37). The physical capacity related to both health and athletic performance was evaluated. The tests were applied at the beginning and at the end of the study. To compare the anthropometrical measurements and the variables of motor performance according to evaluation moments an analysis has been made of the repeated measures of the average profiles of the groups. The results pointed out that the classical dancers have a lower corporal weight, lower height, lower % of fat and lower corporal mass index than the other groups. The cardiorespiratory capacity and the horizontal impulsion have not shown meaningful differences between the groups.

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The classical dancers and the non-classical have shown higher performance than the scholars concerning the vertical impulsion, equilibrium, coordination and agility. Regarding the variables flexibility, localized muscular resistance and strength, the classical dancers have had higher scores than the other groups.

KEY WORDS: dance, physical condition and physical education

INTRODUCTION

Construction of abilities include many elements, however some specific physical capacities are necessary. Weight-lifters need strength, marathon runners need cardio respiratory resistance, among other. Dance calls for development of many components taking into consideration that movements such as grand-jeté needs both flexibility and force. A fine neuro-muscular coordination is required to achieve equilibrium out of the gravity center as well as for rapid stepping. A frequent mistake, for instance, is the emphasis put into the flexibility neglecting strength and other physical qualities. If training is not done with planning, there is no technical gain leading to discouragement of the dancer (ROBERTSON, 1988).

The constitution of the body, which is related to the dance technique, include strength, power, flexibility, coordination, equilibrium, agility, cardiovascular and muscular resistance, among other (NANNI, 1998). If properly worked out, dance movements can be repeatedly done with efficiency and with no excessive fatigue.

Claro (1995) refer that the dance favors improvement of fitness, however it depend of an adequate formation phase. The process is compromised if done with specific orthodox techniques without any concern with the global coordination of the individual, with its age range or provoking stereotyped movements.

Classic dance with good orientation can be one example for such basic formation because it leads to a detailed control of the requested joints in all dance techniques. Gelbert (1986) agrees to this assertive while affirming that ballet is composed of bilateral movements, with a perfect symmetric equilibrium, producing efficient muscle power and coordination that results in less effort and economy in body use.

As the practice of dance requires an harmonious refinement of different motor capacities, in the following paragraphs it will be defined these capacities as well as the problems related to the inadequate work out for each physical quality under consideration.

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Flexibility in classical ballet is a must and dancers spend much time aiming to increase the range of movement. Achour Junior (1994) mention that ballet training emphasizes the abduction of the lower limb and external rotation, but with exclusion of adduction. This uneven movement induces pain in the lateral aspect of the knee and in the anterior part of the hip. In this way, as a prophylactic measure, dancer should concentrate on a lengthy bilateral static stretching.

Working-out for muscular strength is not popular among classic dancers. Robertson (1988) comments that hypertrophy is of concern among them that are under constant pressure to maintain a sylphid-like body image. However, muscular strength can be achieved without excessive development of the muscular mass.

To Sharkey (1998) increase in speed depends on the principle of specificity and the movement must be characteristic of the sport. In this way, dancer can improve its speed training by training the choreographic movement.

Robertson (1988) argue that dancers with a well developed agility can make efficient choreographic movements, preventing lesions during rapid changes of position. In dance this capacity has added complexity since it is not just a matter of changing direction of level, but also to perform steps within a musical rhythm with, in this context, involves a more complex neuromotor control.

In dance the coordination occurs when the movements are made according to the aimed esthetic without need for adjustments in the pattern of the performed movement. For example, for a grandplié it is necessary pelvic alignment to the trunk, with knee flexion what requires practice to control the action of lowering the body to the ground and stabilize the pelvis and trunk (GELABERT, 1986).

In what regards cardio respiratory fitness, Fração et al. (1999) state that classic ballet is an intermitted activity where caloric consumption during bar exercises is low, contrasting with the high caloric demands during central and activities and those during actual performance. High amounts of energy are used in a short period, insufficient, therefore, to provoke adequate cardio respiratory response. In classic dancers these characteristics leads to a maximum oxygen consumption similar to those in athletes while performing intermittent activities (mean 43.7 ml/Kg/min).

In dance, the search for an adequate image for classic ballet goes beyond parameters such as percentage of thin mass in the general population. As long as dancers improve their technique, there is need for keeping weight with low percentage of fat to attain a sylphid-like image. Freedson (1988), for body fat, found values

varying according to the level of training. High performance teen dancers shows, in average, 16.4% whereas professional shows 22.1%.

Taking into consideration these aspects, the aim of the present study was to evaluate the physical condition of classic, non-classic dancers and school girls in a discipline of physical education, in order to assess the difference in motor performance between these groups.

MATERIAL AND METHODS

Place of study and sample procedures

The study was done with girls from 12 to 17 years old. It was selected 83 individuals divided in three groups: (i) classic dancers – those who practice classic ballet and have the characteristics of a ballet group. The group included 27 individuals practicing for 90 minutes four or more classes a week; (ii) non-classic dancers – those who do not practice and have no study on classic ballet, but take part in a ballet group (jazz and street dance). There were 19 individuals practicing at least 90 minutes classes twice a week; (iii) school girls – 37 individuals who do not participate dance in classes but were enrolled in the discipline of physical education with three 50 minutes classes a week, taken as a representative group for this age range.

Evaluation of the physical fitness

To evaluate the physical fitness it were used tests related to health and performance according to basic criteria of validity, fidelity and objectivity and that accumulate information from different population with consolidate reference values in order to assure comparison between groups. Figure 1 describe the selected tests.

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<u>Fitness</u>	<u>Test</u>	<u>Source</u>
<u>aerobic capacity (1)</u>	<u>Queens College</u>	<u>McArdle et al., 1998.</u>
<u>Flexibility (1)</u>	<u>seat and catch</u>	<u>Guedes e Guedes, 1995/ Mayer e Böhme, 1996.</u>
<u>Localized muscular resistance (1)</u>	<u>Abdominal flexion in one minute</u>	<u>Monteiro, 1993.</u>
<u>Muscular strength (1)</u>	<u>Arm flexion</u>	<u>Pollock e Wilmore, 1993.</u>
<u>Explosion strength (2)</u>	<u>Test for vertical and horizontal impulsion</u>	<u>Masudo, 1983/ Mayer e Böhme, 1996.</u>
<u>Static equilibrium (2)</u>	<u>flamingo test</u>	<u>Marins e Giannichi, 1998.</u>
<u>Coordination (2)</u>	<u>Burpee test</u>	<u>Marins e Giannichi, 1998.</u>
<u>Agility (2)</u>	<u>Weavv run</u>	<u>Marins e Giannichi, 1998.</u>
<u>Body composition (1)</u>	<u>Skin folds</u>	<u>Pollock e Wilmore, 1993.</u>

- (1) fitness related to health
 (2) fitness related to athletic performance

Figure 1 – Identification of the tests related to health condition and athletic performance

Two evaluation were made along the school year: (i) a pre test in the first week of school activities in order to evaluate the initial physical fitness related to health and athletic performance; (ii) post test aiming to verify the physical fitness at the end of the second school semester. The data collection was done at the dancing school having the best dancers with highest technical performance. It is a private elementary and high school that convene students of the same area go the academies. This region is characteristic for having high middle class population that, in turn, use the services available in the sector of town.

Statistical evaluation

It was used the mean profile test for repetitive measures in independent groups (WICHERN E JOHNSON, 1992). The health fitness antropometric variables were presented in tables with mean and standard deviation followed by letter to indicate its significance ($p < 0.05$) while comparing groups. For interpretation of results on should consider the following instructions: two means followed by the same low case letter do not differ to the response to moment within the group; two means followed by at least one same upper case letter do not differ to the response of these groups in the same momento of evaluation.

RESULTS

Results (TABLE 1) indicate that both school girls and classic dancer concentrate higher proportions of participation at the age range of 12 to 13 years (45.94 and 66.67% respectively). Among the non-classic dancers predominates the age range of 16 to 17 years (47.37%).

TABLE 1 – Distribution of the frequencies of participants according to age and group.

age	Group					
	school girls		Classic dancers		Non-classic dancers	
	fi	fri (%)	fi	fri (%)	fi	fri (%)
12-13	17	45.94	18	66.67	6	31.58
14-15	14	37.84	6	22.22	4	21.05
16-17	6	16.22	3	11.11	9	47.37
Total	37	100.00	27	100.00	19	100.00

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The mean initial body weight (44.19 ± 7.81) and height (5.26 ± 7.90) for classic dancer was inferior than the other groups (TABLE 2). For body weight it was not observed significant difference between the initial and the final evaluation (32 weeks) in all groups. In what concerns height, there was an increase from the pre to the post test for school girls and classic dancers. The body mass index (BMI) showed similar results for comparison among groups; for the classic dancers (18.25 kg/m^2) it was inferior, with significance, to the school girls (20.25 kg/m^2) and the non classic (20.74 kg/m^2), the latter not showing difference between them. However, the difference in BMI were not expressive while comparing the moments of evaluation, showing that the variations in height were not sufficient to promote alteration in the BMI.

TABLE 2 – Mean and standard deviation for the anthropometric variables studied.

Variables	Group	Moment	
		Initial	Final
Wheighth	School	51.93 ± 10.05 a B	52.37 ± 9.01 a B
	Classic	44.19 ± 7.81 a A	45.10 ± 7.38 a A
	Non-classic	52.96 ± 6.17 a B	53.42 ± 5.25 a B
Heighth	School	159.93 ± 6.12 a A	161.04 ± 5.46 b B
	Classic	155.26 ± 7.90 a A	156.28 ± 6.59 b A
	Non-classic	160.22 ± 5.34 a B	160.83 ± 4.88 a B
IMC	School	20.25 ± 3.29 a B	20.18 ± 3.11 a B
	Classic	18.25 ± 2.04 a A	18.44 ± 2.19 a A
	Non-classic	20.74 ± 1.95 a B	20.79 ± 1.70 a B

Note:

TABLE 3 – Mean and standard deviation for the variables related to the health condition

Variable	Group	Moment	
		Initial	Final
Body fat	School	23.90 ± 7.47 a B	23.19 ± 6.77 a B
	Classic	17.63 ± 4.81 a A	17.04 ± 4.72 a A
	Non-classic	27.26 ± 6.04 b C	24.14 ± 5.09 a B
VO ₂ max.	School	32.89 ± 2.52 a A	34.00 ± 2.40 b A
	Classic	33.69 ± 2.73 aA	34.66± 2.32 b A
	Non-classic	34.36 ± 2.19 a A	34.20 ± 2.43 a A
Flexibility	School	26.10 ± 8.96 a A	30.07 ± 7.31 b A
	Classic	37.57 ± 6.16 a B	40.41± 5.09 b C
	Non-classic	37.47 ± 8.25 a B	37.11 ± 9.26 a B
Muscular resistance	School	5.03 ± 0.53 a A	5.32 ± 0.59 b A
	Classic	6.01 ± 0.70 b C	5.78 ± 0.59 a B
	Non-classic	5.44 ± 0.80 a B	5.89 ± 0.79 b B
Muscular strength	School	3.46 ± 1.35 a A	4.18 ± 1.06 b A
	Classic	4.47 ± 1.27 a B	5.19 ± 0.91 b B
	Non-classic	3.57 ± 1.11 a A	4.43 ± 1.00 b A

The relative distribution of body fat (TABLE 3) had inferior means values in the classic dancers in both moments of evaluation. The non-classic dancer were the only to present reduction of fat percentage form the initial to the final evaluation. In brief: for non classic dancers there were significant reduction of body fat without modification in the BMI. These results can be better understood when observed along the distribution of the age range: the school girls and classic dancer are concentrated in the 12 to 13 years range and the non classic in the 16 to 17 years range. In this case it is pos-

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sible to consider that growth factors and development could had some influence in the observed anthropometrical values.

In what regards values for maximum VO2 there was no significant difference in the mean responses among the groups. However, it was observed a significant modification in the school girls group and classic dancer group from the initial to the final evaluation what did not occur in the non classic dancers group.

Flexibility of classic and non classic dancers was superior to

TABLE 4 – Mean and standard deviation for the variables related to the athletic performance.

Variables	Group	Moment	
		Initial	Final
Horizontal impulsions	School	137.81 ± 17.36 a A	147.58 ± 17.05 b A
	Classic	147.89 ± 20.62 a A	152.91 ± 20.94 a A
	Non-classic	137.61 ± 14.18 a A	144.20 ± 17.26 a A
Vertical impulsions	School	30.11 ± 5.40 a A	32.09 ± 5.79 b A
	Classic	34.18 ± 5.51 a B	36.30 ± 3.24 b B
	Non-classic	32.44 ± 6.14 a AB	33.94 ± 5.54 a AB
Equilibrium	School	2.95 ± 1.73 a A	2.59 ± 2.19 a A
	Classic	2.26 ± 1.93 a A	1.30 ± 0.72 b B
	Non-classic	2.78 ± 2.07 a A	2.17 ± 1.89 a AB
Coordination	School	14.95 ± 2.84 a A	17.76 ± 2.56 b A
	Classic	18.22 ± 2.83 a B	20.67 ± 4.13 b B
	Non-classic	17.78 ± 2.36 a B	19.05 ± 2.07 a AB
Agility	School	12.86 ± 1.47 a B	12.76 ± 1.26 a B
	Classic	12.48 ± 1.12 a B	11.67 ± 0.83 b A
	Non-classic	11.89 ± 1.18 a A	11.89 ± 1.28 a A

school girls in the initial evaluation. In the final there were also difference between the classic and non classic dancers. The latter did not evolved from the pre to the post test, showing that the body working has aid only to maintain the initial levels of flexibility. The initial localized muscle resistance was greater among classic dancers but showed decline in the final period of follow-up. The two other groups showed significant improvement in this variable. In the final moment the classic and non classic dancers had a superior performance when compared to the school girls, that is, the non classic become similar to the classic demonstrating that this sort of exercise is most productive to this physical capacity. The classic dancer had superior muscular strength at the pre and post test. All participants showed improvement in the muscular strength along the studied period.

Table 4 shows the results for horizontal impulsion, vertical impulsion, equilibrium, coordination and agility. The non classic dancers did not showed significant improvement from the initial to the final moment for the five variables. The school girls presented expressive evolution for the horizontal impulsion, the vertical impulsion and coordination, whereas the classic dancers had improvement in all but for horizontal impulsion. In the initial evaluation the comparison among groups shows the following results: (i) for horizontal impulsion and equilibrium there is no difference among groups; (ii) classic dancer have better vertical impulsion than school girls; (iii) classic and non classic dancer have greater scores for coordination; (iv) non classic dancers have more agility. For the final evaluation it was found that: (i) there is no difference in the performance of horizontal impulsion among groups; (ii) in the vertical impulsion, equilibrium and coordination the classic dancers have superior performance to the school girls; and (iii) in what concerns agility, classic and non classic dancers are faster than school girls. In brief, excepting the horizontal impulse, the performance of classic dancers were always superior to the others.

DISCUSSION

In were study, classic dancers mean weight, height and body fat percentage lower than in the other groups and, in average, they trained for six hours a week. Similarly to this, Pegeon et al (1997) studied for five years the modifications in weight, height and puberal development of 97 dancers (mean age 12.6 years) that were training clas-

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sis ballet (8.8 ± 0.8 hour/week). They compared to 30 students of the elementary school, practicing two hours a week physical education and other sport modalities and observed that 16% of the dancers showed, during pre-puberty, growth speed inferior to the expected. It should be noted the similarity of body fat percentage reported by these authors (18.0 ± 1.7) and the finding of the present study (17.6 ± 4.8).

In relation to physical fitness, it was observed that the maximum VO₂ for horizontal impulsion do not express significant differences among the groups. In spite of that the mean response between the initial and final moment demonstrated that classic dancers and school girls showed significant improvement in the cardio-respiratory condition.

Blackman et al. (1988) followed up 16 teens with mean age of 14 years old divided in two groups. The experimental one had an increase in the maximum VO₂ from the pre to the post test although the work done did not contribute to equal the aerobic condition to the values considered as ideal; both groups had a low maximum VO₂ when compared to the American standards even though not similar to values reported in the present study. In contrast, Ramos et al. (1995) refer that classic dancers can not be taken as endurance athletes but have maximum VO₂ indexes superior to sedentary individuals.

In what concerns the horizontal impulsion, Guedes and Guedes (1997) studied the characteristics of the motor performance of 172 school children at the age range of 7 to 17 years old. In the long jump, girls more than 13 years old showed value of 145.6 ± 10.9 , a result close to the one found in the present study in which non classic dancers showed 144.2 ± 17.2 and school girls 147.5 ± 17.05 , in the post test and the classic ones had 147.8 ± 20.6 , in the pre test.

Classic dancer showed a significant superior performance in regards of flexibility, localized muscular resistance and muscular strength in relation to the other groups. Guedes and Guedes (1997) refer, in the seat and reach test (28.4 ± 5.8), results that are similar to the present study (30.1 ± 7.3) for school girls. For classic dancers, the comparison of the mean score obtained in the post test is close to the percentile 95 showed by that author, that is, in contrast of the maximum VO₂, for this physical quality, the ballet dancers had a superior performance. Françaõ et al. (1999) stress that, despite the ample range of movement of these professional, there is no report in the literature of cases of hypermobility and, therefo-

re, they argue that the flexibility is acquired with specific training for this purpose.

Simpson (1989), for localized muscular resistance, observed that in the one minute abdominal test performed by aerobic dancers in the pre test the result was 32.63 and the in post test 35.34. In the present study it was observed that classic dancers, at the initial moment had a mean value of 36.12 and in the final, 33.41, with statistical difference between the evaluations.

How to explain these results? Most admissible hypothesis is that, in aerobic dance, the work aims to achieve increasing fitness and in the classic ballet, in the beginning, muscle resistance is the target and only latter the efforts focus into the development and improvement of choreography. It was seen in the academies that after the sixth months the time devoted to improvement of physical capacity was used to rehearse choreography without any concern with warming or stretching. This sort of approach can lead to decreased physical performance, favoring muscle-skeletal damage. Another explanation for the diverging results is the female school students of the present study are younger than the university students. In the former, the average values for the post test (28.3 ± 0.3) related to localized muscle resistance were similar to those of Guedes and Guedes (1997) that reported values of 28.4 ± 5.8 for students above 13 years old.

In what concern muscular strength, Parnianpour et al. (1994) evaluated the isometric and dynamic force in the trunk of dancers and reported that they are significantly stronger than the female population. To Fração et al. (1999) this physical capacity is developed mainly in the lower limbs, since the repetitive load of the usual movements of the classic on the lower limbs lead to high gains of muscular force when compared to the population. Robertson (1998) also refer that contemporary dance practitioners devote extra time to gain muscular mass since to this dance style the usual sylphid shape is not appealing.

On vertical impulsion, Matsudo (1993) reviewed studies done at the CELAFISCS and report some result that are similar to the ones observed in the present study. This is the case of the scores for the test of vertical impulsion (31.9 ± 10.4) in which females from 11 to 15 years old showed mean rates similar to the school girls (32.1 ± 5.8), that is, have a performance that comply with other values of reference.

Fração et al. (1999) mentioned that they did not find reports in the literature on the measure for explosive force in dancers. A possible explanation for a greater impulsion than in schools girls

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may be related to the dynamic of classes, which involves the frequent training of repeated jumps and short jumps that, according to Nanni (1998), are common to many dance practices. In this sense, due to the lack of practicing any specific modality of sport and their dancer training did not emphasize jumps, as it occurs in jumps, did not show a proficient impulsion.

Concerning equilibrium, Golomer and Monod (1995) studied 54 dancers and 43 sedentary of both sexes. They observed that the former had a superior performance and conclude that training of dance steps and figurations are the responsible for the development of the equilibrium performance.

Goslin and Burden (1986) studied agility and investigated the physical fitness of school students of both sexes in order to compare differences on race, among them: 98 whites, 92 mixed e 32 blacks. They reported that white female adolescents had more development in Shuttle Run comparing to other racial groups. They performed the test in 13 seconds in average what is similar to the results for the present study (12.8 in the pre-test and 12.7 in the post test).

In this study, the classic dancers (11.7 seconds) and the non-classic dancers (11.9 seconds) showed superior results to the male white students (12 seconds) and black (12.3 seconds). This reveals that dance can contribute to the improvement of fitness and can be used, including, as training for other sport modalities.

In what regards coordination, it was seen that dance practices shows improvement in this capacity. According to Robertson (1988) dance requires a fine development of coordination in order to make rapid changes of level and direction, as well as to maintain the correct alignment of the spine during rotation.

To Claro (1995), a well orientated dance has in its basis exercises with predominance of analytical joint dissociation (neck, shoulders, trunk, arms, hand, pelvis, knee and feet) for a better global association, favoring, therefore, a more elaborated frame of general coordination. This activity increases positively in the pedagogical level, since it has in the music one of the main and necessary elements to its basis.

Physical education, when correctly orientated can also collaborate in the improvement of the general coordination of human beings, but, by its own history, has some difficulty to select its strategy for its practice.

CONCLUSION

Results indicate that the classical dancers have a less corporal weight, lower height, lower percentage of fat and lower corporal mass index than the other groups. The cardiorespiratory capacity and the horizontal impulsion have not shown meaningful differences between the groups. The classical dancers and the non-classical have shown higher performance than the scholars concerning the vertical impulsion, equilibrium, coordination and agility. Regarding the variables flexibility, localized muscular resistance and strength, the classical dancers have had higher scores than the other groups.

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