The Effects of a Two Days Per Week Aerobic Dance Programme on Cardiovascular Endurance and Body Composition of American, Egyptian and Bahraini Female College Students

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ABSTRACT

The purpose of this study was to determine the effects of an aerobic dance programme on the cardiovascular endurance and the body composition of female physical education college students in three countries. The colleges used were Oregon State University, U.S.A.; Helwan University, Alexandria, Egypt; and The University College of Bahrain. Thirty students from each college were used. Half of each group were assigned as a control group. The training sessions for each group were identical and consisted of a 10 minute warm-up, 30 minutes continuous aerobic dance to music, and a 5 minute cool-down dance period. The exercise intensity for the aerobic dance routines were prescribed at 70% and 85% of maximum heart rate. Resting heart rate and blood pressure were measured. The sum of seven skinfold (subscapular, triceps, chest, midaxillary, superailiac, abdominal and thigh) and seven circumference measures (upper arm, chest, waist, abdomen, hips, thigh and calf) were used as indicators of subcutaneous fat and body dimensions. The 12 minute run and walk test was used as a measure of cardiovascular endurance. An analysis of variance was used to test the data. The results indicated that a two-day per week aerobic dance programme did increase cardiovascular endurance. There was a significant decrease in resting heart rate and no significant changes were found in blood pressure. Significant changes were found in body composition measures and body weight for the Egyptian and Bahraini subjects.

It is important for maintaining cardiovascular endurance and modifying body composition to have the necessary quantity and quality of exercise [1]. Aerobic exercise are those exercises which demand large quantities of oxygen for prolonged periods and ultimately force the body to improve those systems responsible for the transportation of oxygen [2]. Aerobic dance is defined as a choreographed routine of movements from various types of dance combined with other rhythmic movements such as hopping, skipping, jumping, and stretching continuously performed to music [3].

Aerobics characteristically involves covering long slow distances (L.S.D.) rather than short bursts of speed. Aerobic dance is the incorporation of various dance steps, calisthenics, and other whole body routines with music [4].

There is little information available concerning the effects of aerobic dance programmes on cardiovascular fitness, and few studies investigated the effects of aerobic dance on body composition. Researchers have attempted to measure alterations in body composition other than a change in total body weight on American female college students [3, 5].

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Aerobic dance meets or exceeds generally accepted minimums for training intensity and duration [4, 6, 7, 8, 9]. However, there are few studies available concerning the effects of aerobic dance training programmes on cardiovascular fitness. In addition, the question of training frequency is of importance.

The American College of Sports Medicine [10] generally recommended activities that elevate the heart rate to about 60% of the maximum heart rate which will substantially stress the cardiovascular system. Heart rate is primarily age dependent, and working between 70% and 85% of maximum heart rate seems most desirable. Heart rate of 114, 145 and 156 beats per minute for women during an aerobic dance class can be a useful modality for improving cardiovascular fitness [11].

The question of training frequency is of importance. Training sessions lasting from 15 to 60 minutes three to five days per week are recommended. However, the greater the intensity of training, the shorter the duration of each training session may be [1]. Nevertheless, many aerobic dance lessons are conducted with only two days of training each week. Clearly, et al [4]. conducted a study to determine the effects of a two-days and a three-days per week or a total of 10 weeks aerobic dance programme on maximal oxygen uptake and cardiovascular fitness. As a conclusion to their study, they recommended that perhaps if the length of the aerobic dance training programme had been extended beyond 10 weeks, significant cardiorespiratory improvements for two-days per week training might have been seen.

The major focus of the present study was to investigate the effects of 12 weeks aerobic dance programme for two-days per week on cardiovascular endurance and body composition of female college students in three different countries (U.S.A., Egypt, and Bahrain).

METHODS

SELECTION OF SUBJECTS

Ninety female college students age 19 to 25 years of age were used as subjects in the study. The colleges used were : Oregon State University (U.S.A.), Physical Education Faculty for Women, Helwan University (Alexandria, Egypt), and Bahrain University (State of Bahrain). Thirty students from each university were used, half of each group were randomly assigned as a control group. Subjects who had been previously trained or those who had participated in any type of activities were excluded from the study. All subjects were free of any kinds of diseases or handicaps. A written agreement for participating in the study was obtained from all subjects. During the training period, the experimental groups participated in an aerobic dance programme, where as the control group did not participate in any regular physical activities.

DATA COLLECTION PROCEDURES

The training programme was conducted at Oregon State University for the American subjects during the winter term of the 1984 academic school year, and in Egypt during the spring term of 1984 for the Egyptian subjects, and during the fall term of the 1985 academic school year for the Bahraini subjects. The training sessions were identical and consisted of a 10 minute warm-up, 30 minutes continuous aerobic dance to music, and a 5 minute cool-down dance period. The exercise intensity for the aerobic dance routine was prescribed at 70% and 85% of maximum heart rate. Resting heart rate and blood pressure were measured, as well as body weight, for all subjects before and after the twelve weeks training sessions. The sum of seven skinfold measures was obtained using the skinfold caliper (subscapular, triceps, chest, midaxillary, superiliac, abdominal and thighs) and seven circumference measures were obtained using a cloth tape following Behnke procedures and Wilmore (upper arm, chest, waist, abdomen, hips, thigh, and calf). Both measures were used as indicators of subcutaneous fat and body dimensions. The twelve-minute run-and-walk test was used as a measure of cardiovascular endurance.

The aerobic dance training routine started with 10 minutes of continuous dance routines (at an intensity level of 70% to 80% of maximum heart rate) and progressively increased to 30 minutes by the sixth week of training. Heart rate was frequently evaluated by the instructor. Post training measures were obtained for all subjects within two days of completion of the aerobic dance programme.

DATA ANALYSIS

A "t" test was used to determine if there was a significant difference between the pre and post-mean scores for the American, Egyptian, and Bahraini experimental and control groups on any of the dependent variables.

one way analysis of variance evaluated the different effects between the three countries, as well as Turkey post hoc technique as a follow up procedure for further analysis of mean differences. an alpha level of 0.05 was used for all significance tests.

RESULTS

Comparison of personal date for the experimental and control groups for the American, Egyptian and Bahraini subjects are presented in Table I, and figures 1, 2, 3. The means, standard deviations, standard error of the mean, and pre-to post-mean differences for the dependent variables are presented in Tables II, VIII, XIII, and XIV. No significant changes were found in pre to post-training for the control groups.

The results of the study indicated that :

1. A two-day per week aerobic dance programme for twelve weeks did increase cardiovascular endurance for the American, Egyptian, and Bahraini subjects (Table II, figure 4). There was a significant difference effect between the three countries involved in the study (Table III). The American mean difference effect was greater than the Egyptian mean difference effect, and the Egyptian mean difference effect was greater than the Bahraini mean difference effect (Table IV).

2. There was a significant decrease in resting heart rate for the three experimental groups (Table V). Also, there was a significant difference effect between the three countries (Table VI). The Bahraini mean difference effect was greater than the Egyptian mean difference effect, and the Egyptian mean difference effect was greater than the American mean difference effect (Table VII, and figure 5).

3. No significant changes were found in maximum heart rate for the three countries (Table VIII).

4. There were no significant changes in the systolic blood pressure and diastolic blood pressure for the experimental and control group (Table IX).

5. No significant changes were found in body weight for the American subjects, however, there were significant changes for the Egyptian and Bahraini subjects (Table X, XI). On the other hand, there was no significant difference effect between the Egyptian and Bahraini subjects (Table XII, figure 6).

6. There was no significant change in sum of seven skinfolds, and sum of seven circumferences for the American subjects, though there were significant changes for both the Egyptian and Bahraini subjects (Table XIII, XVI). There was a significant difference effect between the three countries in sum of seven skinfolds (reduction) (Table XIV). However, the Bahraini mean difference was higher than the Egyptian and the American mean difference (Table XV, figure 7).

7. For the sum of seven circumferences, there was no significant change for the American subjects (Table XIV), although there were significant difference effects between the American and both the Egyptian and Bahraini subjects. The Bahraini mean difference equalled the Egyptian mean difference in the sum of seven circumferences (Table XVII, XVIII, and figure 8).

TABLE I

Means, Standard Deviations, and Standard Error of the Mean for Experimental and Control Groups (Age, Height, Weight)

Variables	*Countries*	*Group*	*Mean*	*S.D.*	*Sex*	*Mean Diff.*
	American	E	20.4	2.133	.57	
		C	20.73	1.79	.478	− .333
Age	Egyptian	E	20.133	.915	.244	
(year)		C	21.4	1.99	.532	−1.267
	Bahrainis	E	19.73	.593	.158	
		C	19.60	.737	.197	.13
	American	E	168.72	1.524	3.081	
		C	168.613	16.306	4.359	.107
Height	Egyptian	E	159.345	2.10	.561	
(CM)		C	158.933	2.548	.681	.412
	Bahrainis	E	161.3	4.828	1.290	
		C	160.93	4.574	.039	.37
	American	E	53.039	6.635	1.774	
		C	52.66	6.184	1.653	.039
Weight	Egyptian	E	57.282	3.318	.887	
(Kg)		C	55.866	3.618	.967	1.415
	Bahrainis	E	57.318	12.065	3.225	
		C	61.578	11.448	3.06	−4.26

E = experimental group, C = control group

FIGURE 1

Age Mean Scores for the Experimental and Control Groups

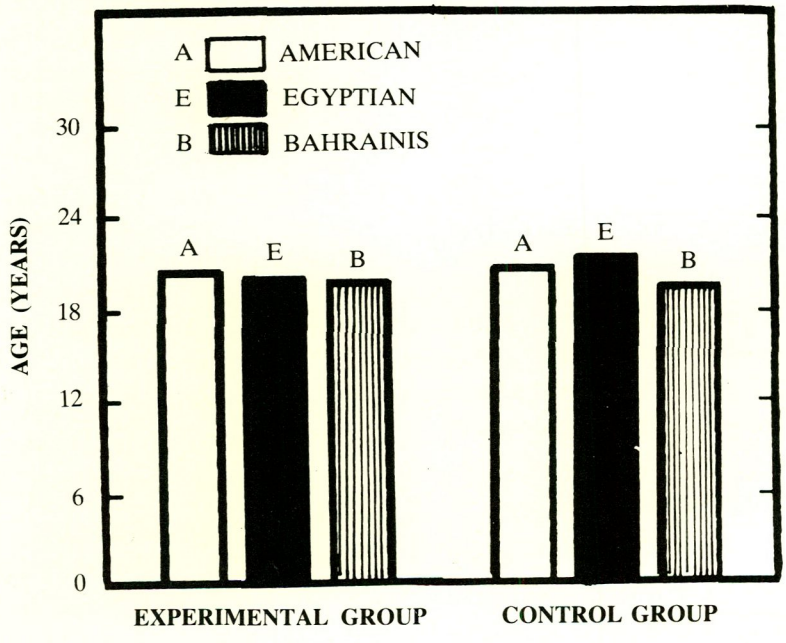


FIGURE 2

Height Mean Scores for the Experimental and Control Groups

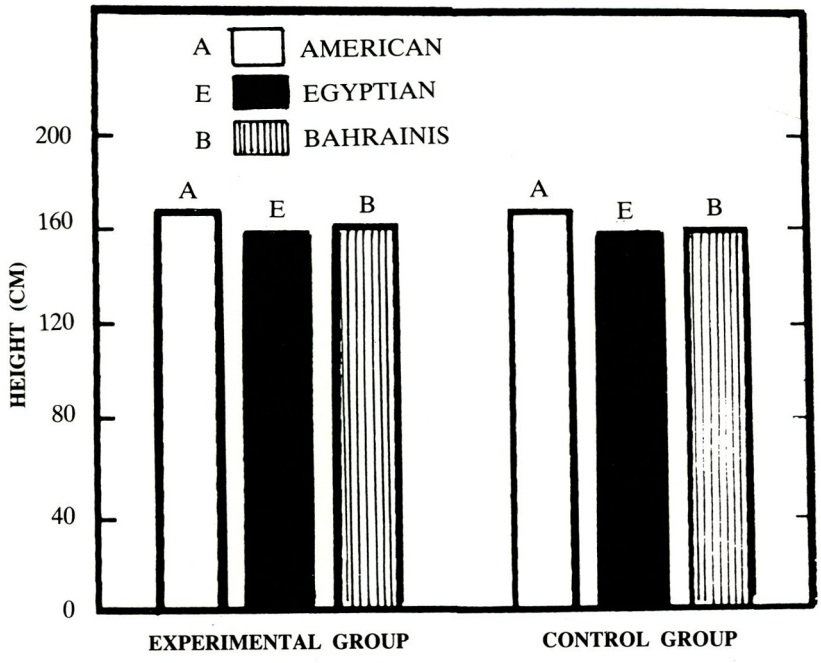


FIGURE 3

Weight Mean Scores for the Experimental and Control Groups

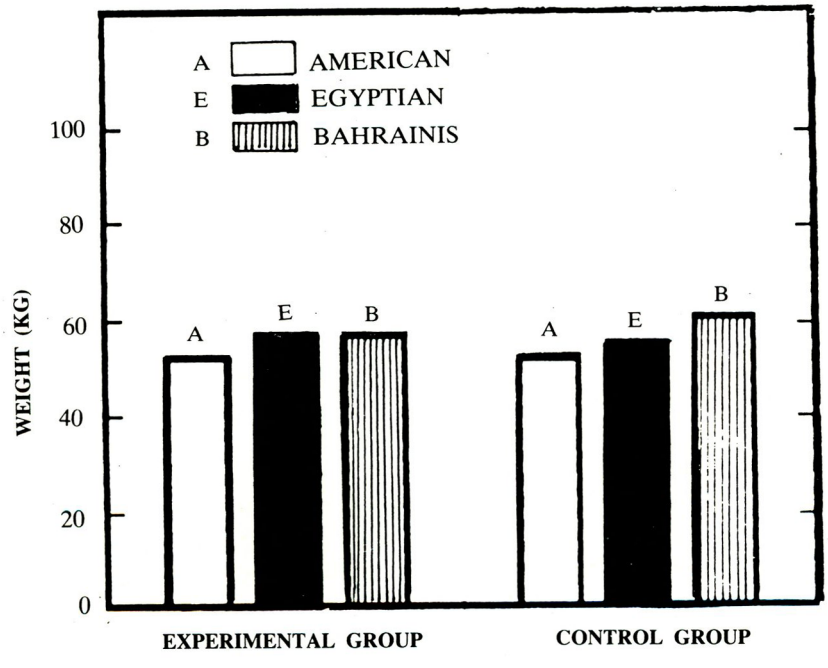


TABLE II

Means, Standard Deviations, Standard Error of The Mean, and "t" Values for the Cardiovascular Endurance Test

Variable	*Country*	*Group*	*BEFORE TRAINING* *Mean*	*S.D.*	SE_X	*AFTER TRAING* *Mean*	*S.D.*	SE_X	*Diff*	t_{values}
12 minute-run & walk test	American	E	1662.000	240.975	64.41	2941.168	407.491	108.925	−1279.168	−10.465*
		C	1662.000	240.975	64.41	1565.761	287.838	76.94	96.239	.993
	Egyptian	E	1541.111	269.269	71.97	2435.509	388.257	103.78	− 894.399	− 7.331*
		C	1541.111	269.269	71.97	1525.599	283.508	75.66	15.51	.154
	Bahrainis	E	1588.538	182.616	48.81	1944.079	278.055	74.32	− 355.54	− 4.139*
		C	1588.535	182.618	48.81	1595.827	178.206	47.63	− 6.98	− .111

t tabular = 2.145, df = 14, alpha = .050.
e = experimental group, C = control group

TABLE III

One Way Analysis of variance for the Twelve Minute-Run-And-Walk Test

Source of Variation	*SS*	*df*	*MS*	F_c	F_t
Treatment	6457417.18	2	3228708.59	17.256*	3.23
Error	7858595.86	42	187109.425		
Total	14316013.00	44			

TUKEY TABLE IV

Country	Post-Pre	diff	T_c	Q_t	Decision
American	1279.161	384.763*	99.2	3.44	A> E
Egyptian	894.398	538.857*			E> B
Bahrainis	355.541				

$T = (Q\alpha;r\ N-r)\sqrt{MS_{error}/n}$

* Significant at .05 level

TABLE V

Means, Standard Deviations, Standard Error of the Mean, and "t" Values for the Resting Heart Rate (bts.min)

Variable	*Country*	*Group*	*BEFORE TRAINING* *Mean*	*S.D.*	SE_X	*AFTER TRAING* *Mean*	*S.D.*	SE_X	*Diff*	t_{values}
	American	E	70.267	3.826	1.02	62.33	1.49	.399	7.937	7.479*
		C	69.60	3.581	.957	69.20	3.427	.916	.40	.313
Resting	Egyptian	E	83.267	12.458	3.33	67.33	3.829	1.235	15.937	4.755*
Heart-		C	82.80	12.06	3.22	80.80	10.591	2.83	2.00	.483
Rate										
(bts.min)	Bahrain	E	94.00	19.669	5.257	69.867	6.39	1.708	24.133	4.519*
		C	91.80	18.131	4.846	88.733	15.736	4.206	3.067	.495

t tabular = 2.145, df = 14, alpha = .05.
e = experimental group, C = control group

TABLE VI

One Way Analysis of variance for the Resting-Heart Rate (bts.min)

Source of Variation	*SS*	*df*	*MS*	F_c	F_t
Treatment	2100.311	2	1050.156	6.725	3.23
Error	6558.267	42	156.149		
Total	8658.578	44			

TUKEY TABLE VII

Country	Post-Pre	diff	T_c	Q_t	Decision
Bahrainis	24.133	8.2*	2.865	3.44	B> E
Egyptian	15.933	8.53*			E> A
American	7.40				

$T = (Q\alpha; r\ N-r)\sqrt{\ } MS_{Error}/\ n$

* Significant at .05 level

FIGURE 4

Mean Difference Effect for the Twelve Minute-Run-and-Walk Test

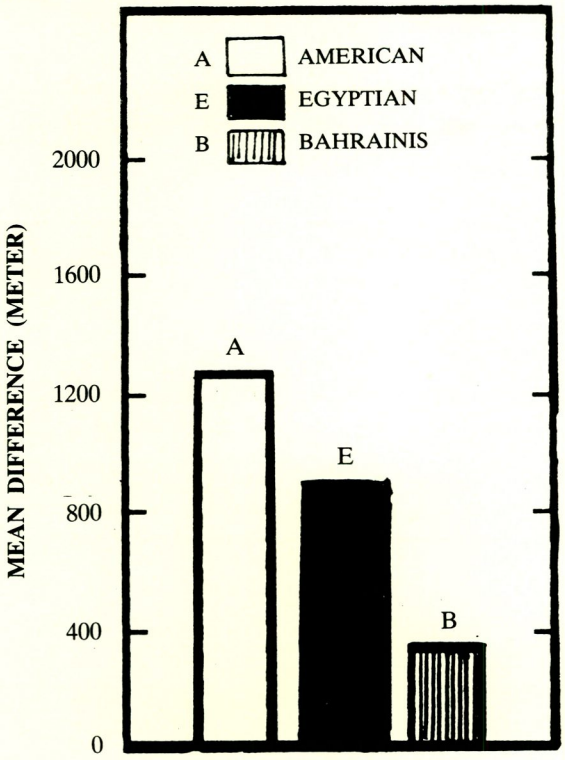


FIGURE 5

Mean Difference Effect for the Resting Heart Rate

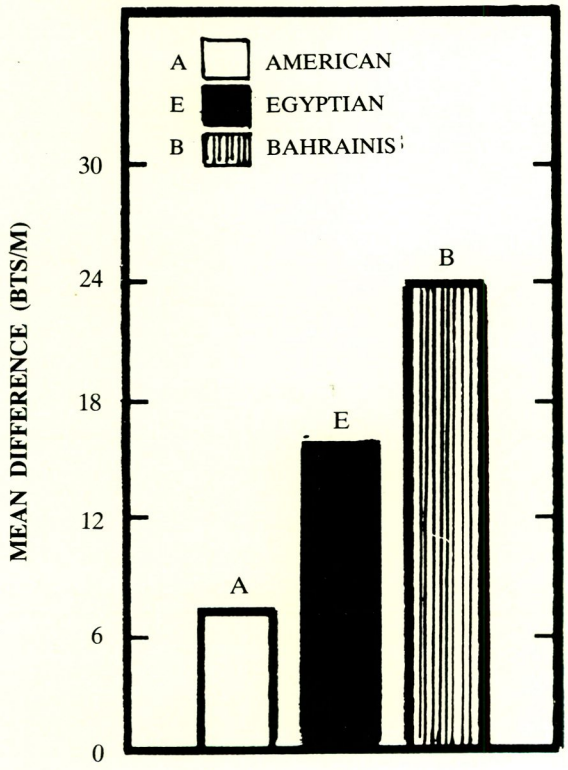


TABLE VIII

Means, Standard Deviations, Standard Error of the Mean, and "t" Values for the Maximum Heart Rate (bts.min)

Variable	*Country*	*Group*	*BEFORE TRAINING* *Mean*	*S.D.*	SE_X	*AFTER TRAING* *Mean*	*S.D.*	SE_X	*Diff*	t_{values}
	American	E	193.53	71.42	19.09	191.20	70.32	18.79	2.33	.09
		C	193.40	8.184	2.18	193.667	8.64	2.309	.267	.087
Maximum	Egyptian	E	189.133	15.487	4.139	187.733	14.781	3.95	1.4	.519
Heart-Rate		C	192.267	8.737	2.33	191.80	8.687	2.322	.467	.431
(bts.min)	Bahrain	E	159.00	47.71	12.75	159.733	47.81	13.047	−.733	−.042
		C	161.44	45.68	12.21	135.28	27.76	7.42	26.16	1.895

t tabular = 2.145, df = 14, alpha = .05

e = experimental group, C = control group

TABLE IX

Means, Standard Deviations, Standard Error of the Mean, and "t" Values for the Blood Pressure (mm hg)

Variable	*Country*	*Group*	*BEFORE TRAINING* *Mean*	*S.D.*	SE_X	*AFTER TRAING* *Mean*	*S.D.*	SE_X	*Diff*	t_{values}
	American	E Sys	123.67	17.5	4.67	121.87	17.55	4.69	1.8	1.39
		Dia	72.07	5.09	1.36	71.93	4.51	1.20	.137	.320
		C Sys	123.66	17.53	4.68	121.867	17.567	4.695	1.793	1.389
		Dia	72.06	5.092	1.36	71.833	4.511	1.205	.134	.315
Blood −	Egyptian	E Sys	120.20	13.246	3.54	118.60	13.405	3.58	1.60	.719
Pressure		Dia	73.4	5.22	1.39	71.93	4.15	1.109	1.47	1.492
(mm hg)		C Sys	122.467	12.744	3.40	123.33	14.96	3.998	−.863	−1.297
		Dia	74.53	4.69	1.25	74.13	4.80	1.28	.40	1.0
	Bahrain	E Sys	119.6	14.97	4.0	122.0	19.46	5.20	−2.4	−.702
		Dia	73.2	4.828	1.29	72.4	4.42	1.18	.8	2.10
		C Sys	121.867	14.491	3.87	123.2	13.728	3.669	−1.33	−.899
		Dia	73.60	5.865	1.567	73.33	4.938	1.319	.30	.299

t tabular = 2.145, df = 14, alpha = .05

E = experimental group, C = control group, Sys= systolic, Dia= diastolic.

TABLE X

Means, Standard Deviations, Standard Error of the Mean, and "t" Values for Body Weight (Kg)

Variables	*Country*	*Group*	*BEFORE TRAINING* *Mean*	*S.D*	SE_X	*AFTER TRAINING* *Mean*	*S.D*	SE_X	*Diff*	t_{values}
Body Weight (Kg)	American	E	53.039	6.635	1.77	53.88	6.876	1.83	−.841	−.344
		C	52.661	6.185	1.65	51.687	6.437	1.72	.974	.423
	Egyptian	E	57.282	3.318	.886	53.633	2.785	.085	3.649	3.262 *
		C	55.867	3.619	.967	55.943	3.636	.97	−.076	.282
	Bahrain	E	57.0	12.219	3.266	47.867	10.982	2.935	9.133	2.151 *
		C	61.579	11.448	3.06	60.52	11.907	3.182	1.059	.248

t tabular=2.145, df=14, alpha=.05

E= experimental group, C= control group.

TABLE XI

One Way Analysis of Variance for Body Weight (Kg)

Source of Variation	*SS*	*df*	*MS*	F_C	F_t
Treatment	137.724	2	68.86	8.89*	3.23
Error	325.239	42	7.744		
Total	426.962	44			

TUKEY TABLE XII

Country	*Post-Pre*	*diff*	*T*	*Q*	*Decision*
Bahrain	− 4.60	.145 n.sig	.638	3.44	B ≥ E
Egyptian	− 4.45	3.637*			E > A
American	− .82				

$T = (Q\alpha; r\ N-r) \sqrt{MS_{error}/n}$

* Significant at .05

TABLE XIII

Means, Standard Deviations, Standard Error of the Mean, and "t" Values for Sum of Seven Skinfolds (mm)

Variables	*Country*	*Group*	*BEFORE TRAINING*			*AFTER TRAINING*				
			Mean	*S.D*	SE_X	*Mean*	*S.D*	SE_X	*Diff*	t_{values}
Sum of Seven Skinfolds (mm)	American	E	161.44	45.68	12.21	135.28	27.76	7.42	26.0	1.895
		C	159.0	47.71	12.75	159.73	47.81	12.78	−.733	.042
	Egyptian	E	187.47	9.63	2.57	171.133	11.56	3.09	16.337	4.206*
		C	189.13	15.48	4.14	187.733	14.78	3.95	1.353	.519
	Bahrain	E	193.533	71.43	19.09	160.733	38.625	10.32	32.90	2.761 *
		C	193.53	71.42	19.10	191.20	70.32	18.71	2.33	.09

t tabular=2.145, df=14, alpha=.05

E= experimental group, C= control group.

TABLE XIV

One Way Analysis of Variance for Sum of Seven skinfolds (mm)

Source of Variation	*SS*	*df*	*MS*	F_C	F_t
Treatment	9327.644	2	4663.822	6.734*	3.23
Error	29090.267	42	692.625		
Total	38417.911	44			

TUKEY TABLE XV

Country	*Post-Pre*	*diff*	*T*	*Q*	*Decision*
Bahrain	−30.20				
Egyptian	.733	−29.467*	6.035	3.44	B > E
American	− .0666	− .799 n.sig			E = A

$T = (Q\alpha; r\ N-r)\ \sqrt{MS_{error}/n}$

* Significant at .05

FIGURE 6

Mean Difference Effect for the Body Weight

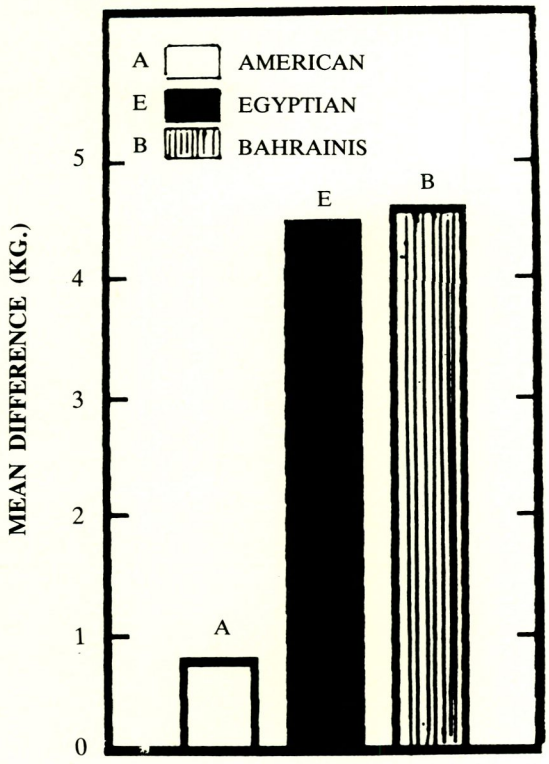


FIGURE 7

Mean Difference Effect for the Sum of Seven Skinfolds

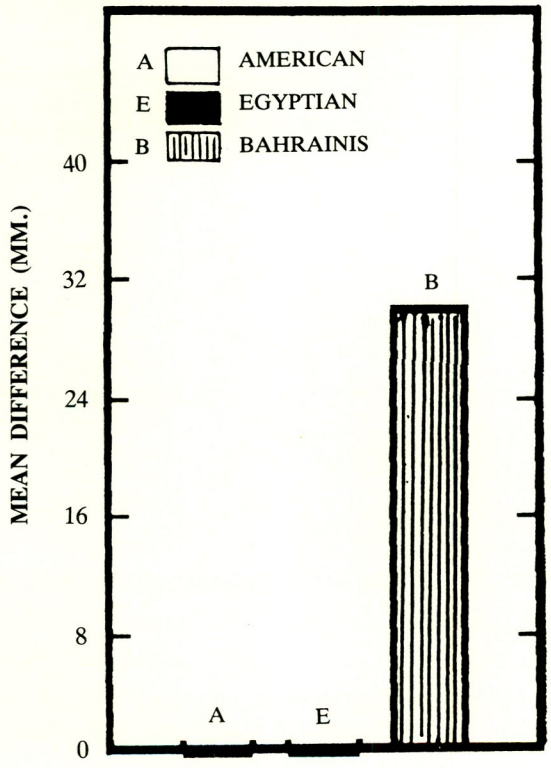


TABLE XVI

Means, Standard Deviations, Standard Error of the Mean, and "t" Values for Sum of Seven Circumferences (cm)

Variables	*Country*	*Group*	*BEFORE EXERCISE* *Mean*	*S.D*	SE_X	*AFTER EXERCISE* *Mean*	*S.D*	SE_X	*Diff*	t_{values}
Sum of Seven Circumferences (cm)	American	E	435.62	76.055	20.3	448.628	72.16	19.28	−13.0	−.483
		C	401.467	45.466	12.15	401.173	45.07	12.05	.294	.017
	Egyptian	E	470.79	75.79	15.48	370.111	40.97	10.95	100.68	6.46 *
		C	447.706	60.74	16.23	432.913	48.825	13.05	14.79	.735
	Bahrain	E	470.793	75.793	20.26	370.107	40.974	10.95	100.686	2.459 *
		C	449.067	54.879	14.67	426.473	47.095	12.59	22.597	1.21

t tabular=2.145, df=14, alpha=.05

E= experimental group, C= control group.

TABLE XVII

One Way Analysis of Variance for Sum of Seven Circumferences (cm)

Source of Variation	*SS*	*df*	*MS*	F_C	F_t
Treatment	100792.251	2	50396.126	24.76*	3.23
Error	85484.685	42	2035.349		
Total	186276.936	44			

TUKEY TABLE XVIII

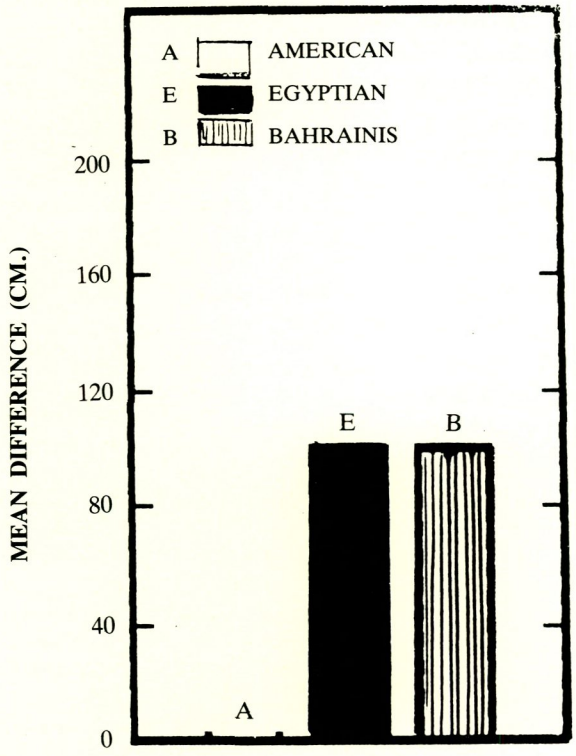
Country	*Post-Pre*	*diff*	*T*	*Q*	*Decision*
Bahrain	− 100.60	00.0 n.sig	10.346	3.44	B = E
Egyptian	−100.60	−98.36*			B, E > A
American	− 2.231				

$T = (Q\alpha; r\ N-r)\ \sqrt{MS_{error}/n}$

* Significant at .05

FIGURE 8

Mean Difference Effect for the Sum of Seven Circumferences



DISCUSSION

The aerobic dance programme employed in the present study was typical to those in widespread use and described in many instructional manuals [3, 9, 12, 13]. The type, intensity, and duration of the aerobic dance used for conditioning in the present study were very similar to other studies [3, 5, 14, 15].

The decreases in resting heart rate accompanied by no change in control groups, indicate that cardiovascular endurance was altered by the aerobic dance programme for the American, Egyptian and Bahraini subjects. These changes were similar to those reported in other aerobic dance studies on younger women, [3, 15, 16] and similar to changes reported to result from bicycle and walk/run conditioning in adults [17, 18, 19].

The nonsignificant changes in systolic and diastolic blood pressure are in agreement with other endurance conditioning and aerobic dance studies [3, 19].

The nonsignificant changes in body weight and body composition measures (sum of seven skinfolds, and sum of seven circumferences) for the American subjects is in agreement with other studies using young American college women in which aerobic dance programmes did not have any significant decrease in body weight or body fat estimated from skinfolds [3, 14, 15].

CONCLUSION

Based on the analysis of the data obtained from the present study, the following conclusions were drawn : 1) The significant changes (reduction) in

body weight and body composition for the Egyptian and Bahraini subjects may refer to their eating habits (less fattening) also, participating in such type of activity in hot weather and high temperature might have an influence on body weight reduction and decrease in their body composition, because muscles become more dense and take up less space than fat. In addition to, and in response to vigorous exercise for the first time in their lives, the muscle involved becomes slightly larger and more toned, since fat takes up a great deal more space than muscle, so the subject had to lose inches and centimeters with a concommitant gain of solid tissue in addition to the fact that walking in hot weather, the individual will lose approximately ¼ litre of water per hour. 2) Aerobic dance provides an effective conditioning to enhance cardiovascular fitness in addition to activities such as bicycling, swimming, and running; as long as large muscle groups are involved in aerobic activity providing sufficient intensity, duration, and frequency without regard to the mode of training.

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