High intensity interval training (HIIT): impact on fitness Levels and Level of Performance

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This study aimed to study the effect of HIIT training on the fitness level and level of performance. A total of 30 students of third year college girls, with a percent of 18% of their class (aged 18-20) were divided into two groups: one experimental group (EG) HIIT EG consisting of 15 subjects, and a control group (CG) consisting of 15 subjects. The subjects underwent 12 weeks of training. They were tested for fitness levels and level of performance was made in the pre-test before training and at the re-test after 12 weeks of training. Significant differences in the fitness level and level of performance, were found between post-test and pre-test measurements in the EG. Furthermore, there were significant differences in all indicators of fitness level and level of performance, between the EG and CG after completing 12 weeks of training. Results indicated significant differences between the experimental group and the control group on the fitness level and level of performance. The results of this study suggest that HIIT is positively correlated with fitness level and level of performance. HIIT is therefore associated with an improvement in fitness level and level of performance.

Key words: coaching- HIIT- performance - Fitness

Introduction

Scientific development has added many of modern training methods through which an student / athlete is efficiently set up to qualify him/herself to raise the level of performance. And scientists have worked hard in an attempt to reach the best ways to improve the quality of performance.

The use of modern trends in training are important in raising and enhancing the level of student /athletic performance.

High-intensity interval training (HIIT) refers to exercise that is characterized by relatively short bursts of vigorous activity, interspersed by periods of rest or low-intensity exercise for recovery. HIIT is infinitely variable, and the specific physiological adaptations induced by this form of training are likely determined by many factors including the mode and precise nature of the exercise stimulus, i.e. the intensity, duration and number of intervals performed, as well as the duration and activity patterns during recovery.

This research aims to study the differences between the HIIT and Aerobic Training and its impact on each of:

Physical fitness elements related to rhythmic exercise (agility - Flexibility - Coordination - reaction time – balance - Ability) for third year college girls in rhythmic gymnastics.

Levels of performance in rhythmic exercise (pivots – flexibility – balance – jumps & leaps – Dance steps – the unity of performance – total performance) for third year college girls in rhythmic gymnastics.

Highlighting the benefit of using HIIT program in optimizing the fitness level.

Highlighting the benefit of using HIIT program in optimizing the level of performance.

Method

Experimental method by using two groups an experimental group and a control group, by using "pre" and "post" measurements.

Participants

Third year female students from the Faculty of Physical Education for girls at Aljazeera - Helwan University for the educational year (2014 – 2015)

Random sample of 30 students with a percent of 15% of their class subdivided into two experimental groups.

Descriptive variables such as: Height, Weight, Age,

Data Collecting : Fitness Elements tests: Agility test, Flexibility test , Coordination test. Reaction time test., Balance Test, Ability test.

Assessment of Skilled Performance:
Skilled performance for rhythmic gymnastics score sheet.
Scores were taken by rhythmic gymnastics Professors

Time plan for the program:
It has been designed as a 12 week program with a 4 session a week each training session 30mins .All in all are 48 training session in the time duration of 24 hours

Components of the program:
The proposed program included a set of axes and dimensions, which are:

First axis: warm up exercises - First dimension: warm up of large muscles (chest, back, thighs, trunk)

Second dimension: warm up of smaller muscles (arms, shoulders, Calf) - Second Axis: The Main section :

HIIT exercises (short bursts of vigorous activity, interspersed by periods of rest or low-intensity exercise for recovery).

Third axis: cool down exercises Which cools down the body, and bring it back to it's normal state.

Table (1) The significance of the difference between the two measurements, the "pre" and "post", and rate of improvement for the experimental group in the variables regarding physical fitness   N=15

Variables	Pre		Post		T	Significance	%
	Mean	SD	Mean	SD			
Frontal Split	9.53	1.06	5.00	0.534	16.56*	significant	47%
Side Split	11.53	1.76	5.00	1.06	20.30*	significant	56.6%
Bridge	40.20	1.08	33.80	1.78	16.00*	significant	16%
Agility	43.06	3.21	32.66	3.19	31.02*	significant	24%
Coordination	63.33	5.23	54.46	5.55	17.86*	significant	14%
Speed	4.66	0.617	8.0	0.910	15.44*	significant	71.6%
Reaction Time	8.73	0.883	4.26	0.703	23.27*	significant	14%
Upper part muscle ability	4.26	0.798	5.56	0.842	12.16*	Significant	30.5%
Lower part muscle ability	12.66	2.58	17.46	2.47	13.53*	Significant	38%
Balance	25.33	4.80	47.66	10.49	11.49%	Significant	88.1%
Lower part strength	4.60	0.736	7.96	0.859	18.36*	Significant	73%
Upper part strength	8.26	2.43	15.66	1.01	20.57*	Significant	89.5%

Value of "T" = 2.013

We see in table (1) that:

There is a significant statistical difference between the two

measurements, the "pre" and "post", for the experimental group in favor of the "post" measurement in the variables regarding physical fitness elements.

Table (2) The significance of the difference between the two measurements, the "pre" and "post", and rate of improvement for the control group in the variables regarding physical fitness N=15

Variables	Pre		Post		T	Significance	%
	Mean	SD	Mean	SD			
Frontal Split	9.60	1.05	8.33	0.899	10.71*	significant	13.2%
Side Split	11.33	1.75	9.13	1.05	9.86*	significant	19.4%
Bridge	40.06	1.22	38.06	1.33	9.16*	significant	5 %
Agility	42.73	3.26	40.20	3.0	7.23*	significant	5.9%
Coordination	63.0	5.27	60.93	5.20	8.32*	significant	3.3%
Speed	4.73	0.703	6.05	0.995	14.49*	significant	28%
Reaction Time	8.66	0.816	7.0	0.654	13.22*	significant	19.1%
Upper part muscle ability	4.33	0.816	4.06	0.752	11.0*	Significant	6.2%
Lower part muscle ability	12.33	2.58	13.66	2.28	10.58*	Significant	10.7%
Balance	25.66	4.95	29.93	3.35	12.91*	Significant	16.6%
Lower part strength	4.46	0.743	6.65	0.948	12.23*	Significant	49.1%
Upper part strength	7.06	1.48	8.26	1.66	11.22*	Significant	17%

Value of "T" = 2.013

We seen in table (2) that:

There is a significant statistical difference between the two measurements, the "pre" and "post", for the control group in favor of the "post" measurement in the variables regarding physical fitness elements.

Table (3) The significance of the difference between the two "post" measurements, for both the experimental and control group in the variables regarding physical fitness. (N=30)

Variables	Post		Post		T	Significance
	Mean	SD	Mean	SD		
Frontal Split	5.00	0.534	8.33	0.899	12.33*	significant
Side Split	5.00	1.06	9.13	1.05	8.85*	significant
Bridge	33.80	1.78	38.06	1.33	7.42*	significant
Agility	32.66	3.19	40.20	3.0	6.64*	significant
Coordination	54.46	5.55	60.93	5.20	3.29*	significant
Speed	8.0	0.910	6.05	0.995	9.99*	significant
Reaction Time	4.26	0.703	7.0	0.654	11.01*	significant
Upper part muscle ability	5.56	0.842	4.06	0.752	3.71*	Significant
Lower part muscle ability	17.46	2.47	13.66	2.28	4.36*	Significant
Balance	47.66	10.49	29.93	3.35	5.82*	Significant
Lower part strength	7.96	0.859	6.65	0.948	6.77*	Significant
Upper part strength	15.66	1.01	8.26	1.66	19.88*	Significant

Level Result

The table shows the differences between the per and post-performance level

Showing results associated to the given variables regarding performance level (pivots – flexibility – balance – jumps & leaps – dance steps – unity of performance-total performance of the unit).

Table (4) Significant differences between the two measurements, pre and post, and rate of improvement of the experimental group in Variables regarding performance level N=15

Variables	Pre		Post		T	Significance	%
	Mean	SD	Mean	SD			
Pivots	1.60	0.705	2.90	1.38	12.10*	significant	81.2
Flexibility	1.73	0.593	2.96	1.25	14.71*	significant	71.0
Balance	1.40	0.507	2.66	1.14	13.06*	significant	90.0
Jumps & Leaps	0.800	0.253	1.55	0.718	15.03*	significant	93.7
Dance steps	1.53	0.516	2.88	1.07	12.41*	significant	88.2
The Unity of performance	0.833	0.244	1.53	0.643	12.78*	significant	83.6
Total performance	7.66	1.38	12.88	2.16	20.18*	significant	68.6

Value of "T" = 2.013

Table (4) shows that:

There is a significant statistical difference between the "pre" and "post" "performance level, for the experimental group in favor of the "post" measurement in the variables regarding performance level.
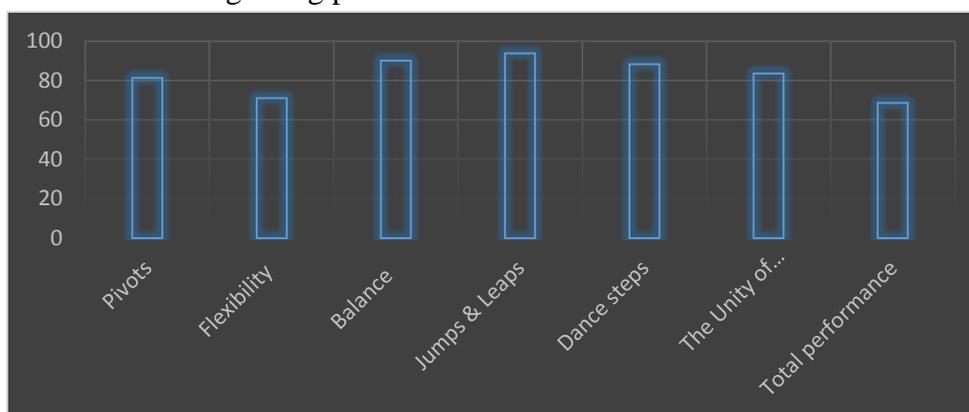

Table (5) Significant differences between the two measurements, pre and post, and rate of improvement of the control group in Variables regarding performance level N=15

Variables	Pre		Post		T	Significance	%
	Mean	SD	Mean	SD			
Pivots	1.53	0.516	2.06	0.457	4.0*	significant	34.6
Flexibility	1.60	0.507	2.0	0.700	3.05*	significant	25.0
Balance	1.33	0.488	1.93	0.457	4.58*	significant	45.1
Jumps & Leaps	0.833	0.244	0.833	0.244	26.0*	significant	____
Dance steps	1.60	0.507	1.86	0.639	2.25*	significant	16.2
The Unity of performance	0.800	0.253	0.800	0.253	15.92*	significant	_____
Total performance	7.76	1.24	9.33	1.24	5.97*	significant	20.2

Value of "T" = 2.013

Table (5)shows that:

There is a significant statistical difference between the two measurements, the "pre" and "post", for the control group in some of the variables of the performance level represented in (pivots, Flexibility, balance, dance steps, total performance) favor of the "post" measurement and no statistical difference in some of the variables represciented in (jumps and leaps, the unity of the performance).
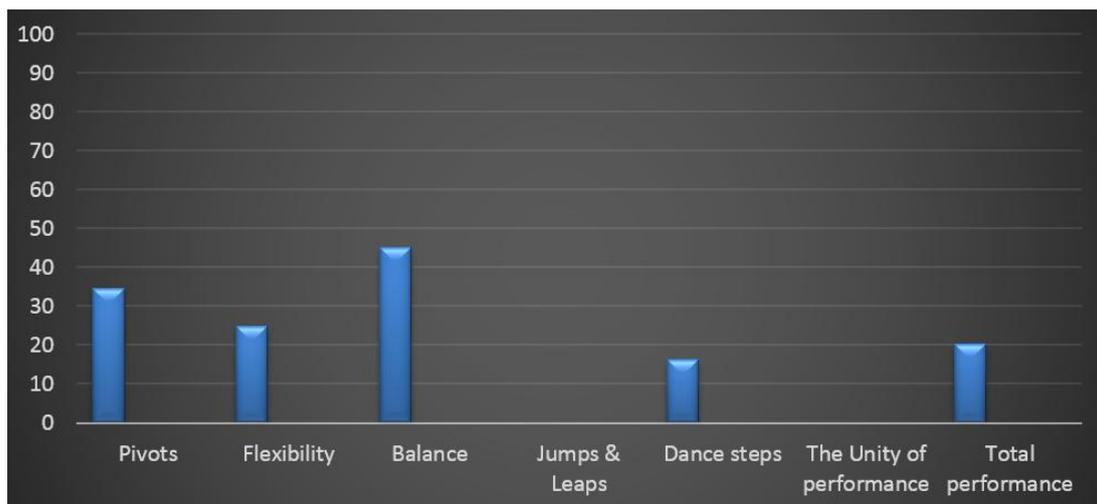
Table (6) Significant differences between the two post measurements of the experimental group and control group in Variables Regarding performance level. N=30

variables	post		Post		T	Significance
	Mean	SD	Mean	SD		
pivots	2.90	1.38	2.06	0.457	12.30*	significant
Flexibility	2.96	1.25	2.0	0.700	14.71*	significant
Balance	2.66	1.14	1.93	0.457	13.06*	significant
Jumps & Leaps	1.55	0.718	0.833	0.244	15.03*	significant
Dance steps	2.88	1.07	1.86	0.639	12.41*	significant
The Unity of performance	1.53	0.643	0.800	0.253	12.78*	significant
Total performance	12.88	2.16	9.33	1.24	23.71*	significant

Value of "T" = 1.96

Table (6)shows that:

There is a Significant differences between the two post measurements of the control group and experimental group in favor of the experimental in Variables regarding performance level.
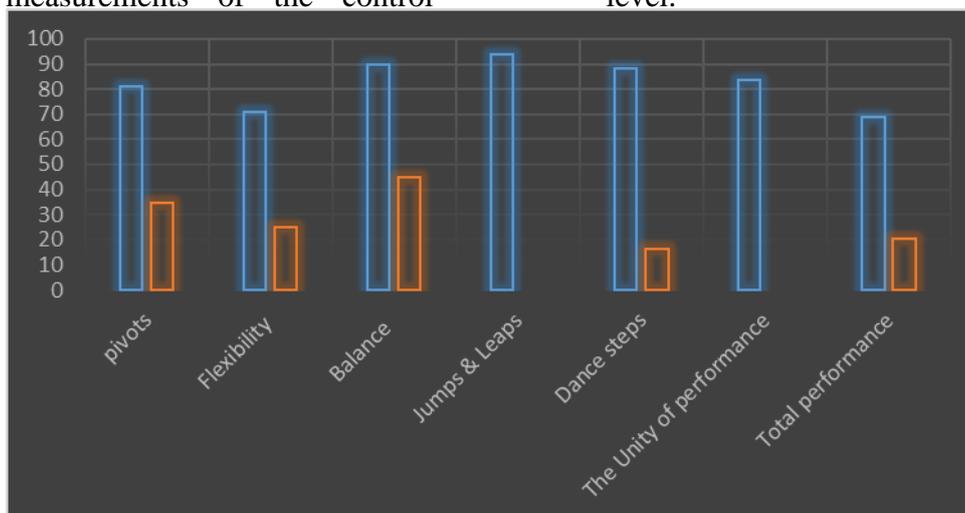
Discussion:

Table (1) clarifies the results related to the variables of fitness level for the experimental group that are represented in (frontal split- side split- bridge – agility – coordination – speed – reaction time – upper part muscle

ability- lower part muscle ability- balance – lower part strength – upper part strength)

These results indicate that there is a significant statistical difference between the "pre" and "post" measurements in the variables relating to fitness and the rate of improvement reached (47%, 56.6%, 16%, 24.7%, 14%, 71.6%, 14%, 30.5%, 38%, 88.1%, 73%, 89.5%) in the variables of (frontal split- side split- bridge – agility – coordination – speed – reaction time – upper part muscle ability- lower part muscle ability- balance – lower part strength – upper part strength)

Table (2) clarifies the results related to the variables of fitness level for the control group that are represented in (frontal split- side split- bridge – agility – coordination – speed – reaction time – upper part muscle ability- lower part muscle ability- balance – lower part strength – upper part strength)

These results indicate that there is a significant statistical difference between the "pre" and "post" measurements in the variables relating to fitness and the rate of improvement reached (13.2%, 19.4%, 5%, 5.9%, 3.3%, 28%, 19.1%, 6.2%, 10.7%, 16.6%, 49.1%, 17%) in the variables of (frontal split- side split- bridge – agility – coordination – speed – reaction time – upper part muscle ability- lower part muscle ability- balance – lower part strength – upper part strength)

Table (3) clarifies the results related to the variables of fitness level for the experimental group and control group in the post measurement for each group.

These results indicate that there is a significant statistical difference between the post measurement for the experimental group and the post measurement for the control group in the favor of the post measurement for the experimental group.

Table (4) clarifies the results related to the variables of performance level for the experimental group that are represented in (Pivots -flexibility – balance – jumps & leaps- Dance steps-

the unity of performance- total performance)

These results indicate that there is a significant statistical difference between the "pre" and "post" measurements in the variables relating to performance level and the rate of improvement reached (81.2%, 71%, 90%, 93.7%, 88.2%, 83.6%, 68.8%) in the variables of (Pivots -flexibility – balance – Jumps & Leaps- Dance steps- total performance of the unit- harmony of performance)

Table (5) clarifies the results related to the variables of performance level for the experimental group that are represented in (Pivots -flexibility – balance – jumps & leaps- Dance steps- the unity of performance - total performance)

These results indicate that there is a significant statistical difference between the "pre" and "post" measurements in the variables relating to performance level and the rate of improvement reached (34.6%, 25%, 45.1%, 16.2%, 20.2%) in the variables of (Pivots - flexibility – balance - Dance steps - total performance) and no improvement reached on the variables (Jumps and leaps - the unity of the performance)

Table (6) clarifies the results related to the variables of performance level for the experimental group and control group in the post measurement for each group.

These results indicate that there is a significant statistical difference between the post measurement for the experimental group and the post measurement for the control group in the favor of the post measurement for the experimental group.

Conclusions:

In the light of the hypothesis and aim of study, as well as the methods used, and after conducting statistical appraisal of the results, we can safely deduce the following:

1- The suggested high intensity interval training efficiently enhances skilled performance levels for rhythmic exercises training.

2- The suggested high intensity

interval training efficiently enhances the fitness levels for rhythmic exercises training.

Recommendations:

1- Using high intensity interval training programs for students to enhance their performance levels.

2- Using high intensity interval training programs for students to enhance their fitness levels.

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