

## Quantification of Flexibility in Response to High Intensity Interval Training and Moderate Intensity Continuous Training among College Women Athletes

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### Abstract

The aim of the study was to quantify the Flexibility of college-age female athletes in response to high-intensity interval training and moderate-intensity continuous training. To this study forty five (N=45) female athletes from various Arts and Science Colleges in Coimbatore District, Tamilnadu, India, were randomly chosen as subjects. They were divided randomly into three groups of fifteen each i.e., (n=15) Group-I underwent High-Intensity Interval training (HIIT), Group-II underwent Moderate-Intensity Continuous Training (MICT) and Group-III acted as Control. The training period was limited to three days per week for twelve weeks. The Sit and reach test was used to measure the dependent variable for this study, which was Flexibility. The chosen dependent variable was assessed on each individual both before and right after the experimental period. With the dependent 't'-test and Analysis of covariance, the data collected from the experimental groups and control group prior to and following the experimental period were statistically evaluated (ANCOVA). The Scheffe's Post hoc test was used to ascertain the paired mean differences whenever the 'F' ratio for adjusted post test means was found to be significant. For each scenario, the degree of confidence was set at 0.05. The development of balance ability was found to be improved by the High-Intensity Interval Training group (HIIT) more than the Moderate-Intensity Continuous Training group (MICT) and Control group.

Key words: High-Intensity Interval Training, Moderate-Intensity Continuous Training, Flexibility

## INTRODUCTION

Sports training, in a nutshell, mean preparing for a performance. It helps the athlete build strength and endurance gradually, improves their skill levels, and strengthens confidence. As simple as this may sound, but formulating the 'perfect' training method that fulfills all your physical goals is a dream come true. The workout program you follow has a significant impact on your desired outputs; hence training must be relevant to your purpose and sport you intend to pursue (Berger Richard, 1982).

There is no hard and fast rule that one must follow in order to achieve a particular result; this is due to varied body types, different metabolism levels, and diverse age groups. With multiple options available, it becomes all the more challenging to choose one. The best way is to try everything and see what gives you the most reliable results; experiment and learn in the process. Here are some conventional models of training:

Continuous training or steady-state training includes longer intervals of physical exercise without breaks or rest periods. Ideally, in this method, the heart rate is kept constant between 60% to 80% throughout the session, and it aims at enhancing your respiratory and cardiovascular system. Once you build your cardiovascular endurance, it becomes easier for your body to cope up with routine activities without running out of breath (Laursen and Jenkins, 2002).

Continuous exercise is recommended if you are looking forward to losing weight, participating in marathons, swimming, triathlons, and bike rides. It is also an excellent way to begin exercising before moving on to the high-intensity workout. Typical sessions include swimming, running, biking, walking, or a combination of all, for about 20 to 30 minutes.

Interval training alternates between short bursts of high-intensity workout and periods of rest and recovery to promote the recovery rate, speed, and lactate threshold of the player's body. In this method, the high-intensity periods are anaerobic exercises, and the recovery period can vary from complete rest to low-intensity activities (Hood et al., 2011).

Benefits of following this routine include faster and more efficient workout sessions – allowing your body to work more in limited time, reduces the risk of overtraining – since the intensity varies, it avoids the risk of overtraining and freedom to experiment with exercises.

High-intensity interval training (HIIT) is a training protocol alternating short periods of intense or explosive anaerobic exercise with brief recovery periods until the point of exhaustion. HIIT involves exercises performed in repeated quick bursts at maximum or near maximal effort with periods of rest or low activity between bouts. The very high level of intensity, the interval duration, and number of bouts distinguish it from aerobic (cardiovascular) activity, because the body significantly recruits anaerobic energy systems (although not completely to the exclusion of aerobic pathways).The method thereby relies on "the anaerobic energy releasing system almost maximally"(Tabata, et al., 1986).

## METHODOLOGY

The study was conducted on 45 (N=45) female athletes who were students at various arts and science colleges in the Coimbatore District of Tamil Nadu, India. They were divided into three groups of fifteen people each at random, or (n=15). High-Intensity Interval Training (HIIT) was used in Group I, Moderate-Intensity Continuous Training (MICT) was used in Group II, and Control was used in Group III. Three days a week for a total of twelve weeks comprised the training programme. Sit and Reach Test (Schell and Leelarthae-pin,1994) to measure the dependent variable such as Flexibility they chose for their study: The chosen dependent variable was assessed on each individual both before and right after the experimental period.

## ANALYSIS OF THE DATA

Analysis of covariance (ANCOVA) was used to evaluate differences, if any, among the adjusted post test means on individual criterion variables using the data collected from the experimental groups and control group on prior and after experimentation on selected variables. The Scheffe's test was used as a post hoc test whenever they found that the simple effect's f-ratio value was significant in order to identify any matched mean differences. The 0.05 level of significance was set in each case.

Table 1 summarizes the analysis of covariance on Flexibility for the High-Intensity Interval Training (HIIT), Moderate-Intensity Continuous Training (MICT), and Control group's pre, post, and adjusted test results.

**Table – 1**

**Computation of Analysis of Covariance of Pre Test, Post Test and Adjusted Post Test on Flexibility of Experimental Groups and Control Group**

Test	High-Intensity Interval training(HIIT) Group	Moderate-Intensity Continuous Training(MICT) Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	F-ratio
Pre-Test Mean	17.87	18.20	18.47	Between groups	2.71	2	1.36	1.02
				Within Groups	55.87	42	1.33	
Post-Test Mean	23.73	20.67	18.27	Between groups	225.24	2	112.62	55.52*
				Within Groups	85.20	42	2.03	
Adjusted Post-Test Mean	24.13	20.54	17.99	Between sets	245.91	2	122.95	80.64*
				Within Sets	62.52	41	1.52	

\* Significant at 0.05 level of confidence

Table value for df (2, 42) at 0.05 level = 3.22 Table value for df (2, 41) at 0.05 level = 3.23

The table-1 shows that the pre-test mean values of Flexibility for High-Intensity Interval training (HIIT) group, Moderate-Intensity Continuous Training (MICT) group and Control group are 17.87, 18.20 and 18.47 respectively. The obtained 'F' ratio of 1.02 for the pre test mean is lesser than the table value of 3.22 for degrees of freedom 2 and 42 required for significance at 0.05 level of confidence on Flexibility.

The pre-test mean values of Flexibility for High-Intensity Interval training (HIIT) group, Moderate-Intensity Continuous Training (MICT) group and Control group are 23.73, 20.67 and 18.27 respectively. The obtained 'F' ratio of 55.52 for the pre test mean is greater than the table value of 3.22 for degrees of freedom 2 and 42 required for significance at 0.05 level of confidence on Flexibility.

The adjusted post test mean values of Flexibility for High-Intensity Interval training (HIIT) group, Moderate-Intensity Continuous Training (MICT) group and Control group are 24.13, 20.54 and 17.99 respectively. The obtained 'F' ratio of 80.64 for the pre test mean is lesser than the table value of 3.22 for degrees of freedom 2 and 42 required for significance at 0.05 level of confidence on Flexibility.

The results of the study indicated that there is a significant difference between the adjusted post-test means of High-Intensity Interval training (HIIT) group, Moderate-Intensity Continuous Training (MICT) group and Control group on Flexibility.

Since, three groups are compared and whenever the obtained 'F' ratio for adjusted post test is found to be significant, Scheffe's test is used to find out the paired mean difference and it is presented in Table-2.

**Table – 2**

**Scheffe's test for the Difference between Paired Means on Flexibility**

High-Intensity Interval training(HIIT) Group	Moderate-Intensity Continuous Training(MICT) Group	Control Group	Mean Difference	Confident Interval Value
23.93	20.65	---	3.28*	1.15
23.93	---	18.08	5.85*	
---	20.65	18.08	2.57*	

*\*Significant at 0.05 level of confidence.*

Table -2 shows that the mean difference values of High-Intensity Interval training (HIIT) group and Moderate-Intensity Continuous Training (MICT) group, High-Intensity Interval training (HIIT) group and Control group, Moderate-Intensity Continuous Training (MICT) group and Control group are 3.28, 5.85 and 2.57 respectively, which are greater than the confidence interval value of 1.15 on Flexibility at 0.05 level of confidence.

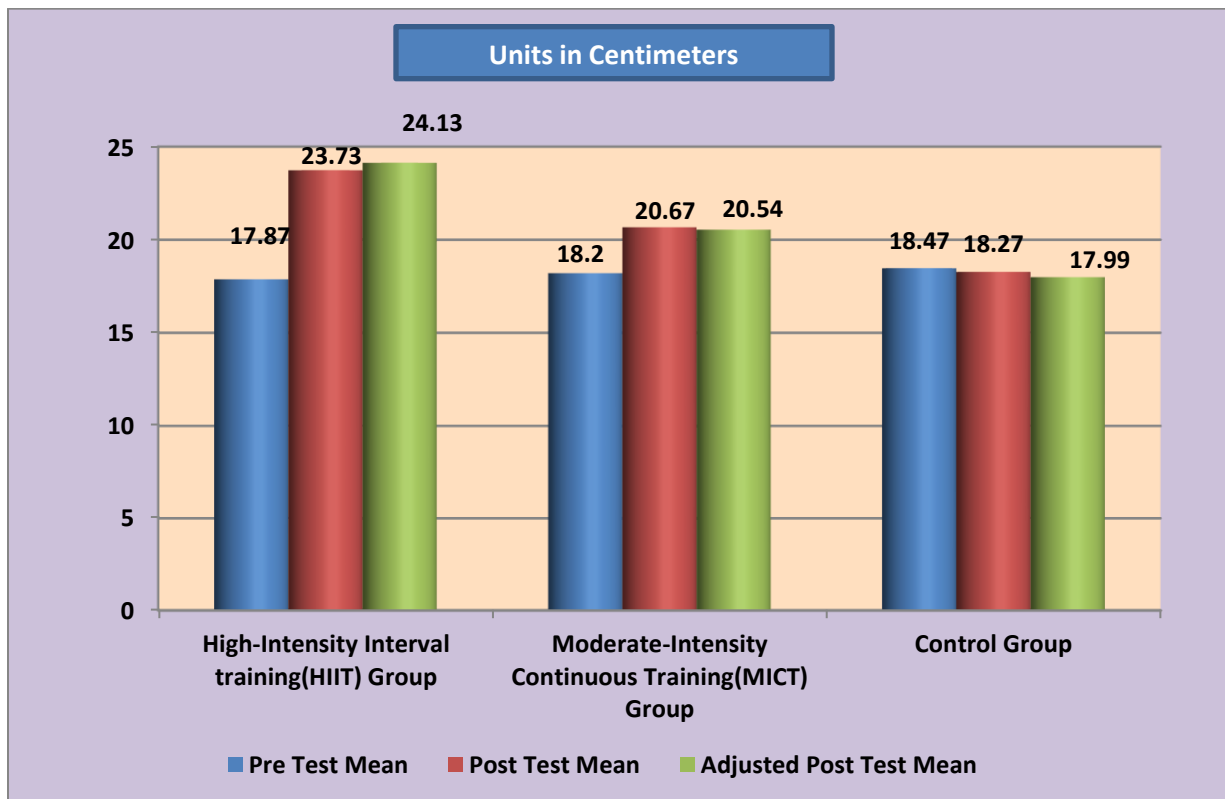
The results of the study showed that there was a significant difference between High-Intensity Interval training (HIIT) group and Moderate-Intensity Continuous Training (MICT) group, High-Intensity Interval training (HIIT) group and Control group, Moderate-Intensity Continuous Training (MICT) group and Control group.

The above data also reveal that Moderate-Intensity Continuous Training (MICT) group is better than High-Intensity Interval training (HIIT) group and Control group.

The Pre, Post and Adjusted Post mean values of High-Intensity Interval training (HIIT) group, Moderate-Intensity Continuous Training (MICT) group and Control group on Flexibility are graphically represented in the Figure -1.

**Figure: 1**

**The Pre, Post and Adjusted Post Test Mean Values of Experimental Groups and Control group on Flexibility (In Centimeters)**



## CONCLUSIONS

From the analysis of the data, the following conclusions were drawn.

1. Significant differences in achievement were found between High-Intensity Interval training (HIIT) group, Moderate-Intensity Continuous Training (MICT) group and Control group in Flexibility.
2. The experimental groups namely, High-Intensity Interval training (HIIT) group, and Moderate-Intensity Continuous Training (MICT) group had significantly improved in Flexibility.
3. The High-Intensity Interval training (HIIT) group was found to be better than the Moderate-Intensity Continuous Training (MICT) group and Control group in the performance of Flexibility.

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