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A comprehensive study on the effect of varied intensities of bench step training on certain physiological variables on sportspersons of Kurukshetra University

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Abstract

Background: Bench Step Training is usually associated with Cardio and develops high level of physical fitness. The aim of the study was to find the effect of varied intensities of bench step training on physiological variables like heart rate, cardio respiratory endurance and respiratory rate of the sportsperson of Kurukshetra University.

Method: Ninety sportspersons of Kurukshetra University from discipline acted as subjects whose age ranged between 18 -24 years and divided into three equal groups. Group I was low intensity training group (LITG), Group II was high intensity training group (HITG) and the third was control group (CG). Bench step training was administered thrice per week, one hour per day for 12 weeks separately for respective training groups. The physiological variables tested were resting pulse rate (RPR), cardiorespiratory endurance (CRE) and respiratory rate (RR). The statistical tool used was Analysis of Variance (ANCOVA) to find out the significant difference between the LITG and HITG.

Result: The results showed that the F ratio for RPR between the LITG and HITG from pre to post-test was, 9.56 and 26.62, for CRE the F ratio was 0.05 and 2.36 and for RPR the F ratio was 0.03 and 15.05 respectively. There was no change in the performance of the CG.

Conclusion: It was concluded that RPR, CRE and RR improved due to bench step training in both the experimental groups. Moreover, HITG resulted greater improvements than LITG and there was no change in the performance of CG. Further it is concluded that Bench Step Training is an exercise modality effective for enhancing total fitness profile by improving muscular performances, muscle morphology, and cardiovascular fitness.

Keywords: Respiratory rate, heart rate, cardio respiratory endurance, bench step training

Introduction

Training is a program in which the exercise of various types is designed not only to increase his techniques and skills but also to increase the energy capacities of an athlete for a particular event. There are different methods of specific training programmes available for the development of speed, muscular strength, local endurance and cardio respiratory endurance to enhance the performance to the maximum level. Weight, Interval, Fartlek, Isotonic, Isometric, Isokinetic and bench step training are some of the methods used in this direction. It is not an easy task to select the training method for a particular sportsman. A clear understanding of what is required and what needs to be harnessed has to be analysed in a sportsman for an effective conditioning program. There are specific principles and guidelines for achieving optimal training adaptation. Training programme are designed to suit specific energy sources needed for an athletic event or contest.

Moreover it is generally agreed that everybody does not respond to training in the same manner. Bench step training procedure requires the subject to lift his weight to a known height (height of the bench) at predetermined rate set by a metronome. The main purpose of the study was to find out the effect of varies intensities of bench step training on physiological variables of heart rate, cardio respiratory endurance and respiratory rate.

Step aerobics, also known as bench aerobics and step training, is a form of aerobic exercise that involves stepping on and off a small platform.

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Step aerobics was studied by physiologists in the 1980s, and in 1990 it swiftly grew in popularity in the U.S. as a style of health club exercise, largely because of promotion by Reebok of the Step Reebok device and associated exercise routines, prominently advocated by Gin Miller. Step aerobics attracted more men to group exercise classes. At its peak in 1995, there were 11.4 million people doing step aerobics.

Today, step aerobics classes are carried by many health clubs. Exercise routines include weights held in the hands for upper body development. Music with a medium (not fast) tempo often accompanies the routine, and learning a choreography sequence can hold the participants' interest.

Aerobics traces its origin to the 1968 book *Aerobics* by Dr. Kenneth H. Cooper, which inspired Jacki Sorensen to start her Aerobic Dancing program, combining music and dance routines to create an aerobic exercise pattern. Also in 1969, Judi Missett developed Jazzercise, combining jazz dance with fun exercise in much the same way. Building through the 1970s, Missett's Jazzercise and Sorensen's Aerobic Dancing became very popular in the U.S., such that by 1981–82 they counted 4,000 instructors each, and more than 300,000 students combined.

In 1982, Jane Fonda's Workout video changed the fitness world dramatically, starting a boom in home video exercise instruction through the 1980s and beyond. This same boom benefited health clubs by increasing the number of people who were involved in fitness.

Step Development

Stair climbing exercise was already thousands of years old when physiologists started studying its medical characteristics in the 20th century. Climbing stairs was long known to be healthy exercise for the heart. The act of stepping up and down on one bench was studied in 1986 by a team led by Doctor Fredric L. Goss of the Human Energy Research Laboratory at the University of Pittsburgh. Goss *et al.* examined the popular Heavy Hands hand weights fitness product combined with stepping exercises on the "Superstep" 12-inch (30.5 cm) fitness bench, comparing this combination to treadmill exercises and finding them equivalent. Goss followed this in 1988 with an evaluation of the energy expenditure of step aerobics combined with hand weights.

At the same time, Atlanta-based aerobics competitor Gin Miller was sidelined from high impact activities in 1986 when she injured her knee. She was advised by her physical therapist to build her strength back up by stepping on and off an upside-down plastic milk crate (11 inches (28 cm) tall). The crate was too high, so she used her 8-inch front porch step instead. After a few weeks of therapy, she noticed her increased fitness and realized this would be a good workout method for others. Working with Connie Collins Williams, Miller used prototypes made of plywood, and tried them out in an Atlanta Gold's Gym franchise, the location later called Sportslife. Working together, they developed 250 separate step-based movements. The program was aimed at men, the usual gym-goers at Gold's. These wooden prototype benches were very long: 24 by 2 feet (7.32 by 0.61 m), with a choice of heights: 10, 11 and 12 inches. Small weights held in the hands could also be used. Fitness instructor Kathy Smith first experienced the Williams/Miller prototype step aerobics program during its

early days, thinking "This is the most cutting-edge workout I've ever seen."

Miller and Williams formed a company called Bench Blast in late 1988, making wooden steps from 6 to 12 inches high. They began to sell the benches and teach their style of step aerobics. The two split in 1989, with Miller leaving for Reebok. Miller's friend and Reebok shoe representative Kelly Watson saw the Bench Blast program, and recommended Miller visit Angel Martinez, Reebok's Director of Business Development. Martinez thought the step aerobics idea was good, and introduced Miller to Reebok CEO Paul Fireman who quickly gave the go-ahead to hire Miller and start a major product campaign. Reebok already had connections with many health clubs through their shoe promotions, and they were very interested in any new aerobics program which would attract male customers, since existing classes were about 90% women. Reebok commissioned physiology trials of the step exercise program, undertaken in 1989 by Doctors Lorna and Peter Francis at San Diego State University. The Francis study showed that 40 minutes of step aerobics was equivalent to running 7 miles (11 km) in terms of oxygen breathed and calories burnt, but the body stress was much lower, the same as normal walking. Lorna Francis also observed a Bench Blast training session in May 1989, remarking that it was an excellent overall exercise regimen for people without joint problems.

Meanwhile, in New Jersey, fitness trainer Catherine Friedrich had been working with long wooden benches which were 14 inches (36 cm) high. Up to six people at a time could perform her leg strengthening and aerobics movements on one bench. In 1988 when she heard about the Bench Blast project, she put together a video production company with Chris Williams, the owner of Four Seasons Health Spa in Glassboro, forming Step N Motion Videos. They produced their first step aerobics video in mid-1989, using wooden benches.

Problems with the Bench Blast wooden benches included difficulty of storage, sideways instability, slippery upper surface when wet with sweat, dangerous sharp corners, and the heights were too challenging. Lyle Irwin, a shareholder of Sportslife gym, saw Williams and Miller struggling with these problems; he suggested the first adjustable-height step bench on June 19, 1989, with nesting stacked layers, and later patented the idea. Sportslife CEO Rich Boggs joined with Irwin to hire Industrial Design Associates (IDA) to fabricate an attractive plastic exercise aide in the form of an adjustable-height step. William J. Saunders and Samuel Crosby of IDA worked with QPI, a plastics molding company in Atlanta, to prepare a prototype step, which was first displayed in October 1989 in Chicago at a trade show. Reebok licensed "The Step" through Boggs and Irwin's new company, Sports Step. The step base unit was teal with a black non-skid upper surface. It came with two sets of risers in contrasting colors: purple and gray for health clubs, purple and pink for home users. The first official deliveries were in January 1990, carrying Reebok's name as well as The Step trademark.

Early demonstration units were trialed by Step Reebok in select health clubs, including Mezzplex in West Los Angeles in December 1989. Gin Miller taught the routines to local instructors. Mezzplex began offering two to three step aerobics classes every day.

Demand for the Step Reebok device quickly rose, requiring Boggs to add two more manufacturing plants in other cities, including one in Ontario, California. Combined, the three plants were making 50,000 steps every month. Sports Step extended their reach with manufacturing licenses in Japan and Europe.

Two months after its introduction to the general public, step aerobics classes were attracting major media attention, starting with a March 1990 article published by The New York Times. Miller promoted Step Reebok in person, touring the U.S. and demonstrating it at hundreds of exercise studios. Step aerobics became widely popular, helping the company sell many thousands of step devices, and millions of lightweight, flexible high-top shoes with ankle support. For promoting aerobics through Step Reebok, Miller was named IDEA Fitness Instructor of the Year in 1991. Step aerobics programs were soon developed by Jazzercise, Kathy Smith, Jane Fonda, Molly Fox, and New Zealand health club founder Les Mills. The year 1995 was

the peak of step aerobics, with 11.4 million practitioners.

Method

The subjects selected for the study were Ninety sportspersons of Kurukshetra University from different discipline whose age ranged between 18 -24 years and divided into three equal groups. Group I was low intensity training group (LITG), Group II was high intensity training group (HITG) and the third was control group (CG). Bench step training was administered thrice per week, one hour per day for 12 weeks separately for respective training groups. The physiological variables tested were resting pulse rate (RPR), cardio respiratory endurance (CRE) and respiratory rate (RR).

The statistical tool used was Analysis of Variance (ANCOVA) to find out the significant difference between the LITG and HITG.

Results

Table 1: Showing the Pre and Post Test Scores on Physiological Variables of the Experimental Groups and Control Group

Variables	Test	Mean of Control Group	Mean of Experimental Group-I	Mean of Experimental Group-II	F
Respiratory Rate	Pre	19.2	19.07	19.17	0.03
	Post	19.5	15.6	15.6	15.0
Cardio Respiratory Endurance	Pre	2369.67	2364	2372.67	0.05
	Post	2354.33	2391	2414	2.36
Resting Pulse Rate	Pre	73.47	70.8	70.37	9.56
	Post	73.9	69.97	69.27	26.62

The results showed that the F ratio for Respiratory rate between the Experimental Group I (Low intensity group) and the Experimental Group II (High Intensity Group) was 0.03 and 15.0, the F ratio for the Cardio Respiratory Endurance between the groups was 0.05 and 2.36 and for Resting Pulse Rate the F ratio was 0.03 and 15.05 respectively. The results showed that the high intensity group had shown significant improvements in the three selected physiological variables of respiratory rate, cardio respiratory endurance and the resting pulse rate when compared to the other two groups of low intensity and the control group. Further the low intensity group also showed improvements in the study variables when compared to control group. There was no change in the performance of the Control Group. This clearly points out that the Bench Step Training had a profound effect on the high intensity group and to some extent on the low intensity group.

Conclusion

It was concluded that Respiratory rate, Cardio Respiratory Endurance and resting pulse Rate improved due to bench step training in both the experimental groups. Moreover, High Intensity Group resulted greater improvements than Low Intensity Group and there was no change in the performance of Control Group. Further it is concluded that Bench Step Training is an exercise modality effective for enhancing total fitness profile by improving muscular performances, muscle morphology, and cardiovascular fitness.

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