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Research Article



Physiological parameters response to mat pilates training on school level male handball players

E.Balaji* and Dr.K.Murugavel**

*Director of Physical Education, CBM College, Sakethapuri, Kovaipudur, Coimbatore-641042, Tamilnadu, India.

**Professor & Head and Director, Department of Physical Education, Bharathiar University, Coimbatore-641046, Tamilnadu, India

*Corresponding author: *sportybalaji_99@rediffmail.com*

Abstract

The study was designed to investigate the “physiological parameters response to mat pilates training on handball players”. To achieve the purpose 30 school level male handball players were randomly selected from Coimbatore district as subjects and their age ranged between 14 and 17 years. They were divided into two groups. The group I was considered as experimental group and group II was considered as control group. The investigator did not make any attempt to equate the group. The control group was not given any exercise and the experimental group was given mat pilates training for five days per week. The experimental group was given training for the period of 8 weeks of mat pilates training. The following criterion variables were chosen namely Respiratory rate, Breath holding time and Vital capacity. All the dependent variables were assessed before and after the training period of 8 weeks. The collected data on physiological parameters due to effect of mat pilates training was analyzed by computing mean and standard deviation. In order to find out the significant improvement if any, ‘t’ test was applied. 0.05 level of confidence was fixed to test the level of significance. The study revealed that the physiological parameters were significantly improved due to the influence of mat pilates training.

Keywords: Mat Pilates training, Physiology, Respiratory rate, Breath holding time, Vital capacity.

Introduction

Pilates, originally developed by Joseph Pilates after World War I, is described by practitioners as “a unique method of physical fitness that uses a combination of muscle strengthening, lengthening and breathing to develop trunk muscles and restore muscle balance” (Bernardo, 2007; Cozen, 2000; Kloubec, 2010; Latey, 2001; Smith and Smith, 2005). Contrary to traditional resistance exercises based on training the muscles in an isolated manner, Pilates exercises have a holistic approach, requiring activation and coordination of several muscle groups at a time (Pilates, 2001). Although recent studies (Caldwell *et al.*, 2009; Johnson *et al.*, 2007) reported that Pilates exercises are suitable for all ages, all body types and fitness abilities due to the modifiable nature of the

movements, (Kaesler *et al.*, 2007; Kloubec, 2010; Segal *et al.*, 2004; Sekendiz *et al.*, 2007).

In developing his method, Joseph Pilates “combined the mental focus of and specific breathing of yoga with the physicality of gymnastics and other sports” (Ungaro, 2002) for the ideal of attaining a complete coordination of body, mind, and spirit (Gallagher and Kryzanowska, 2000). The mind–body approach is further elucidated by the principles (CCCPFB) that Pilates founded his method on: centering, concentration, control, precision, flow, and breath (Adamany and Loigerot, 2004; Adams and Quin, 2007; Gallagher and Kryzanowska, 1999; Siler, 2000; Ungaro, 2004).

Pilates yields numerous benefits, increased lung capacity and circulation through deep, healthy breathing is a primary focus. Strength and flexibility, particularly of the abdomen and back muscles, coordination-both muscular and mental, are key components in an effective Pilates program. Posture, balance, and core strength are all heartily increased. Bone density and joint health improve, and many experience positive body awareness for the first time. Pilates teaches balance and control of the body, and that capacity spills over into other areas of one's life.

The game of handball is very strenuous on the body. The combination of the three basic movement elements - running, jumping, throwing – puts a lot of pressure on the muscular- skeletal structure. As selection of a proper person for handball is performed in early ages, physiological properties with physical profile should be learned. Variables to determine physical profile were observed. The observed variables comprise of respiration parameters, blood pressure, aerobic and anaerobic capacity.

The better team or players required physiological system of the body to be fit. It must function well enough to support the specific activity that the individual is performing. Handball players need physiological fact that the human organism needs stimulating exercise. When the whole body is subjected to regular muscular activity, requiring vigorous stress on the heart, lungs and muscles, the general efficiency of physiological functions is being improved. Research now strongly has the theory that regular and vigorous training helps to keep the heart healthy and may have good cardiovascular endurance. A physically fit heart bears at a lower rate and pumps more oxygen, which denotes the substantial increase of ability to do more physical activities (**Astriand and Rodani, 1970**).

Though there are several training methods, which are recommended for the improvement of physiological parameters, the pilates training for handball players to develop physiological parameters has not been conducted in an exhaustive manner in India.

Thus, it was hypothesized that compared to the control group, Pilates training would significantly improve the respiratory rate, breath holding time and vital capacity in the experimental group.

Materials and Methods

Thirty school level male handball players were randomly selected from the Coimbatore district as subjects and their age ranged between 14 and 17 years. They were divided into two groups. The group – I was considered as the experimental group and group – II was considered as the control group. The control group was not given any exercise and the experimental group was given mat pilates training for five days per week for the period of 8 weeks. The evaluated parameters were respiratory rate (Respiratory count per minute), breath holding time (control pause test), and vital capacity (wet spirometer test). The parameters were measured before and after the pilates training programme and the effects of the training programme were examined (Table-1). The collected data on physiological parameters due to effect of pilates training was analyzed by computing mean and standard deviation. In order to find out the significant improvement if any, 't' test was applied.

Pilates training

Pilates training target for a heart rate of 60–70 % of maximal heart rate for the age. The intensity of pilates training was determined by Carvonen Method (**Fox et al., 1998**).

The Carvonen Method:

$$\begin{aligned} \text{Max. Heart Rate} &= 220 - \text{Age} \\ \text{Heart Rate Reserve} &= \text{HR max} - \text{HR Rest} \\ & \quad (\text{Resting Heart Rate}) \end{aligned}$$

$$\% 60 \text{ Target Heart Rate} = (0.60 \times \text{HRR}) + \text{HR rest}$$

The pilates training program consisted of 8-week series of one hour Pilates exercises four days per week. Exercises were performed on a mat. Each session lasted for about 60 minutes. For all participants training was provided by the same coach verbal and tactile clues were given during each Pilates exercise. At the beginning of the program, while the intensity of exercise was 40%, it was gradually increased to 60% in the eighth week.

Table 1 - MAT pilates training schedule for eight weeks

Week 1 & 2	Week 3 & 4	Week 5 & 6	Week 7& 8
Roll up (5–10 reps)	Swan dive (5 reps)	Roll over (8 reps total)	Shoulder bridge (3 each leg)
Hundred (sets of 10, 20,, 100)	Heel squeeze (6–8 reps)	Scissors (10 reps)	Open leg rocker (10 reps)
One leg circle (10 reps with each leg)	Neck pull prep (5 reps)	One leg kick (alternate 8 reps)	Jackknife (5 reps)
Rolling like a ball (10 reps)	Oblique roll back (5 to each side)	Double leg kick (5 to each side)	Scissors in air (10 reps)
Single leg stretch (5 sets)	Spine twist (5 to each side)	Shoulder bridge prep (3 each leg)	Bicycle in air (10 reps)
Single leg stretch with oblique (5 sets)	Side kicks (8–10 reps)	Teaser variation (5 reps)	Teaser variation
Double leg stretch (10 reps)	Side leg lift series (8–10 reps for each)	Swimming prep (5 reps)	Swimming (40 counts)
Spine stretch forward (5–7 reps)	Teaser preps (5 reps)	Leg pull front prep (5 reps)	Leg pull front (5 reps)
Saw (5 to each side)	Seal (10 reps)	Side bend prep (5 each side)	Side bends (5 each side)
Breast stroke(5 reps)	Slow double leg stretch (10 reps)	Push up (3 sets of 3–4 reps)	Boomerang (5 reps)

Data analysis

Descriptive statistics such as mean and standard deviation were found in order to get basic idea of the data

distribution. ‘t’ test was done for finding whether there is any statistically significant pre-test to post-test mean differences in their respective variables of each groups.

Table 2-Summary of mean and ‘t’ test for the pre and post tests on respiratory rate, breath holding time and vital capacity of control and experimental group

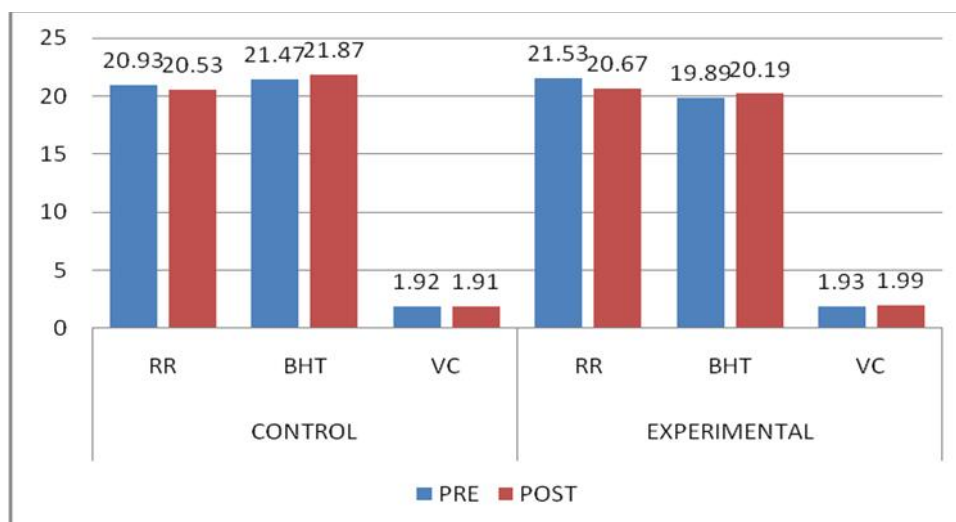
Parameters	Group	Test	Mean	Standard deviation	Mean difference	‘t’ ratio
Respiratory Rate	CON	Pre	20.93	2.25	0.40	1.19
		Post	20.53	2.06		
	EXP	Pre	21.53	1.92	0.86	4.01*
		Post	20.67	1.67		
Breath holding time	CON	Pre	21.47	3.20	0.40	1.11
		Post	21.87	3.94		
	EXP	Pre	19.89	1.36	0.30	4.93*
		Post	20.19	1.41		
Vital capacity	CON	Pre	1.92	0.26	0.01	0.04
		Post	1.91	0.24		
	EXP	Pre	1.93	0.20	0.06	4.58*
		Post	1.99	0.19		

*Significant at 0.05 level of confidence (2.145)

The above table reveals the computation of ‘t’ ratio between mean of pretest and posttest of control and experimental group on respiratory rate, breath holding time and vital capacity of handball players. The mean values of pre and posttest of respiratory rate, breath holding time and vital capacity for control group were 20.93 and 20.53, 21.47 and 21.87 and 1.92 and 1.91 respectively. Since the obtained ‘t’ ratio 1.19, 1.11 and 0.04 were lesser than the required table value 2.145. It was found statistically not significant for the degree of freedom 1, and 14 at 0.05 level of confidence.

The mean values of pre and posttest of respiratory rate, breath holding time and vital capacity for experimental group were 21.53 and 20.67, 19.89 and 20.19 and 1.93 and 1.99 respectively. Since the obtained ‘t’ ratio 4.01, 4.93 and 4.58 were greater than the required table value 2.145. It was found statistically significant for the degree of freedom 1, and 14 at 0.05 level of confidence.

Figure . 1 Bar diagram showing the pre and post test means of control and experimental group on Respiratory rate, Breath holding time and Vital capacity



The results clearly indicated the respiratory rate, breath holding time and vital capacity of experimental group improved due to the influence of 8 weeks pilates training programme.

Conclusions

Based on the result, the following conclusions have been arrived:

- 1) There was significant improvement in respiratory rate due to the influence of Pilates training on school level male handball players.
- 2) Eight weeks of pilates training significantly improved the breath holding time of school level male handball players.
- 3) There was significant improvement in vital capacity due to the influence of Pilates training on school level male handball players.

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