



RESEARCH ARTICLE

Effect of sports specific circuit training on aerobic capacity of high school male basketball players during competitive season

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ABSTRACT

The aim of this study was to evaluate the effectiveness of a basketball specific endurance circuit on improving aspects of aerobic capacity of school basketball players. Thirty male high school aged basketball players volunteered to participate in this study. These subjects were classified into two groups namely experimental and control group. The experiment group underwent 6 weeks 2 sessions per week of basketball specific endurance training this was carried out on an outdoor courts. This training was carried out during the competitive phase of the high school basketball season. Pre and post aerobic capacity was measured on the field. There was a statistical significance from pre to post testing in the experimental group ($p < 0.005$) and no statistical significance on control ($p > 0.05$) group. The basketball specific endurance circuit showed modest effect in improving aerobic fitness during the competitive season.

Key words: Basketball, Aerobic fitness, VO_2 , Circuit training, Competitive season.

INTRODUCTION

It has been shown that a high level of aerobic fitness is important for outlets participating in intermittent (team) sports. At majority of studies investigating the effects of traditional and sports –specific aerobic interval experience on physiological manures and performance have involved field – based team sports. One of the first studies to develop and evaluate sports – specific circuit training approach was in the soccer [1]. This particular study involved soccer players, dribbling a ball through cones and over hurdles in addition to moving backwards while maintaining control of the ball at an intensity of 90 to 95% peak heart rate (HR peak) such sport specific approaches have been demonstrated to induce sufficient physiological stress [1] resulting in an increase in several measures of aerobic fitness, including maximal oxygen uptake (VO_{2peak}) running economy and lactate threshold [2,3]. While there has been a gradual increase in the use of sport-specific conditioning for team sports, several researchers have questioned its effectiveness when compared to traditional methods of training. To date, no study has investigated the influence of a sports specific training approach in the sport of basketball. The aim of this study was to evaluate the effectiveness of a basketball specific endurance circuit on improving aspects of aerobic capacity of school basketball players.

MATERIALS AND METHODS

Subjects

Thirty male high school aged basketball players volunteered to participate in this study. The mean (\pm SD) age, height and body mass were 16.1 ± 1.9 years, $1.72 \pm 0.5m$, $70.3 \pm 10.5kg$, respectively. On average, the players had 3.6 ± 2.4 years of playing experience with Senior/Junior/Sub Junior school basketball team and were regularly participate in training both morning and evening prior to the commencement of this study. The study was approved by the local ethics committee.

Experimental Design

The duration of the training study was six weeks was carried out during the competitive phase of the high school basketball season. Pre and post aerobic capacity was measured on the field.

Data collection

The height was recorded during inspiration using a stadiometer (Holtain Ltd., Crymych, Dyfed, UK) to the nearest 0.1cm and weight was measured by digital standing scale (Model DS – 410, Sekio, Tokyo, Japan) to the nearest 0.1 kg. A standardized ten minute basketball specific warm-up was followed by dynamic and static stretching for five minutes

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prior to test aerobic capacity which was measured by 1 mile run test. Formula to predict $VO_{2max} = 108.844 - 0.1636W - 1.438T - 0.1928H$.

(Where W = Weight in kg, T = Time for the one mile run and H = Heart Rate at the end of the run)

Basketball specific endurance training intervention

The experiment group under went 6 weeks 2 sessions per week of basketball specific endurance training was carried out on outdoor courts is presented in figure 1. This training design was based on a previous design [4] and adapted to mimic as closely as possible the movement patterns of basketball match play [5]. Briefly the experimental group subjects ran the circuit with 90 to 95% HR peak for four times with four minute intervals. The subjects specific heart rate peak was determined from the aerobic test.

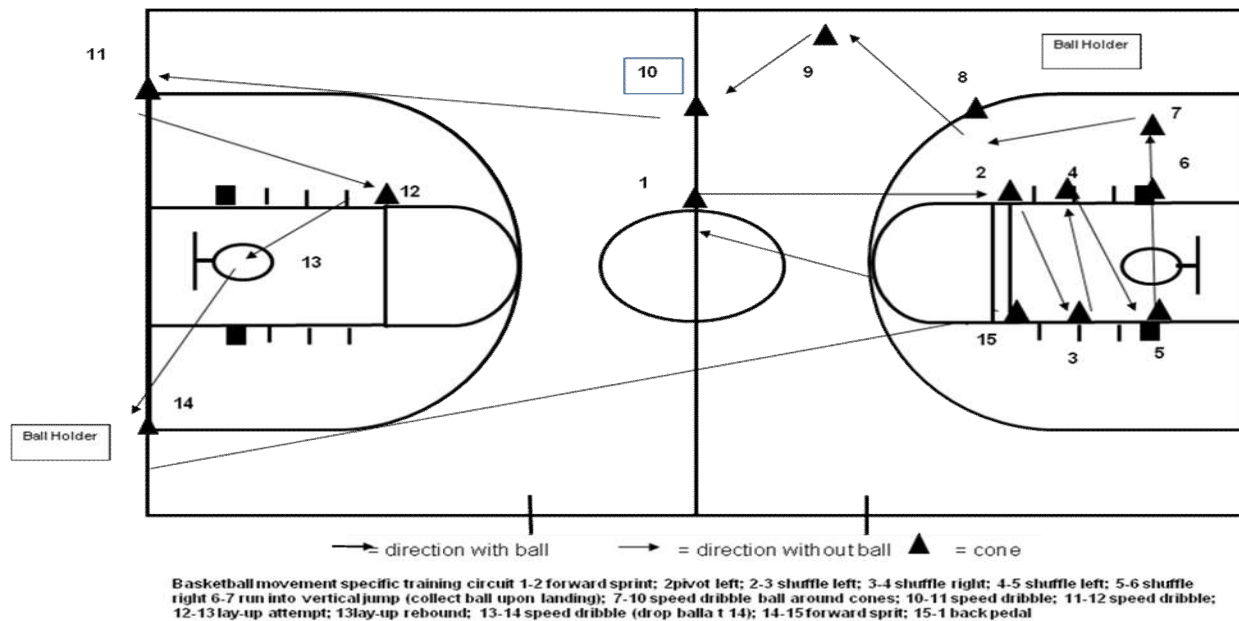


Figure 1. Basketball specific endurance training Protocol

This training protocol was adequate from previous study [6]. The average running time of one circuit was 36 second and the total distance covered during on lap was approximately 108m, with 72% of the movement forward sprinting, 20% side shuffling & 8% back-pedaling. The proportion of the circuit considered 'offence' activity where a basket ball was dribbled was 42%, while 58% was considered 'defensive' activity without the ball. One field goal attempt, one rebound, three vertical jump, one pivot, and 14 changes of direction were completed during one repeat of the circuit. The control group performed their typical basketball training drills which were overseen by the coach. Heart rate was monitored during six week endurance training regime with the team system, Experimental and control group subjects wore heart rate monitor (Omron HR-100c., Illinois, USA). Which were continuously observed throughout the duration of the training session by the participant and after each training participant heart rate was recorded.

Statistical Analysis

Pre and post test data were collected before and after 6 weeks of training. The collected data was analyzed using analysis of covariance (ANCOVA). Statistical significance was set to a priority at $P < 0.05$. All statistical tests were calculated using the statistical package for the social science (SPSS) for windows (Version 11.5)

RESULTS

Aerobic capacity

In Table 1 shows within group statistical significance from pre to post testing was found in the experimental group ($p < 0.005$) and no statistical significance on control ($p > 0.05$) group. The mean increase being 1.7 ml/kg/min was found in the experimental group. There were no statistically significant differences between groups.

Table 1. Means (\pm standard deviations) for the aerobic capacity of school basketball players

Aerobic capacity	Pre-test	Post-test
Experimental Group	47.89(3.31)	49.59(1.25)*
Control Group	49.42(1.43)	49.39 (1.19)

* Indicates Significant changes (Post -Pre) When using Pre-test score as a covariate, $P < 0.005$.

DISCUSSION

For many years aerobic endurance was considered of little importance to basketball performance [7]. However, recent time-motion analysis investigations have revealed that aerobic endurance is required for successful basketball performance [8]. In support, the amount of live time spent in high intensity activity is significantly correlated with VO_{2peak} in basketball

performance [8], thus reinforcing the importance of a high level of aerobic fitness in basketball players. The basketball specific endurance training used specifically to develop aerobic endurance in the present study manifested a 3.4% increase in aerobic capacity of experimental group during the competitive season. However, the change observed in the present study is lower than the 7% increases in VO_2 reported previously in basketball players [6], respectively, after a traditional aerobic endurance training period compared to control groups. There are several possible reasons why a small change was observed compared to previous works. The first and foremost is training was carried out during the competitive season [2,6,9]. The second reason is shorter duration of the training programme [2,6,9].

Conclusion

The basketball specific endurance circuit induced greater improvements in aerobic fitness, suggesting it was somewhat effective in improving aerobic fitness during the competitive season.

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