

FARTLEK TRAINING AND ITS IMPACT ON BIOCHEMICAL PROFILES OF BASKETBALL PLAYERS

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Abstract:

Purpose: The purpose of the present study was to determine the impact of twelve weeks of Fartlek Training on Biochemical Profiles of Basketball Players.

Method: Thirty male basketball players (aged 18 – 24 years) were selected from Imphal East and Imphal West districts of Manipur (India). The subjects were randomly assigned to an experimental group (n=15) and a control group (n=15). The experimental group underwent twelve weeks of Fartlek training, while the control group did not engage in any specific exercises. Pre- and post-test scores were analysed using descriptive statistics and ANCOVA at a significance level of $p < 0.05$.

Results: The experimental group showed improved scores in haemoglobin and triglycerides compared to the control group ($p < 0.05$). The analysis showed significant improvements with an F value of 339.04 for haemoglobin and 147.539 for triglycerides ($p < 0.05$).

Conclusion: It was concluded that the Fartlek training group demonstrated statistically significant improvements in haemoglobin and triglyceride levels, while the control group did not show any significant changes. It was confirmed that a 12-week Fartlek training program effectively enhanced these biochemical parameters in basketball players.

Keywords: Fartlek Training, Basketball, Biochemical Parameters, Haemoglobin, Triglycerides.

Introduction:

As a fast-paced sport, basketball requires its players to display effortful endurance, high speed, agility, and powerful explosions of energy in short bursts, which are crucial for making those key performance plays (Wen et al., 2018). The interplay of effort that is put into the game means that the player's body pays a significant toll on the aerobic and anaerobic parts of their body. Because of this phenomenon, an integrated exercise program has to be designed in order to enhance all these factors (Iaia et al., 2009). This means that training methods which combine endurance with power outputs have to be put in place. In team sports, Fartlek training is one of the new developments that is gaining acceptance. This innovative technique combines aerobic

and anaerobic efforts into one workout through changing intensities at different periods, also known as interval training (Eleckuvan, 2014). Fartlek training, which first appeared in Sweden in the 1930s, is known for its versatility and suitability. Fartlek differs from other forms of interval training, which have a specific work-to-rest ratio, in that it allows for changes in intensity, which is often seen in team sports like basketball. It includes varying intensities such as jogging, sprinting, and walking at a pace that is comfortable to a person as well as dictated by the particular training session (Gibala et al., 2014). Such variation in intensity has positive impacts in improving one's cardiovascular fitness, endurance, and ability to recover from exertion within a short span of time. For this reason, Fartlek is being incorporated into basketball training to enhance the performance of the players on the court (Lim et al., 2018). Even though the performance gains of speed play training like Fartlek in agility, speed and endurance are well established, little is known about its effects on the biochemical profiles of an athlete. Blood glucose, cholesterol, lipids, and metabolic components are critical biochemical markers which determine an individual's general fitness and athletic capabilities. These parameters are essential for energy provision in high-intensity aerobic exercises such as sprinting, as well as for recovery, sustaining immune function and lowering the risks of injuries. Biochemical markers of an athlete may change with regular training as a reflection of improved metabolic efficiency or altered stress responses within the body (Bachero-Mena et al., 2017). With regard to basketball, players perform intermittent high-intensity efforts, which makes an appropriate biochemical profile critical for performance maintenance and mitigation of physical strain or injury. Changes in biochemical indices like blood glucose concentration, lipid profile (LDL and HDL) and other biochemical markers serve as parameters for metabolic health in an athlete and the effects of training (Lee et al., 2017). Fartlek training and its combination of walking and jogging, incorporates both aerobic and anaerobic exercises and thus has the potential to bring about remarkable changes in these parameters which can improve performance as well as promote health among basketball players (Ciuti et al., 1996). This research attempts to analyze the effects of Fartlek on the biochemical profile of the basketball players' vital parameters, which include haemoglobin and triglycerides. It is hoped that by conducting these measurements prior to and immediately following the implementation of the structured 12-week Fartlek training program, it will be possible to evaluate whether this active rest and training technique will bring positive biochemical changes that enhance athletic output and health without significant effort. Moreover, the researchers will assess the effects of Fartlek training on the metabolic responses of basketball athletes who have high-volume and intensity training in the long run (Eleckuvan, 2014). For example, knowing the metabolic impact of Fartlek training could help coaches and sports scientists to understand how this method benefits metabolic health as well as enhances the performance of basketball players. Fartlek training can serve as a tool to achieve specific goals within the scope of sports science by improving health and performance in team sports (Li et al., 2021).

Purpose of the study:

The main purpose of the study is to find out the impact of twelve weeks of Fartlek Training on Biochemical Profiles of Basketball players.

METHODOLOGY

Selection of Subjects:

Thirty male basketball players aged 18-24 years were randomly selected for this study from Imphal East and Imphal West Districts of Manipur. All participants had previously competed in State-Level competitions.

Selection of Variables:

The study selected the following variables:

1. Haemoglobin
2. Triglycerides

Ethics Clearance:

The subjects of this study are human individuals. The Institutional Human Ethical Committee of Manipur University, Canchipur, Imphal (India) approved the study with Ref. No. MU/IHEC/2024/17 and written informed consent forms were obtained from all the subjects who volunteered for the study.

Procedure of Data Collection:

The data collection for haemoglobin and triglycerides was conducted at Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal (India), a certified medical institution with trained professionals and standardized procedures. Before initiating data collection, a formal application was submitted to the Medical Director of Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal (India), through the Medical Officer of Manipur University, Canchipur, Imphal (India). Written informed consent was obtained from all participants before the data collection. Participants were instructed to fast for 8–12 hours before the blood sample collection to ensure accurate measurements. On the scheduled testing days, participants were taken to Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal (India), where trained laboratory technicians performed all blood sample collections and analyses. Blood samples were collected, and serum triglyceride and haemoglobin levels were measured following the hospital's routine biochemical analysis protocols.

Laboratory Procedures and Quality Control:

All analyses were carried out by certified professionals at the hospital (Jawaharlal Nehru Institute of Medical Sciences, Imphal), adhering to their standard operating procedures and ensuring the validity and accuracy of the results.

Design of the Study:

This study employed an experimental research design. The selected thirty male basketball players were randomly assigned into two equal groups, the experimental group (n=15) and the control group (n=15). Blood samples were collected from both groups before the intervention to measure haemoglobin and triglyceride levels. Following the baseline assessments, the experimental group underwent a supervised twelve-week fartlek training program, while the control group continued with their regular basketball practice without additional training. At the end of the training period, blood samples were collected again using the same standardized procedures to ensure consistency between pre- and post-intervention measurements. The fartlek training program consisted of five sessions per week (Monday to Friday), each lasting 60 minutes.

Training Program:

The 12-week Fartlek training program implemented in this study is based on the principles outlined by McArdle et al., 2015 which emphasize the benefits of Fartlek training combining aerobic and anaerobic intervals to enhance athletic performance. A detailed breakdown of the specific elements, including weekly progression, intensity levels, duration of intervals, and recovery periods is presented in Table 1.

Table 1: Weekly Fartlek Training Program

Training weeks	Warm-up	Details of Training program		Repetition	Set	Intensity	Rest between set	Warm down
1 – 3 weeks	10 min.	Walk	1 min.	3	2	50-60%	2 minutes	10 minutes
		Jog	4 min.					
		Run hard	2 min.					
4 – 6 weeks	10 min.	Walk	1 min.	3	2	60-70%	2 minutes	10 minutes
		Jog	4 min.					
		Run hard	2 min.					
7 – 9 weeks	10 min.	Walk	1 min.	3	2	70-80%	2 minutes	10 minutes
		Jog	4 min.					
		Run hard	2.5 min.					
10 – 12 weeks	10 min.	Walk	1 min.	3	2	80-85%	2 minutes	10 minutes
		Jog	4 min.					
		Run hard	3 min.					

Note: The Fartlek training program was carried out over twelve weeks, five days of training (Monday to Friday) and 60 minutes for each session. 50% - 60% = Low Intensity, 60% - 70% = Medium Intensity, 70% - 80% = High Intensity and 80% - 85% = Very High Intensity.

Statistical Analysis:

The data collected were entered into an Excel spreadsheet and statistical analyses were conducted using IBM SPSS software (version 22.0; SPSS Inc., Chicago, IL, USA). The statistical distribution of pre and post-test scores was assessed using descriptive statistics and analysis of covariance (ANCOVA) was employed to examine variations among groups. The significance threshold for statistical analyses was set at $P < 0.05$.

Results:

The result of the study indicated a significant improvement in haemoglobin among the selected subjects in both the experimental and control groups. Table 2 presents the statistical analysis of the data collected from the pre-test and post-test of haemoglobin after twelve weeks of fartlek training in both the experimental and control groups.

Table 2: Computation of Analysis of Covariance of haemoglobin

Variables	Test	Experimental Group	Control Group	Source of variance	Sum of Square	df	Mean Square	Obtained 'f' value
Haemoglobin	Pre-test mean	14.053	13.986	Between	0.033	1	0.033	0.073
				Within	12.774	28	0.456	
	Post-test mean	15.366	14.08	Between	12.416	1	12.416	41.01*
				Within	8.477	28	0.302	
	Adjusted Post	15.341	14.105	Between	11.415	1	11.415	339.04*

	mean test			Within	0.909	2	0.033	
	Mean Diff.	-1.313	-0.094			7		

Table F-ratio at 0.05 level of confidence for 1 and 28 (df) =4.20, 1 and 27 (df) =4.215.

*Significant

As shown in Table 2, the obtained pre-test means on Haemoglobin in the experimental group was 14.053 and control group was 13.986. The obtained pre-test F value was 0.073 and the required table F value was 4.20, which proved that there was no significant difference among the initial scores of the subjects.

The obtained post-test means on Haemoglobin in the experimental group was 15.366 and control group was 14.08. The obtained post-test F value was 41.01 and the required table F value was 4.20, which proved that there was a significant difference among post-test scores of the subjects.

Taking into consideration the pre-test means, post-test means and adjusted post-test means were determined and an analysis of covariance was done, the obtained F value 339.04 was greater than the required value of 4.215 and hence, it was accepted that there were significant differences among the treated groups.

Further, the mean score of haemoglobin for the experimental group and control group were presented in Figure 1.

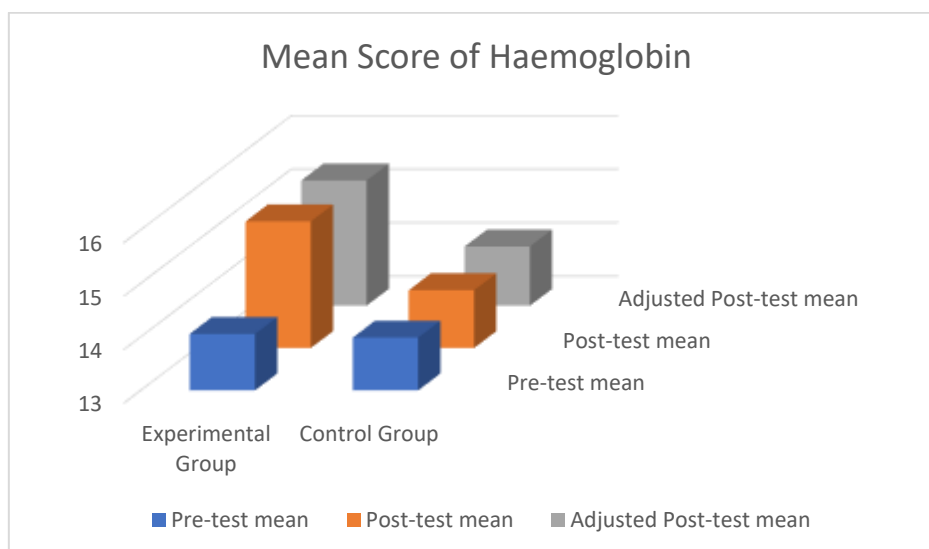


Figure 1: Graphical Presentation of mean score of Haemoglobin for Experimental and Control Group

Further, the result of the study indicated a significant improvement in triglycerides among the selected subjects in both the experimental and control groups. Table 3 presents the statistical analysis of the data collected from the pre-test and post-test of triglycerides after twelve weeks of fartlek training in both the experimental and control groups.

Table 3: Computation of Analysis of Covariance of triglycerides

Variables	Test	Experimental Group	Control Group	Source of variance	Sum of Square	df	Mean Square	Obtained 'f' value
Triglycerides	Pre-test mean	79.666	78.40	Between	12.033	1	12.033	0.077
				Within	4360.933	28	155.747	
	Post-test mean	69.733	77.40	Between	440.833	1	440.833	4.731*
				Within	2608.533	28	93.161	
	Adjusted Post mean test	69.253	77.880	Between	556.652	1	556.652	147.539*
				Within	101.868	27	3.772	
Mean Diff.	9.933	1						

Table F-ratio at 0.05 level of confidence for 1 and 28 (df) =4.20, 1 and 27 (df) =4.215.

*Significant

As shown in Table 3, the obtained pre-test means on Triglycerides in the experimental group was 79.666 and control group was 78.40. The obtained pre-test F value was 0.077 and the required table F value was 4.20, which proved that there was no significant difference among the initial scores of the subjects.

The obtained post-test means on Triglycerides in the experimental group was 69.733 and control group was 77.40. The obtained post-test F value was 4.731 and the required table F value was 4.20, which proved that there was a significant difference among post-test scores of the subjects.

Taking into consideration the pre-test means, post-test means and adjusted post-test means were determined and an analysis of covariance was done, the obtained F value 147.539 was greater than the required value of 4.215 and hence, it was accepted that there were significant differences among the treated groups.

Further, the mean score of triglycerides for the experimental group and control group were presented in Figure 2.

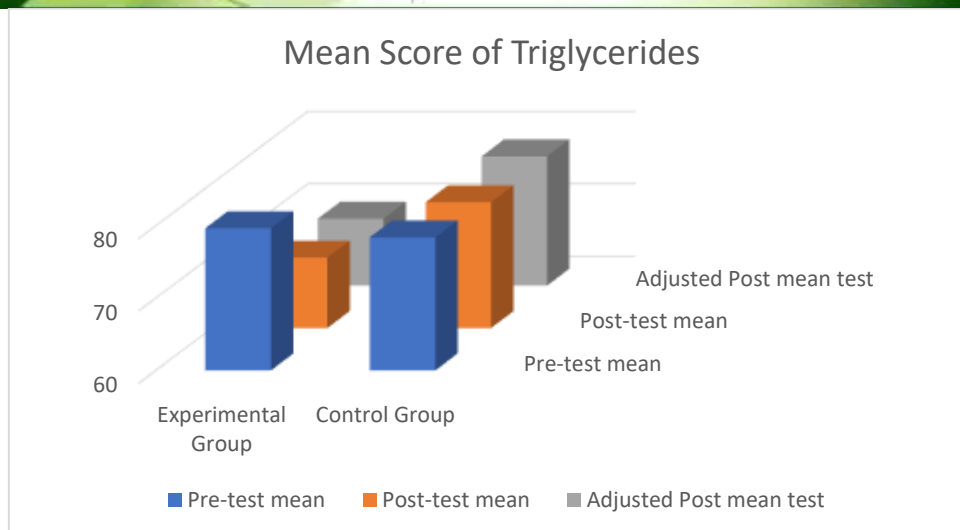


Figure 2: Graphical Presentation of mean score of Triglycerides for Experimental and Control Group

Discussion

Basketball is a fast-paced sport that requires players to maintain high aerobic capacity and optimal biochemical balance to sustain repeated bouts of high-intensity activity. The present study investigated the effects of a twelve-week Fartlek training program on biochemical profiles of basketball players, with findings revealing significant improvements in haemoglobin and triglyceride levels. The experimental group showed higher gains than the control group, as indicated by the obtained F values for haemoglobin (339.04) and triglycerides (147.539), both exceeding the critical value of 4.215, confirming significant treatment effects. These results are consistent with earlier studies that have demonstrated the impact of endurance and intermittent training on physiological and biochemical markers. For instance, Farooque et al. (2023) reported improvements in haemoglobin, HDL, creatine, and RBC counts, alongside reductions in LDL and VLDL following endurance training, highlighting the role of exercise in lipid metabolism and oxygen transport. Similarly, Manna et al. (2011, 2010, 2013) found that structured training improved VO_2 max, anaerobic power, strength, and lipid profiles in hockey and soccer players, although some variables like body mass remained unchanged. Research on soccer and basketball athletes has further shown reductions in haemoglobin and hematocrit over competitive seasons (Andelković et al., 2015) and enhancements in fat metabolism and liver enzyme regulation through endurance training (Bayram & Goksu, 2015). Complementary evidence from Elkeky et al. (2020) and Xie et al. (2024) indicates that cross-training and high-intensity interval training improve recovery, beta-endorphin release, and blood lactate clearance, underscoring the efficiency of intermittent methods like Fartlek.

The findings also align with recent sport-specific research emphasizing the benefits of intermittent load-based training. Singh, Singh, and Mola (2025) confirmed that interval training enhanced motor abilities in youth football players, while Mola and Bayısa (2020) reported circuit training improvements in health-related fitness among sport science students. Likewise, Husain, Mola, and Shaw (2024) demonstrated how external loads affect gait mechanics, paralleling basketball's fluctuating sprinting, decelerating, and jumping demands that Fartlek effectively replicates. Moreover, nutritional awareness and stakeholder involvement have been

shown to influence training outcomes (Taye, Mola, & Rahman, 2024; Taye et al., 2025), indicating that biochemical adaptations may be maximized when training is integrated with recovery, diet, and psychosocial support. Finally, long-term adaptations reported in a 12-week program for long jumpers (Mola et al., 2025) reinforce the present study's evidence that systematic Fartlek training can enhance endurance, regulate lipid metabolism, reduce fatigue-related biochemical imbalances, and improve recovery efficiency.

This study provides strong evidence that Fartlek training positively influences the biochemical profiles of basketball players, particularly haemoglobin and triglycerides, which are crucial for oxygen delivery and energy metabolism. Its sport-specific value lies in replicating the variable intensity patterns of basketball, thereby promoting physiological resilience and metabolic efficiency. However, its optimal effectiveness requires integration with nutritional, managerial, and psychosocial strategies to support holistic athlete development (Mola & Shaw, 2024; Taye et al., 2025).

Conclusion:

The study concluded that the Fartlek training group demonstrated statistically significant improvements in haemoglobin and triglyceride levels, while the control group did not show any significant changes. It was confirmed that a 12-week Fartlek training program effectively enhanced these biochemical parameters in basketball players. This suggests that Fartlek training can be integrated into basketball training plans to improve oxygen-carrying capacity and lipid metabolism, both of which are essential for athletic performance and overall health.

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Conflict of interest:

The authors declare no conflict of interest. In addition, no financial support was received.

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