



The Interruption Of Physical Training Has Affected Special Preparation In Some Of The Functional Of The Heart And Physical Of The Heat Sports Basketball Players Presented By The Researcher

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Abstract. *Training on some Heart Functional variables H. 2004, The effects of (9) pulse rate (H.R), stroke volume (S.V) and cardiac output (C.O.P.) in the body and physical abilities(10)-(13)(elongation of upper and lower limbs) Basketball players have heat stress on some it to test the functional variables of heart & physical ability before leaving trainings except(HR - Stroke)Pulse are increase until after gathering process for one weeks that High intensity interval training study was effective. Heterogeneity in tribal study findings. In the functional variables of the heart, it was increased in all study variables and results. (Pulse Rate (H.R), Decreased Functional Indices Strike Size (S.V) Stroke volume and Cardiac Out Put (C.O.P.)) In the body, while I said and reduced physical abilities (speed elongation for upper and lower limbs) and the researcher recommends reduce out of training time After the end of a sports season for The Decrease in Physical Functioning Through the Effects Phase, moderate intensity physical exercises during break from training.*

Keywords: *Basketball; Functional Variables Of The Hear; Physical Variables; Training Interruption; Training.*

1. INTRODUCTION

Basketball players are different from athletes in other sports, especially regarding their physical growth characteristics (height) and oxygen requirements (Clemente & Moran, 2024; Vretaros, 2024). Additionally, the heart beat of a basketball player can expand to approximately 1.60 milliliters to house blood (Martinez et al., 2021; Tongwu et al., 2025) in what we call sport-specific cardiovascular remodelling. However, the physiological capacity of other body systems and organs are not much different from those of athletes in another team sport (Cao et al., 2024).

Basketball is a multidimensional demanding sport where aspects like speed, strength and endurance are necessary as well as being able to maintain performance of the four quarters of play (Alcaraz et al., 2025). According to some research, a player can cover 5–8 km in a game (Niknam et al., 2025). Functional capacities or traits that allow the athlete to continue playing without an increase in performance deterioration, as the athlete reached a still relatively low fatigue-based adaptation phase (Matzka et al., 2025). Adaptation, in this case, is the modulation of an external relative to internal training loads and a broadening in physiological efficiency or performance (Gnanasigamani et al., 2025).

After cessation of training, performance in both elite athletes and non-athletes (the general population) does diminish due to physiological deconditioning (Buchheit et al., 2025). This stopping causes a drop in performance, because the body readjusts its physiological

responses based on lower functional demands being imposed on the cardiac system (Zeppilli et al., 2024). As a result, they nullify the advantages of previous physiological adaptation (Clemente & Moran, 2024).

Thus, the identification of physiological responses and functional indicators from the heart or physical capacities resulting from training halt is crucially important for both athletes and non-athletic populations (Martinez et al., 2021). This is especially important for coaches who should predict and manage potential consequences following a training interruption (Tongwu et al., 2025).

Error in citationOut—• Training cessation ↓ muscle disuse maximal HR (↓ blood volume and venous return to the heart [↓ stroke volume & cardiac output]). Evidence shows that short-term detraining leads to significant elevation in heart rate while stroke volume and VO_2 max drop (Niknam et al., 2025). These effects are associated with declines in cardiac muscle efficiency and size (Martinez et al., 2021; Alcaraz et al., 2025).

Basketball players who stop training after many years of habitual practice maintain relatively high levels of cardiovascular and muscular function, enabling them to train at relatively high intensities compared with untrained individuals. This is true for both elite athletes as well as individuals participating in sport for health reasons; albeit in different extents (Vretaros, 2024). Therefore, the research problem was to see alterations in cardiovascular variables (heart rate [HR], stroke volume [SV] and cardiac output) as well as physical variables (speed endurance and strength endurance) of basketball players after an eight-week of training break period (Gnanasigamani et al., 2025).

The objective of the current study is to investigate the impact of an eight-week cessation period on selected cardiovascular performance variables (HR, SV, CO) and physical performance parameters (speed endurance of upper and lower extremities) in basketball players (Tongwu et al., 2025) .

Research Hypotheses is:

Among basketball players of Hit Club, there were no statistically significant differences between cardiovascular functional variables before and after training cessation (i.e., HR, SV, and CO).

Selected physical ability variables (upper and lower limb speed endurance) show no statistically significant differences between pre- and post-tests after training interruption in Hit Club basketball players.

Previous and Related Studies

This should come as no surprise, as previous and related studies represent the basis for scientific research, because they offer a theoretical and empirical groundwork for conducting the current study. This section seeks to review, as well as analyze previously conducted studies that are closely related with the variables and objectives of this study. By considering previous studies, the researcher learns about patterns, consistencies and differences within the literature, allowing them to develop a clearer understanding of the research problem and its wider academic context.

The literature review allows to identify the concepts, methodologies, and instruments used in previous studies. It also aids in identifying the best research design and analytical procedures for the case in question. Also, reading other authors' work assists the researcher to identify limitations in previous studies and makes it clear why conducting the current research is essential and what knowledge can stem from this process. Franco (1998)

This study was designed to examine cardiovascular and other physical variable adaptations, including the effects of detraining in young and old athletes. There were 12 cyclists aged 19–25 years and 12 cyclists aged 50–65 years. Measurements were assessed during training and following two months of detraining. $VO_2\text{max}$ values were high for both groups during training. In older athletes, the cardiac adaptation to aerobic training was mainly attributable to an increase in left ventricular diastolic filling. In younger athletes, left ventricular wall thickness was reduced after 2 months of detraining, whereas in older athletes left ventricular mass and end-diastolic diameter and volume were decreased. Mujika (2000)

This study was raised on the cardiorespiratory system and metabolic characteristics of detraining. The findings revealed that highly trained athletes experienced a significant decline in $VO_2\text{max}$, and heart dimensions diminished following four weeks of training cessation. Rubley et al. (2001)

The present study of 25-detraining applied after flexibility training. The sample included 33 students. Findings showed no significant difference between pre- and post-tests, suggesting that flexibility was preserved during the detraining period. Franco (1998)

This study investigated cardiovascular adaptations to endurance training during prolonged periods of continuous physical activity and the assignment of inactivity. There were 12 older cyclists in the sample. They reported elevated $VO_2\text{max}$ values during the training protocol and a decrease in performance after discontinuation of training.

The present study's novelty is that the treatment was employed here to assess the impact of training interruption (detraining), on heart functional parameters and specific performance

indicators in basketball players. Previous research in sports science has focused primarily (or exclusively) on the physiological adaptation, cardiovascular fitness and physical performance effects of continuous training programs, with less attention paid to limiting factors such as exercise hiatuses in team-based paradigms like basketball.

Different from most previous studies that have mainly examined improvements in the functional variables, this study does not focus primarily but rather investigates the reverse physiological direction of such cardiorespiratory losses (deterioration or modification of physiological function during sport performance) and other sport-specific physical capabilities. Because this program incorporates both the cardiovascular and performance-oriented physical variables, it allows one to get a more well-rounded view of how interrupted training affects athletes on all levels.

The addition of the study on players also adds a sport specificity, in targeting basketball players who are defined to perform high-intensity intermittent exercise with significant reliance on anaerobic energy systems. While previous research can be generalised to other sporting populations/activities or focus solely on endurance-based activities, the results of this study now places the effects of detraining into emphasis with the physiological demands associated with basketball.

A further element of novelty is the inclusion of a pre-test/post-test design after a defined period of training cessation, facilitating direct measurement of changes attributable to removal of training stimuli. This allows you to defend on physiological and performance declines of short duration — something that is often missed in long-term, training research.

Moreover, the study enriches the literature regarding the interplay of training volume and physiological adaptation to explain subsequent performance maintenance, with practical insights for coaches and sports scientists on designing training strategies that minimize loss of performance during training absences.

2. THEORETICAL STUDY

Training

Linguistically: Training teaches discipline, and practice/repetition/habitual nature; for instance, when training an animal it means teaching it to follow prescribed paths (Allawi, 1994).

Terminological Side: Training is a series of planned actions within availability on scientific theories and executed under specific accession to achieve an identified target group (Al-Bisati 2001).

It also describes the processes designed to improve the functional capabilities of the body, for adaption through organized exercises specific to performance needs (Abdel-Ala, 1997).

Physical Abilities

Physical Qualities: These are the physical characteristics that a basketball player must possess in order to quantitatively perform basic abilities and tactical duties if their team is to succeed through-quarantine.

Detraining (Training Cessation)

It is called detraining, the physiological and physical adaptations of the body fail to be maintained resulting in a decrease in athletic performance (Matveev, 1998).

It is also defined as the partial or complete loss of training-induced adaptations when there is a cessation of training load or a significant reduction in training load (Kenney, et al., 2015).

Physiological Variables

These are known as a system of organized physical stimuli or exercises that lead to systematic functional adaptations in whole body systems and organs, all with the goal of obtaining peak athletic performance.

With an intentionality, they include regulating training loads relative to an individual's functional capacity of the body, in order to optimize positive effects while minimizing negative consequences on physiological and health status.

Scope of Study: Human Scope: Basketball players of Hit Sports Club. Spatial Scope: Indoor Hall of Hit Youth Center Temporal Scope: IYBL season (2025–2026), March 1 – June 1, 2025.

2. RESEARCH METHODOLOGY

Research Design

This study adopted an experimental design, specifically a one-group pre-test/post-test. The design consists of one unique group under investigation that is measured on certain dependent variables before and after the introduction of an intervention or treatment. Pre-test is used to get the basis measure, their existing condition before having the treatment. Then after some time applying the experimental treatment we make a post-test, being with the same or equivalent instruments to observe if there are any changes (John W. Creswell, 2014).

Sample

The sample of the study is purposive sampling from basketball players of Hit Sports Club after the end of training season 2025–2026 due to summer vacation, and consisting of 7

players. The participants characteristics in relation to age, height, weight, and the training age are described on Table (1)

The skewness coefficients of these variables were between 0.55 and 1.15, suggesting a normal distribution of the sample on them.

Instruments and Data Collection Tools

Table (1) Characteristics of the Research Sample in Growth Indicators
(Age – Height – Weight – Training Age) (N = 10).

Study Variables	Unit	Mean	SD	Median	Skewness
Chronological Age	Years	18.45	0.64	18.30	0.94
Total Body Height	cm	183.86	4.85	182.50	1.15
Body Weight	kg	74.10	3.96	74.00	0.93
Training Age	Years	4.90	0.44	5.60	0.55

Field Procedures

Measurement of Cardiovascular Variables

(Heart rate (HR), stroke volume (SV) and cardiac output (CO)) Selected cardiovascular variables were measured by echocardiographic examination, performed on Thursday, March 1, 2025. State-of-the-art medical device generates a dynamic calculation expert cardiac matrix.

Echocardiography (ECHO) Device Description

The tests were performed by an echocardiography (ECHO) device, ECHO CRITERIA GROUSOUN 5 SV (Made in Japan) and an Aloka ultrasound device (3–5 MHz, 2D color Doppler, manufactured in 2010).

The device comprises three key components:

- Transducer (energy transmission probe)
- Echocardiography unit
- Display and recording systems



Figure (1) illustrates the echocardiography device and its imaging output.

Measurement of Selected Cardiovascular Functional Variables

1. Heart Rate (HR)

Heart rate was measured using echocardiographic Doppler technology. Measurements were taken while the player was in a **supine position at rest**.

2. Stroke Volume (SV)

Stroke volume was measured using Doppler echocardiography, as illustrated in Figures (26 A, B). Measurements were obtained while the player was in a supine resting position.

Stroke volume was calculated using the following equation:

$$SV = EDV - ESV$$

Where:

EDV = End-Diastolic Volume

ESV = End-Systolic Volume

(*Ross & Wilson, 1982, p. 186*)

Cardiac Output (CO)

Cardiac output is most commonly calculated by measuring stroke volume and heart rate per minute. This is computed using the following formula:

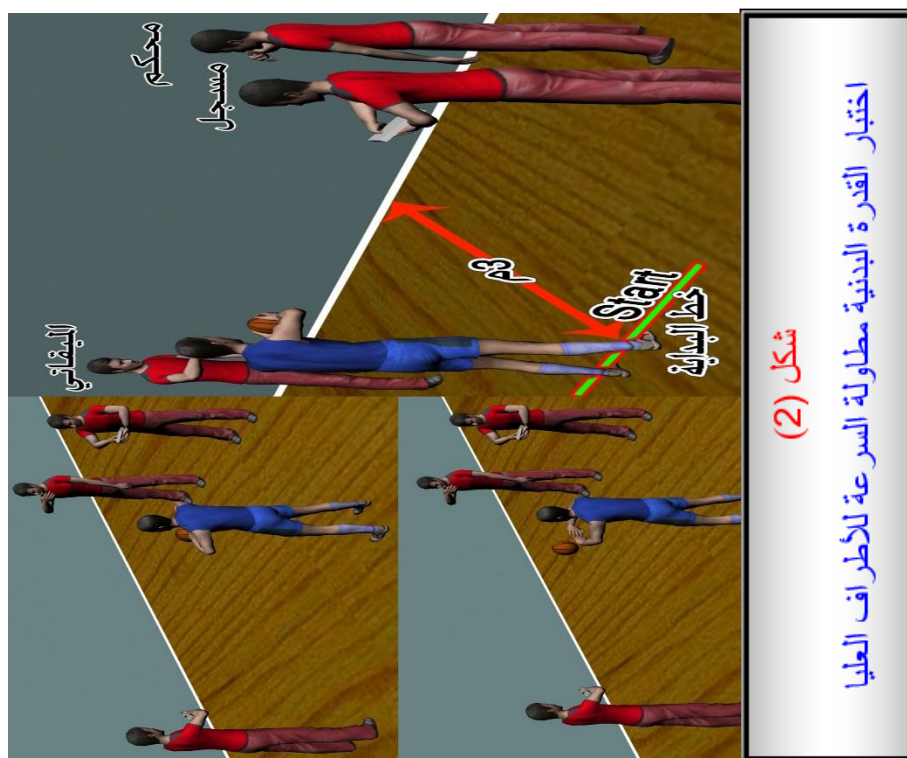
$$CO = HR \times SV$$

The physical measurements of this study specifically targeted the upper and lower limits of muscle speed endurance, which is a determinant for performance in sports that rely on repeated acceleration/jerk (such as basketball). Data Collection: The developed plates were analyzed through physical range of tests on the second day of the experimental plan, which is Saturday. To minimise external variables that could affect performance outcomes, uniform testing environments were ensured across all trials with equipment used for the assessment of muscle enzyme activities; location (indoor room); and time of day.

The wall passing and receiving test, all of which were carried out over a 30 s timeframe, was used to assess upper limbs speed endurance among the chosen physical ability tests. This test is a popular method used in sports science for determining an athlete's ability to exert high-intensity, repetitive upper-body movements for a short time. The test also only needed basic but specialize equipment such as a flat wall, tape remaining on the ground at a set distance of 3 meters from a wall, stopwatch for timing and regulation balls.

In this test, all subjects stand three meters away from the wall with a basketball in hand. At the start signal, a participant started throwing the ball against the wall vigorously and immediately catching it back continuously for 30 seconds. The combined requirement for proper ball control while the participant maintains a high tempo of movement adds both speed and accuracy concerns to this challenge.

Points would be awarded based on the number of completed (and caught) passes made in a certain time frame. We considered only repetitions that passed the ball correctly to the wall and received it correctly after completing a lap. Upper limb speed endurance is communicated via this method of assessment, which is a quantitative indicator encompassing both muscular endurance and neuromuscular coordination output. This test has a good validity and reliability as reported in earlier studies such as work done by Mohammed (1989) and Yun (1980), thus this will be an appropriate tool for evaluating performance of basketball players.



This study assessed the physical performance of the lower limbs using the 40-second running test, which specifically measures speed endurance of the lower limbs. This test has special relevance within the context of basketball, where players must complete repeated high-intensity sprints and rapid change of direction movement in succession and over the duration of the match. The distance covered by the test was measured and marked on a normal basketball court from 0 to 28 meters.

The tools used for this experiment were stopwatch (for timing the test), a whistle (to start the experiment and to have clear signals till at least beeping from there) and adhesive tape (to make markings on the half court, starting line or sides). These measures helped to ensure that the testing process was executed in a controlled environment under repeatable conditions, improving accuracy and consistency.

At the start of each evaluation, players stood behind their respective basketball court baselines. At the timer's signal, the subject sprint-to-the-max to the end of the court that is opposite. The player was then made to go back to the beginning and run back and forth in a shuttle pattern for 40 seconds in total. This repeated sprint type of work mirrors the intermittent high-intensity demands during basketball performance and is highly oxidative on anaerobic energy system stress, especially the lactic acid system¹.

One of the main conditions of performance for the test was that at any given turn, a player had to touch at least one foot with the end line. This was the only condition we strictly maintained so as to keep all the shuttle repetitions valid and not reduce running distance. Proper turn execution also reflects tight coordination, agility and movement control under fatiguing circumstances.

The score of the test was assessed by measuring the overall distance traversed by the player during a 40-second interval (in meters). This provides a quantifiable, objective measure of lower limb speed endurance, including both sprinting ability and fatigue resistance. The test is commonly used in sports performance research and further validated by previous studies including Abdullah (2000) who noted its use as a good indicator of repeated sprint ability for team sport.

3. RESULTS PRESENTATION AND DISCUSSION

First Hypothesis (Cardiovascular Variables)

The hypothesis was that mean cardiovascular variables (HR, SV, CO) measured in the pre- and post-tests at 45 minutes would not be significantly different when assessed following

cessation of training. Means, standard deviations, and t-tests were employed to test this hypothesis.

Statistically significant decreases ($p \leq 0.05$) were observed when comparing pre-test to post-test values for all cardiovascular measures that varied between groups during the test, but with results consistently favoring pre-test measures (Results presented as Mean \pm SDe). These results suggest a substantial decrement in cardiovascular efficiency after the post-training period. In particular, heart rate (HR) elevated from 70.46 beats per minute (bpm) in the pre-test to 75.84 bpm in the post-test indicating a reduced response compared with the control group, stroke volume (SV) decreased significantly from 80.56 ml to 60.85 ml, and cardiac output (CO) was also appreciably lower at 1750.79 ml versus 1360.38 ml.

These physiological alterations are better illustrated by the percentage changes. Heart rate rose by roughly 9.7%, indicating a compensatory mechanism to ensure adequate cardiac output despite diminished cardiac economy. In contrast, stroke volume showed a significant reduction of 43.24% consistent with reduced ability of heart to pump blood in one beat. Likewise, cardiac output was reduced 22.29%, indicating an overall reduction in the heart's capacity to deliver oxygenated blood to working muscles during exercise.

Results of this study clearly indicate that the cardiovascular effects of an eight-week period without exercise (detraining) were significantly deleterious. This observed increase in heart rate, contrasted with reducing stroke volume and cardiac output is in line with what we know from basic physiology, whereby decreased training impulses result in reduced submaximal cardiovascular efficiency and aerobic capacity¹. Additionally, decreased plasma volume, less myocardial contractility and diminishing cardiovascular adaptations as a result of disuse accounts for these changes.

These findings are consistent with previous studies in exercise physiology showing that cessation of physical training induces rapid decrements in central and peripheral adaptations. Specifically, William D. McArdle et al. (2015) and Jack H. Wilmore et al. (2008) note that detraining is associated with reduced stroke volume and cardiac output, as well as an increased resting and submaximal heart rate³. Thus, the current results highlight that constant training should be sustained to maintain cardiovascular fitness in sports with high involvement of aerobic and anaerobic energy systems such as basketball.

Interpretation:

The increase in heart rate and the decreased stroke volume and cardiac output represent physiological deconditioning. These results are in line with earlier studies especially:

- Franco (1998): Decreased left ventricular geometry after detraining.

- Mujika & Padilla (2001): VO₂max and cardiac output reductions after training cessation.
- The most important functional staff of the cardiovascular system (HR, SV, CO) are widely used to assess physical effort capacity of the organism and reactivity due training adaptations and plasticity (Hassan, 1983).

Table (2) Pre- and Post-Measurement Results of Cardiac Functional Variables (N = 7).

No.	Cardiac Functional Variables	Unit	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-value	% Change	Significance
1	Heart Rate (H.R)	beats/min	70.46	2.37	75.84	5.56	5.74	9.70%	Significant*
2	Stroke Volume (S.V)	mL	80.56	21.90	60.85	25.38	10.78	43.24%	Significant*
3	Cardiac Output (C.O.P)	mL	1750.79	420.65	1360.38	1278.20	2.57	22.29%	Significant*

Second Hypothesis (Physical Abilities)

The 2nd hypothesis of the study stated that there would be no statistically significant differences in physical abilities between measurements taken pre-intervention and those taken after, specifically speed endurance. This assumption was not supported by analysis, as statistically significant differences ($p \leq 0.05$) between the two measurements were noted; all outcomes favored pre-test values. This suggests that the training disruption had a significant and detrimental impact on the athletes' physical performance.

Upper limb speed endurance showed a significant reduction with mean repetitions decreasing from pre-test 37 to post-test 29 repetitions, amounting to a decrease of 62.21%. This steep drop indicates that the athletes lost a significant capability to maintain fast and repetitive movements at their upper body, which is a key for basketball skills like passing, dribbling, and shooting. This decrease is due to a decline in neuromuscular efficiency and muscular endurance, both of which are results of the absence of regular training stimuli.

Likewise, the outcomes for lower limb speed endurance exhibited a drop in performance with distance traveled during pre and post-test being 210 m and 185 m respectively, indicating a decrement of 11.9%. Although not as great as that seen in the upper limbs, this reduction clearly represents a major impairment in the players' ability to perform repeated HIR efforts. Such a decline is especially critical in basketball, as lower limb performance is fundamental when it comes to sprinting and jumping and rapid directional changes.

03:44 issue of the Journal of Science and Medicine in Sport display that from upper limb to lower limb speed endurance, stopping training results in a decline. Square the observed reductions with widely accepted tenets of exercise physiology, which posit that detraining causes a gradual decline in muscular endurance, neuromuscular coordination and metabolic function³. Additionally, the 10% decrease in upper limb performance may be due to these muscle groups being more susceptible to disuse or needing more frequent stimulation in order to maintain optimal function.

In conclusion, from these results→ The second hypothesis is rejected which demonstrates that when subject of study had insufficient time for physical training both performance and capacity was compromised mainly in terms of speed endurance.

Interpretation:

Failure to train inhibited speed endurance in certain instances. These results are aligned with previous studies (Franco, 1998) which have shown that ceasing training leads to both cardiovascular and physical performance capacity decrease.

Table (3) Pre- and Post-Test Results of Physical Variables (N = 7).

No.	Physical Variables	Unit	Pre-Test Mean	Pre-Test SD	Post-Test Mean	Post-Test SD	t-value	% Change	Significance
1	Speed Endurance of Upper Limbs	repetitions / 30 s	37.00	1.75	29.00	1.48	24.26	62.21%	Significant*
2	Speed Endurance of Lower Limbs	meters / 30 s	210.00	19.26	185.00	14.27	7.10	11.90%	Significant*

The decline in performance observed can be attributed to several interdependent physiological variables, according to the researcher. One possible mechanism driving the reduction has been described as a decrease in physiological adaptation, most immediately affecting the body's ability to acutely volume-based adapt to exercise (acute), or serum markers of recovery from and response to repeated training stimuli. These indicators may drop temporarily in response to lack of optimal training load periodization or absence of adequate recovery periods, as the adaptive responses of muscular and cardiovascular system won't be up to par.

Second, a high-intensity intermittent sport such as basketball likely accounts for these findings. The demands of basketball are predominantly anaerobic in nature with the lactic acid system providing a significant percentage of energy needed in-game. This system is highly active in short bursts of high-powered activities including sprinting, bounding and rapid

directional changes. Anaerobic metabolism is believed to provide around 90% of energetic needs during these high-intensity periods.

While this process is indeed vital for high-intensity training, over-reliance on the lactic acid system can result in a build-up of metabolic by-products (in particular lactate and hydrogen ions), both of which are responsible for muscular fatigue as well as preventing us from performing at optimal efficiency. Indeed, this physiological response could provide a partial explanation for the drop in post-test scores, given that the athletes might have been buffered following consecutive stages of training and failed to recover adequately.

In summary, the current evidence suggests that while improving tissue oxygenation and increasing mitochondrial density through aerobic training can positively impact performance, incorporating both aerobic and anaerobic conditioning methods may yield a more comprehensive approach to physiological adaption in basketball players and help maintain optimal levels of performance over time.

4. CONCLUSIONS

In basketball players, a significant negative change was detected after a period of 8 weeks without training for cardiovascular functional variables and in physical performance factors. Notably, this disruption of regular training resulted in significant changes in important cardiac parameters such as (HR), stroke volume (SV) and CO, indicative of an overall decrease in cardiovascular efficiency and the body's capacity to deliver oxygenated blood during physical exertion. The end results also showed a significant physical decline with particular focus on speed endurance of both the upper and lower limbs. This decrease suggests reduced athletes' ability to maintain repeated high-intensity actions, which are key indicators of on-court performance in basketball. Taken together, these findings strongly underscore the necessity of frequent training for retention of both cardiovascular fitness and physical preparedness; lengthy periods without activity or break in training can induce rapid declines in both physiological capacity and performance capability specific to a given sport.

RECOMMENDATIONS

- a. Empirical studies with alternative training methodologies & tactics in a variety of sports and age categories.
- b. Use the results of this study to implement training programs to enhance physical and invasion skills in basketball players.

- c. Physiological adaptations wane in athletes when training ceases. The speed of decline, however, varies from person to person based on fitness level and how long a break has been taken from exercise.
- d. Athletes must resist the temptation to return to pre-detrained performance levels immediately after prolonged periods of detraining (e.g., 8 weeks). Instead, training programs should be progressive, easy to do and specific to the individual's situation.
- e. Studies have also demonstrated that following short-term detraining (2–3 weeks), athletes can regain levels of fitness, performance and muscle size quite rapidly provided subsequent exercise is undertaken progressively, gradually returning to pre-detraining efforts.

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