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Effectiveness of Morning versus Evening High-Intensity Interval Training on Selected Performance Parameters of Badminton Players: An Experimental Study

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Abstract

The current study was conducted to examine the effects of high intensity interval training (HIIT) to be applied at morning and evening on some selected parameters of colleges' badminton players. A total of 45 male college's badminton players between the age of 18-24 years was participated in the study. Participants was divided into two groups, Experimental Group (EG) n=30 and Control Group (CG) n=15 based on the aerobic fitness assessment results. The EG was further divided into Morning Group A and Evening Group b. EG was given prescribed training, while CG was remaining as usual. Data was collected two times; T1 pre-test and T2 post-test after eight weeks. T-test and repeated measure ANOVA was applied to measure the statistically significant differences between pre- and post-test results.

Introduction

The introduction section of any research work clarifies background to need for that particular research work. The introduction section of research gives Birds-eye view of the entire research work. This chapter introduces the research problem through historical perspective, problem statement, significance, limitations, and objectives. In this regard, the current study was conducted among badminton players who are facing training problems for years. There is a dire need to conduct an experimental study to examine the current performance parameters of badminton players at college level. The study at hand is an attempt to examine the effects of effectiveness of morning versus evening high intensity interval training on selected performance parameters of badminton players. The researcher is hopeful that this work was helpful for physical education teachers, coaches and trainers to develop their athlete's performance parameters. Badminton is a combination of high-intensity short rallies (anaerobic system) and longer rallies (aerobic system), with short recovery between rallies [1]. Researchers have observed that a badminton players obtain 60-70% of the energy from aerobic system and 30% is from anaerobes system [2,3]. The time period of badminton match is between 15-90 minutes depending on the player's performance and the number of rallies played [4]. Badminton payers require high levels of both aerobic energy towards maintaining performance for a duration of half an hour or more. Hence, the competitive badminton players'

training should concentrate on improving their ability to repeat a high-intensity activities and faster recovery after that. Therefore, aerobic fitness improvement should be included in the badminton training as one of the physical exercise [5]. The effects of High Intensity Interval Training (HIIT) program especially among young badminton players field is little known. HIIT is defined as either repeated short (< 45 s) to long (2-4 min) bouts of high-intensity exercise interspersed with recovery periods [6]. HIIT has emerged as a practicable and efficacious strategy for increasing physical health outcomes in young athletes. Sperlich et al. [7] performed an HIIT program for 5 weeks, 4 times a week for 1- 5 hours of practice and 1 game, among soccer players (age: 13.5 ± 0.4 years) that resulted in an increasing VO2max of 7% [7]. In badminton players requires a combination of aerobic and anaerobic fitness, speed, power, agility, strength, technical and tactical skills [2,8]. The employment of traditional methods (long slow distance, fartlek, etc.) improving aerobic fitness is common among badminton coaches. Therefore, it is necessary to form a training that involved all of these fitness components [9]. Functional training became a well-known worldwide and have been combined to high intensity interval training [10, 11]. Functional training refers to specific training coordinated with the athletes' need to increase their performance in sport [12]. Previous studies had combined high intensity functional training with cross-fit training, which based on the concept on improving work capacity over time by using weight training such as push-ups and squats [10]. However, in this study aerobic exercise was combined with the movement of skills in playing badminton. Therefore, the objective of this study was to investigate the effects of high intensity interval functioning training on aerobic fitness, agility and speed among young badminton players.

Objectives

1. To assess the effects of high-intensity interval training (HIIT) at morning on performance parameters of badminton players.

2. To assess the effects of high-intensity interval training (HIIT) at evening on performance parameters of badminton players.

3. To analyze the significant difference in the effects of HIIT at morning versus evening on performance parameters of badminton players.

HYPOTHESES

H1 High-intensity interval training (HIIT) at morning will have positive effects on performance parameters of badminton players.

H2 High-intensity interval training (HIIT) at evening will have positive effects on performance parameters of badminton players.

H3 HIIT will produce higher beneficial effects on performance parameters in the evening hours as compare with morning hours.

Research Methodology

A quantitative research design was adopted to collect pre- and post-intervention numeric data on the research variables. The study was utilize a pre-test/post-test design to evaluate the effects of HIIT on the selected variables. This design involves measuring the variables of interest before and after the intervention to assess any changes that occur. Participants for the study were selected based on specific criteria, such as age, fitness level, and health status. It is important to ensure that the sample is representative and diverse enough to increase the generalizability of the findings.

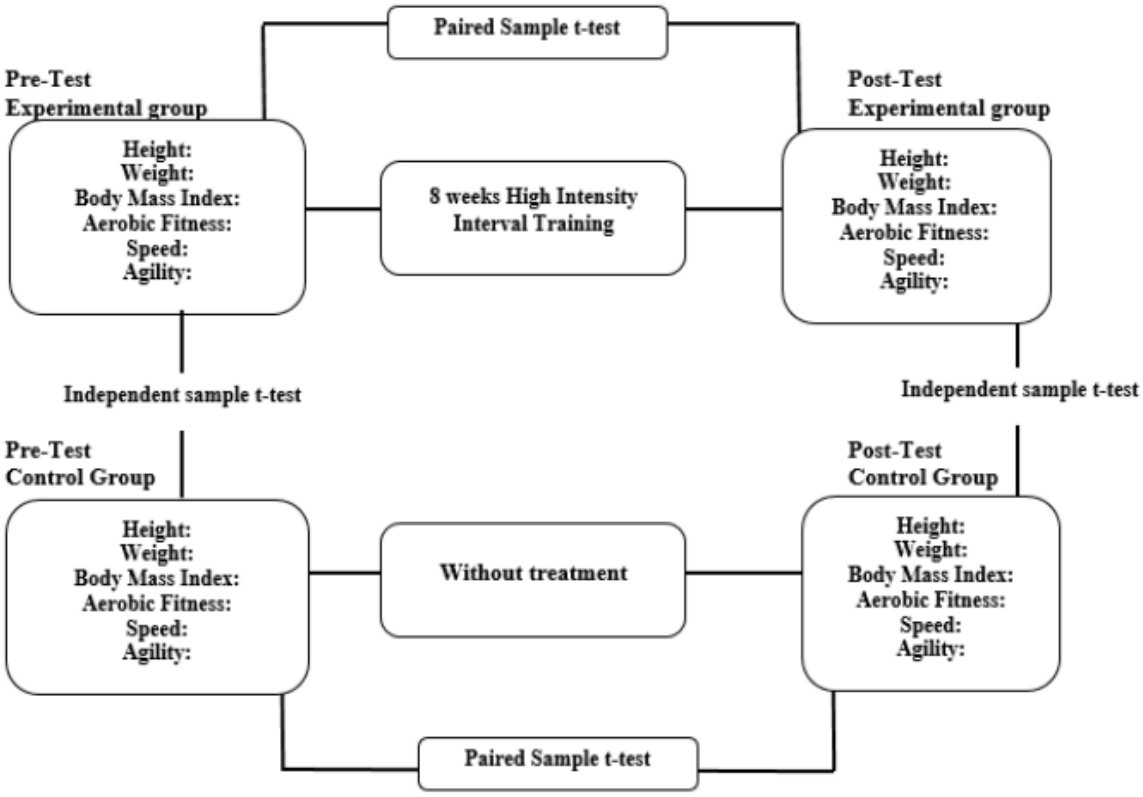


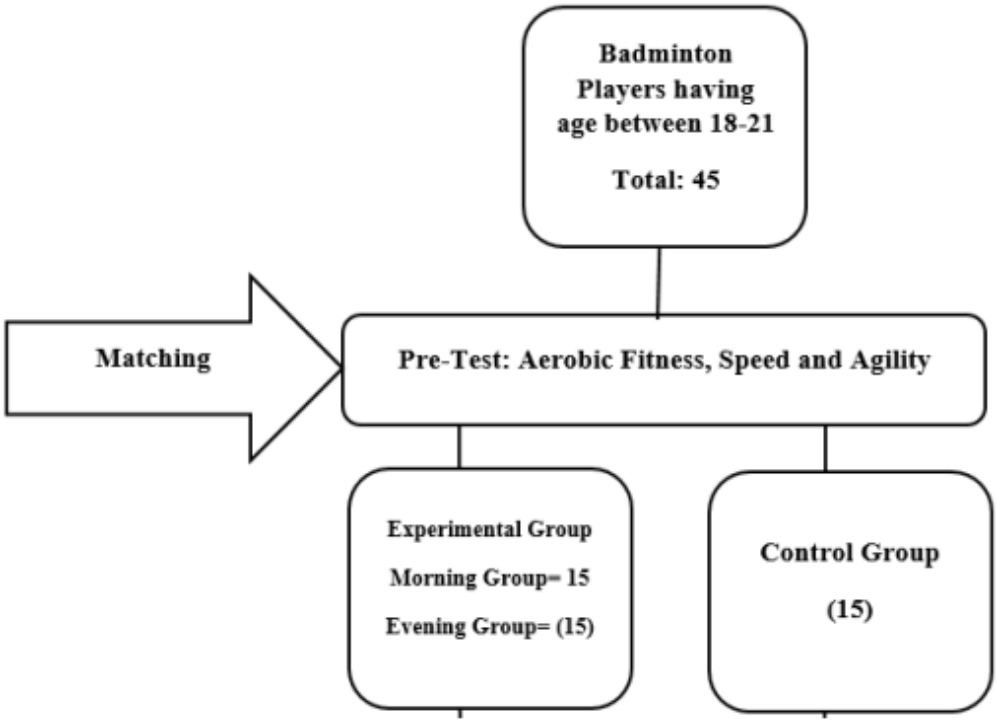
Figure 3.2 Showing the Pre- and Post-Intervention Data Collection

Plan of Work and Design Adopted

The first step in the research process is conducting a thorough literature review to gain a comprehensive understanding of the topic and identify relevant theories, concepts, and previous studies related to HIIT (High-Intensity Interval Training). This will help establish a solid theoretical foundation for the study. Based on the literature review, specific research objectives were formulated. These objectives will guide the entire research process and help determine the variables to be measured and the desired outcomes of the study. Research Design: A quantitative research design was adopted to collect pre- and post-intervention numeric data on the research variables. The study will utilize a pre-test/post-test design to evaluate the effects of HIIT on the selected variables. This design involves measuring the variables of interest before and after the intervention to assess any changes that occur.

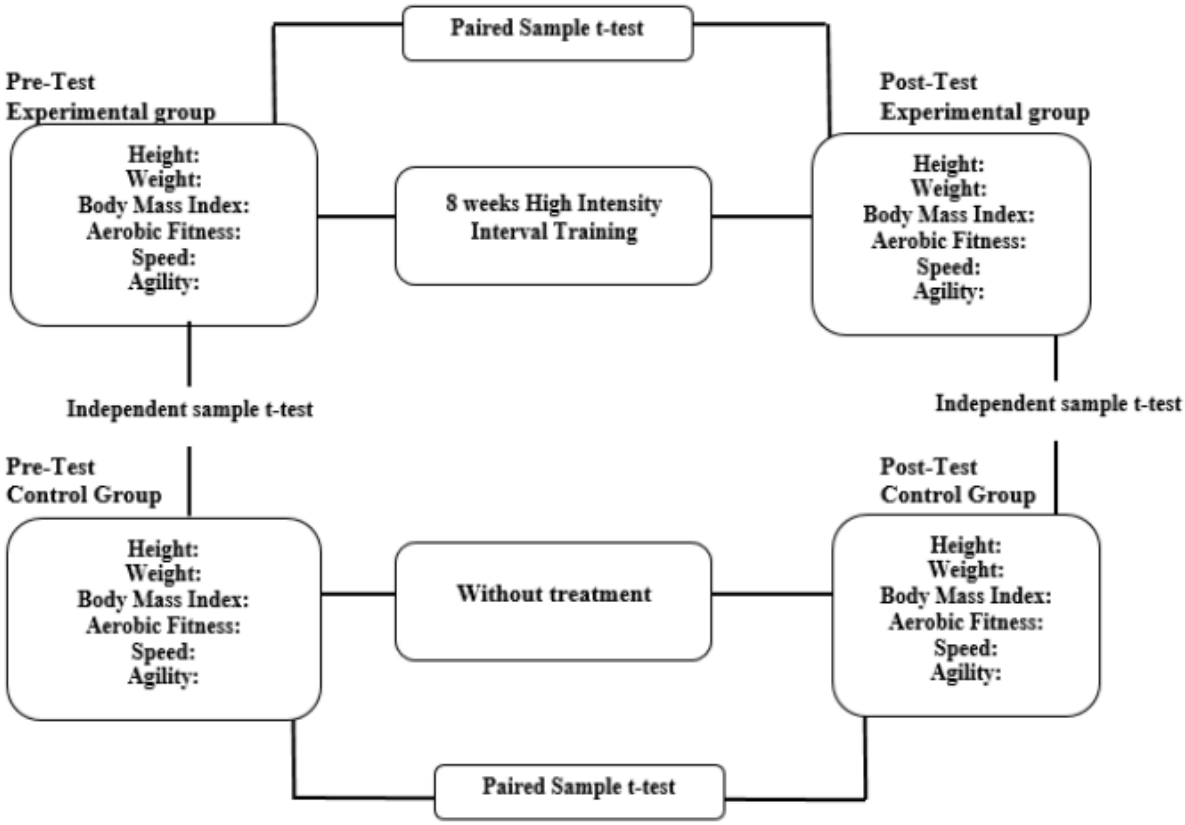
Treatment to be studied:

The experimental group A and B was given high-intensity interval training (HIIT) for 6 weeks, however; the control group was allowed to take part in their routine activities. The HIIT programs will not be given to a control group. The training program was scheduled for the morning between 9:30 to 10:30 and evening 4:00 PM to 5:00 PM. The training program was given under the strict supervision of the researcher. Proper attendance was noted on a specific register to get accurate and authentic results. The training program was conducted at the central ground Government Degree College for Boys, Qila Didar Singh,Gujranwala. The researcher in a cooperation with assistant was personally supervised and ensure proper execution of the HIIT program. A detailed description of both the programs is presented in the following tables.



Methods of Data Collection

All subjects was complete the familiarization phase prior to data collection by attending a session in which they were practiced all HIIT exercises and test conditions. The study was recruit volunteers to conduct HIIT activities in a single group. Additionally, during the practice session, participants informed that the study was completed in two different time periods: in the morning (09.00-10.00) and in the evening (04.00-05.00). The body weights determined using an electronic scale with a 0.1-kilogram accuracy (kg). The participants' heights determined during the measurement using a stadio-meter with an accuracy of 0.01 meters (m). Using an electronic scale, the body mass index and body fat ratios of all subjects was determined and recorded. After HIIT, the participants' 30 m sprint and T-line agility performance was assessed at two different durations throughout the day (starting at 9.00 am and 4.00 pm). Three trials were performed for each measurement, and the highest value of the three trials was used for each variable. After the T-test and 30 m speed test tracks, a two door photocell electronic chronometer system measuring with 0.01 second precision was placed at the start and finish lines of the tracks. Three trials was taken for each variable (a rest interval of 1 min after each trial for the T-test and 30 s after each trial for the 30 m sprint test), and the highest value of the three trials was utilized for analysis.

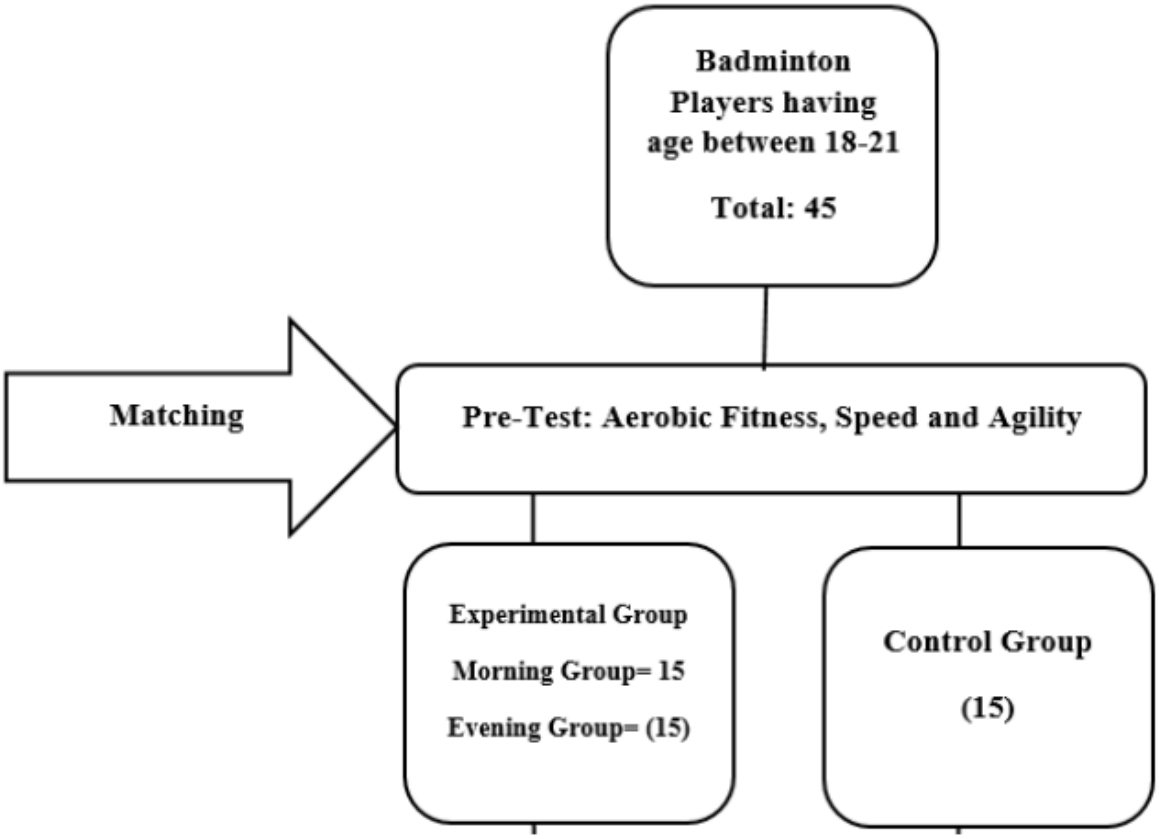


Sampling Technique and Procedure

Forty-Five male volunteers between the ages of 18 and 21, who had exercised consistently three days a week for at least three years and are studying at Government Degree College for boys Gujranwala, was participated in the study. The badminton players was required to meet the following criteria to be included in the study: (a) have been doing the game of hockey for at least 3 years; (b) have no history of disability that would affect the study's outcome; (c) ensure regular participation in the study; and (d) follow the researchers' commands throughout the study. All athletes was given all of the essential information regarding the study's requirements and risks, and they was required to sign an informed consent form indicating that they volunteered to participate. The players were instructed to maintain their usual level of physical activity and abstain from intense activities for 24 hours prior to the study. Additionally, they was forbidden to use stimulants (e.g. caffeine)or depressants (e.g. alcohol) before to the study. Before starting the study, necessary approval was received from Directorate of Academics, Gomal University, Dera Ismail Khan. And Government Degree College for boys, Qila Didar Singh,

Sample Size

The study group was determined using the power analysis application G*Power (version 3.1.9.3, Germany). As a result of the power analysis (confidence interval=.95, alpha=.05, beta=.80, and effect size=.60), it was concluded that at least 45 volunteers should be included in the study. These volunteers will then be divided into two groups Experimental Group (EG) and Control Group (CG). The EG will further be divided into (EG) A having 15 players, (EG) B having 15 players and CG having 15vpayers. The detail description is given in the figure below;



Chapter 4: Results and Discussion

Table 4.1: Descriptive Results of Anthropometric measures of College level Badminton Players

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Age (years)	45	18.00	21.00	19.4889	1.29021	1.665
Height (cm)	45	159.00	184.00	170.3169	7.15671	51.218
Weight (kg) pre	45	56.00	82.00	64.3778	6.59989	43.559
Weight (kg) post	45	53.00	78.00	59.3778	5.62579	31.649
Body Mass Index in Pre-test	45	18.90	28.31	22.2202	2.12380	4.511
Body Mass Index in Posttest	45	16.54	26.93	20.1520	2.44563	5.981

Table 4.2: Pre- and post-test data normality (Aerobic Fitness)

HIIT mean High intensity Interval Training

Tests of Normality

	Groups	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Aerobic Fitness (20 meter Shuttle run test) Pretest	HIIT at Morning	.192	15	.141	.892	15	.073
	HIIT at Evening	.192	15	.141	.892	15	.071
	Control Group	.248	15	.064	.948	15	.488
Aerobic Fitness (20 meter Shuttle run test) Posttest	HIIT at Morning	.219	15	.057	.901	15	.099
	HIIT at Evening	.157	15	.200*	.948	15	.488
	Control Group	.195	15	.129	.901	15	.099

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 4.3: Pre- and post-test data normality (Speed)

HIIT mean High intensity Interval Training

Tests of Normality

	Groups	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Speed (Sprint Time over 20 meters) Pretest	HIIT at Morning	.277	15	.073	.780	15	.182
	HIIT at Evening	.208	15	.081	.900	15	.296
	Control Group	.288	15	.082	.898	15	.190
Speed (Sprint Time over 20 meters) Posttest	HIIT at Morning	.225	15	.090	.805	15	.164
	HIIT at Evening	.240	15	.060	.898	15	.179
	Control Group	.264	15	.086	.898	15	.188

a. Lilliefors Significance Correction

Table 4.4: Pre- and post-test data normality (Agility)

Tests of Normality

	Groups	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Agility (SEMO Agility test) Pretest	HIIT at Morning	.107	15	.200*	.975	15	.926
	HIIT at Evening	.157	15	.200*	.928	15	.253
	Control Group	.209	15	.078	.943	15	.415
Agility (SEMO Agility test) Posttest	HIIT at Morning	.175	15	.200*	.938	15	.354
	HIIT at Evening	.182	15	.193	.949	15	.512
	Control Group	.216	15	.088	.874	15	.089

*. This is a lower bound of the true significance.

Table 4.5.2: ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Aerobic Fitness (20 meter Shuttle run test) Pretest	Between Groups	4.014	2	2.007	2.362	.107
	Within Groups	35.698	42	.850		
	Total	39.712	44			
Aerobic Fitness (20 meter Shuttle run test) Posttest	Between Groups	64.732	2	32.366	49.324	.000
	Within Groups	27.560	42	.656		
	Total	92.292	44			

Table 4.9.3: Estimates (Dependent Variable: Speed (Sprint time over 20 meters)

Estimates

Dependent Variable: Speed (Sprint Time over 20 meters) Posttest

Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
High intensity Interval Training at Morning	2.998[a]	.103	2.790	3.205
High Intensity Interval Training at Evening	3.152[a]	.103	2.943	3.360
Control Group	4.625[a]	.104	4.415	4.834

a. Covariates appearing in the model are evaluated at the following values: Speed (Sprint Time over 20 meters) Pretest = 4.6518.

Conclusion

The research study on the effectiveness of morning versus evening high-intensity interval training (HIIT) on selected performance parameters of badminton players found that both training timings resulted in significant improvements in performance. The study demonstrated that HIIT, whether conducted in the morning or evening, can effectively enhance aerobic capacity, muscular power, agility, and reaction time in badminton players. The findings indicated that there were no significant differences in the overall improvements between the morning and evening training groups. Both groups exhibited similar enhancements across the measured performance parameters. This suggests that the timing of the training session does not significantly impact the overall effectiveness of HIIT for improving these specific performance parameters. However, it is noteworthy that participants in the morning training group reported lower perceived exertion levels during the training sessions compared to those in the evening training group. This subjective measure suggests that morning training may be perceived as less physically demanding, potentially influencing motivation and adherence to the training program. Therefore, when designing training programs for badminton players, coaches and athletes should consider individual preferences, daily schedules, personal energy levels, and motivation. The choice of training timing can be based on these factors, as the study showed that both morning and evening training sessions can yield similar performance improvements. Ultimately, the key is to prioritize consistency and adherence to the training

program, regardless of the specific timing chosen. Further research may explore additional factors that could influence the effectiveness of morning versus evening training, such as chronotype (individual variations in circadian rhythms) and specific performance parameters related to badminton. Additionally, studying the long-term effects of morning versus evening HIIT on performance and recovery could provide valuable insights for optimizing training strategies in badminton and other sports

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