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Effect of Swimming Training Program on Heart Rate among the Young Swimmers

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Abstract

This study examines the effect of structured swimming training programs on young athletes' heart rate and muscular flexibility. The research focuses not only on swimming performance-such as start, turn, and stroke efficiency-but also on designing strength and endurance training programs that enhance physiological adaptations necessary for long-term performance improvement. Two major perspectives from the literature are discussed: the optimal intensity of strength training and the systematic planning of swimming workouts. The findings indicate that specific swimming training programs significantly improve physiological parameters such as heart rate, endurance, and muscular flexibility, thereby enhancing overall athletic performance.

Keywords: Swimming, heart rate, strength, program design, training

Introduction

The cardiovascular system circulates blood throughout the body, delivering oxygen and nutrients while removing metabolic waste. Heart rate (HR)-the number of heartbeats per minute-is a primary indicator of cardiac workload. A normal resting heart rate ranges from 60 to 100 bpm, while endurance-trained athletes often exhibit rates below 60 bpm, signifying superior cardiovascular efficiency.

Swimming, an activity involving coordinated self-propulsion through water, combines aerobic and anaerobic elements and requires precise limb movement and breath control. It enhances endurance, strength, and flexibility while improving oxygen utilization and cardiovascular stability. Understanding these physiological adaptations is essential for designing effective swimming and athletic training programs.

In the present study, middle-aged swimmers (18–20 years) from Shree Hanuman Vyayam Prasarak Mandal's (HVPM) Aquatic Center, Amravati, were selected as participants. A simple random group design with pre-test and post-test measures was employed. The control group performed routine activities, whereas the experimental group underwent a structured swimming training program for 60 minutes/day, 6

days/week over 90 days. Post-test findings revealed significant improvement in heart rate and muscular flexibility among the experimental group compared to the control group.

Methodology

Sources of Data

Participants were drawn from Shree Hanuman Vyayam Prasarak Mandal's Aquatic Center, Amravati.

Selection of Subjects

Swimmers aged 18–20 years, engaged in regular swimming practice at the HVPM Aquatic Center, were selected using the purposive sampling method.

Experimental Design

A simple random group design was adopted, comprising one experimental and one control group.

- **Experimental Group:** Received structured swimming training.
- **Control Group:** Continued routine daily activity without additional training. The training duration was 90 days.

Test Administration**Resting Heart Rate**

Purpose: To determine each subject's resting heart rate (RHR).

Equipment: Stopwatch (1/100th second precision).

Procedure: Participants' pulse rates were measured in the morning while lying down. After relaxation, the pulse was recorded at the radial artery (thumb side of the wrist) for one minute. Counting began at the first pulse as "zero."

Scoring: Recorded as beats per minute (bpm).

Data Analysis**Analysis of Covariance (ANCOVA) for Heart Rate (18–20 years)**

Source of Variance	d.f.	SSx	SSy	MSSx	MSSy	Fx	Fy
Treatment group means	1	1.07	277.35	1.07	277.35	0.017@	6.386*
Error	58	3703.33	2518.83	63.85	43.43		
Significant at 0.05 level; @Not Significant							
Tabulated $F_{0.05}(1,58) = 4.00$							

Interpretation

$F_x = 0.017$ is not significant, indicating homogeneity between groups in pre-test scores. $F_y = 6.386$ is significant, showing a

meaningful difference in post-test heart rate scores between control and experimental groups.

ANCOVA Summary

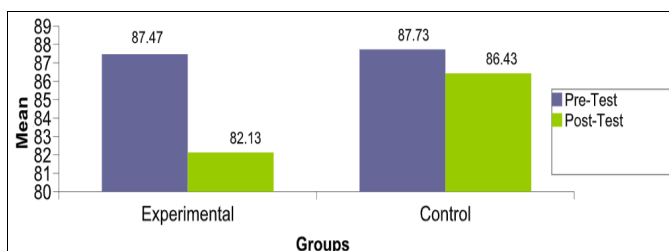
Source of Variance	d.f.	SSx	SSy	SSxy	SSyx	MSSyx	Fyx
Treatment group means	1	1.07	277.35	17.20	253.18	253.18	23.373*
Error	57	3703.33	2518.83	2653.60	617.41	10.83	
Significant at 0.05 level							
Tabulated $F_{0.05}(1,57) = 4.00$							

Interpretation

Since $F_{yx} = 23.373 > 4.00$, the swimming training program significantly improved heart rate regulation in the experimental group compared to the control group.

Group Means and Adjusted Final Means

Group	Sample Size	Mx	My	Adjusted Myx
Experimental	30	87.47	82.13	82.23
Control	30	87.73	86.43	86.34



Mean Difference of Heart rate between the Pre and Post Test of Experimental and Control Groups (18-20 years age)

LSD Test for Significance among Adjusted Post-Test Means

Experimental Group	Control Group	Mean Difference (MD)	Critical Difference (CD)
82.23	86.34	4.11*	1.70

Interpretation

MD (4.11) > CD (1.70), indicating a significant improvement in post-test mean heart rate in the experimental group.

Results

Statistical analysis using ANCOVA revealed that $F_x = 0.017$ (NS) indicates homogeneity at pre-test, while $F_y = 6.386$ (S) demonstrates a significant difference post-training. Furthermore, $F_{yx} = 23.373$ (greater than 4.00) confirms that the swimming training program significantly improved the heart rate of the experimental group swimmers compared to the control group.

Conclusion

The study concludes that the structured swimming training regimen administered to the experimental group significantly enhanced cardiovascular efficiency and muscular flexibility. The findings suggest that planned swimming programs contribute to better heart rate control, endurance, and overall physical performance among young swimmers. Future studies may explore long-term adaptations and compare varying aquatic training intensities to optimize cardiovascular outcomes.

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