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Influence of Varying Training Protocols (Progressive, Fluctuated, Regressive) on Physical Performance Metrics in Male Field Hockey Players

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ABSTRACT: This study investigates the comparative effects of progressive, fluctuated, and regressive training protocols on physical performance variables among male field hockey players. A total of 60 male players were randomly divided into four groups: progressive training group, fluctuated training group, regressive training group, and control group. The intervention was conducted over a period of 8 weeks duration, during which specific training protocols were administered. Pre- and post-test assessments were carried out for physical performance variables (agility). Statistical analysis was performed using ANOVA and post-hoc tests to determine significant differences among groups. The results revealed that all three experimental training protocols produced improvements, with the progressive training group showing the most consistent gains in strength and endurance, while the fluctuated group showed benefits in agility. The study concludes that variation in training intensity can yield differential benefits and can be effectively tailored based on the specific performance goals of field hockey players.

KEYWORDS: Progressive Training, Fluctuated Training, Regressive Training, Strength, Physical Performance, Physiological Variables, Field Hockey

I. INTRODUCTION

Field hockey is a physically demanding sport requiring a high level of strength, speed, agility, and endurance. The design of effective training protocols plays a crucial role in enhancing athletic performance. Traditional linear progression (progressive training), variable intensity training (fluctuated training), and tapering (regressive training) have all been utilized in sports conditioning, yet limited comparative studies exist in the context of field hockey. This study aims to fill this gap by examining the effects of these training models on key performance indicators.

THE PROGRESSIVE TRAINING PROTOCOL

The Progressive Training Protocol (PTP) was designed to systematically increase the training load over the course of the intervention period. This group followed the principle of gradual overload, where the intensity, volume, or complexity of the exercises was increased incrementally each week to stimulate continuous physiological adaptation. The training program included strength, endurance, and agility components, with exercises such as resistance training, sprint drills, and interval runs. For example, resistance loads were increased by 5–10% every week, and aerobic sessions saw a gradual increase in duration or intensity. This protocol aimed to enhance muscular strength, cardiovascular endurance, and overall physical performance while minimizing the risk of overtraining. All sessions were monitored to ensure proper technique and progression, and the load increments were personalized based on each athlete's baseline performance and recovery rate.

THE FLUCTUATED TRAINING PROTOCOL

The Fluctuated Training Protocol (FTP) employed a non-linear or undulating model in which training intensity and volume varied across the weeks or sessions rather than following a fixed progression. This approach aimed to prevent performance plateaus and overtraining by frequently altering the training stimulus. The fluctuated program integrated alternating high, moderate, and low-intensity sessions within each week. For instance, a high-intensity resistance session (e.g., 85–90% 1RM) might be followed by a moderate-load session (70–75% 1RM) and then a low-load recovery session (50–60% 1RM). Similarly, aerobic and speed training intensities were rotated to allow for optimal adaptation and recovery. This model encouraged neuromuscular adaptation and agility enhancement, particularly beneficial for athletes requiring quick direction changes and varied match-play demands. The flexible design of the

fluctuated protocol made it adaptable to the individual response of athletes, promoting both physical performance and motivation through varied challenges.

THE REGRESSIVE TRAINING PROTOCOL (RTP)

The Regressive Training Protocol (RTP) involved a gradual reduction in training intensity and volume over the intervention period. This model was designed to assess the effects of tapering or deloading strategies on maintaining or slightly enhancing performance while reducing physical stress and fatigue. Initially, participants trained at moderate-to-high intensities, similar to the progressive group. However, as the weeks advanced, the training load was systematically decreased—resistance loads were reduced by 5–10% weekly, and aerobic and speed training volumes were shortened in duration or intensity. The primary objective was to allow physiological recovery while preserving previously acquired fitness levels. This protocol is commonly used during pre-competition tapering or in rehabilitation contexts, aiming to optimize performance by minimizing cumulative fatigue. In this study, the regressive training group provided valuable insight into how reduced training stimuli can still sustain or moderately enhance strength and physiological function, particularly when timed appropriately in the athletic season.

II. METHODOLOGY

The present investigation delves into the progressive, fluctuated, and regressive training protocols on physical performance variables among college -level male hockey players. The study focused on 60 male hockey students drawn from various colleges in the Salem district of Tamil Nadu, aged between 17 to 25 years. These participants were randomly assigned to three groups: Experimental Group I (progressive training group) Experimental Group II (fluctuated Training), Experimental Group II (regressive training group) and a Control Group.

PRELIMINARY MEETING

To ensure the full cooperation of the subjects, a meeting was conducted wherein the purpose and objectives of the research were comprehensively explained. This communication aimed to eliminate any ambiguity and uncertainties among the players regarding the effort required for the successful completion of the study.

TRAINING INTERVENTION

The intervention period spanned eight weeks for both Experimental Group I, Experimental II and Experimental Group III. Each group underwent a structured training program designed to target specific components of physical fitness:

TRAINING PROCEDURE

Experimental Group I participated in progressive training, Experimental Group II underwent , fluctuated training, experimental group III underwent regressive and the control group did not undergo any specific training program. Both experimental treatments, namely progressive, fluctuated and regressive training, were administered over a period of eight weeks. The training sessions occurred three times a week on alternate days, with each session lasting for 60 minutes.

STATISTICAL TECHNIQUE

The data collected from both groups before and after the experimental treatments, focusing on selected variables such as agility underwent statistical analysis utilizing the technique of Analysis of Covariance (ANCOVA). In cases where the 'F' ratio for adjusted post-test means showed significance, Scheffe's post hoc test was employed to ascertain the significance of differences among paired means. A confidence level of 0.05 was established for all analyses to test the hypotheses.

III. RESULTS AND ANALYSIS

The examination of the impact of independent variables on each criterion variable is detailed below. The study's duration was confined to eight weeks, focusing on physical performance variables of agility as the chosen dependent variables. Prior to and immediately after the experimental period, all subjects underwent testing on these selected dependent variables. The data collected from the experimental groups before and after the intervention were subjected to statistical organization utilizing the dependent 't'-test and Analysis of Covariance (ANCOVA). In instances where the 'F' ratio for adjusted post-test means demonstrated notable performance distinctions, the Scheffe's Post hoc test was

conducted to identify significant differences among paired means. A confidence level of 0.05 was established for all analyses.

ANALYSIS OF COVARIANCE AMONG PROGRESSIVE TRAINING GROUP I, FLUCTUATED TRAINING GROUP II, REGRESSIVE TRAINING GROUP III AND CONTROL GROUP ON AGILITY

	Progressive training group	Fluctuated training group	Regressive training group	Control group	Source of Variance	Sum of square	Degrees of freedom	Mean square	F-value
Pre test mean	0.167	0.166	0.167	0.166	Between	0.000	3	0.000	1.08
					Within	0.000	56	0.000	
Post test mean	0.152	0.156	0.146	0.166	Between	0.003	2	0.01	3.07*
					Within	0.019	56	0.000	
Adjusted post mean	0.152	0.158	0.145	0.168	Between	0.004	3	0.002	4.42*
					Within	0.017	55	0.001	

*Significant at 0.05 level of confidence

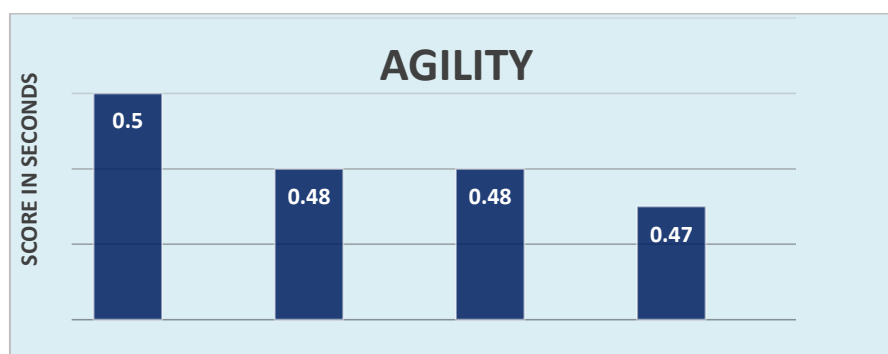
The descriptive statistics for the pre-test, post-test, and adjusted post-test scores on the selected dependent variable were analyzed across four groups: Interval Training Group, Plyometric Training Group, Circuit Training Group, and Control Group. The pre-test mean scores for the groups were closely aligned, with Interval (0.167), Plyometric (0.166), Circuit (0.167), and Control (0.166), indicating that the participants began the intervention at similar baseline levels. The Analysis of Variance (ANOVA) for the pre-test scores revealed no significant difference among the groups ($F = 1.08$, $p > 0.05$), confirming group homogeneity at baseline.

In the post-test analysis, the mean scores showed noticeable differences, with Interval (0.152), Plyometric (0.156), Circuit (0.146), and Control (0.166). The between-group variance was statistically significant ($F = 3.07$, $p < 0.05$), suggesting differential effects of the training interventions.

To account for initial differences, an ANCOVA was conducted using the pre-test scores as covariates. The adjusted post-test means were: Interval (0.152), Plyometric (0.158), Circuit (0.145), and Control (0.168). The analysis of covariance revealed a statistically significant difference among the adjusted means ($F = 4.42$, $p < 0.05$), indicating that the training interventions had a meaningful impact on the dependent variable.

These results suggest that the type of training significantly influenced performance outcomes, with the Circuit Training Group showing the most improvement, while the Control Group exhibited minimal or no change.

FIGURE
BAR DIAGRAM ADJUSTED POST TEST MEAN VALUES OF PROGRESSIVE TRAINING GROUP I, FLUCTUATED TRAINING GROUP II, REGRESSIVE TRAINING GROUP AND CONTROL GROUP ON AGILITY



IV. CONCLUSION

The findings of the study showed that there was a statistically significant improvement in the physical fitness variable of agility as compared to control group.

1. The results of the study shows that the experimental group-II that had undergone fluctuated training group, improved physical performance variables in agility of hockey players.
2. The results of the study shows that the experimental group-II that had undergone fluctuated training group better than progressive training group improved by physical performance variables in agility of college hockey players.

V. RECOMMENDATIONS

It is recommended that coaches and physical educators in the game of hockey should give due to include fluctuated training in their training schedules.

In the physical exercise, while designing the training programme the effect of varied training modalities is explained on positively on physical fitness variables of hockey players, the physical education teachers and coaches can prefer this type of training so as to achieve aim in time.

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