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Effects of PNF stretching and own body exercises on selected muscular endurance and resting pulse rate variables among softball players

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Abstract

The study was formulated as a true random group design consisting of a pre-test and posttest. The subjects (N=60) were randomly assigned to three equal groups of twenty. The selected subjects were divided into three groups randomly. Experimental Group I was considered as PNF stretching exercises group, experimental group II was considered as own body exercises group and control group was not involved in any special treatment. Pre-test was conducted for experimental Groups I and II and the control group on all the variables selected for the study, namely, muscular endurance, resting pulse rate. Experimental groups underwent the respective training for 12 weeks. Immediately after the completion of 12 weeks training, all the subjects were measured of their post test scores on the selected criterion variables. The differences between the initial and final scores were considered the effect of respective treatments. To find out statistical significance of the results obtained, the data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the significance of the study.

Keywords: PNF stretching exercises, own body exercises

Introduction

Sports have a very important role in modern society. It is important for an individual, a group, a nation and indeed the world. Sports performance is the result and expression of the total personality of a sports man. The development of a sports man enabling him to achieve high level of performance is usually concerned in four areas namely physical power, social adjustment, psychological development and physiological efficiency. Different activities make different demands on the organism with respect to circulatory, respiratory, metabolic and neurological and temperature regulating functions (Anaheim, 1987) [8].

Sports is an institutionalized competitive activity that involves physical exertion or the use of relative complex physical skills by individuals whose participation is motivated by a combination of the intrinsic satisfaction associated with the activity itself and the external rewards earned through participation. (Anaheim, 1987) [8].

History of Sport

The development of sports throughout history teaches us a great deal about social changes, and about the nature of sport itself. There are many modern discoveries in France, Africa and Australia of cave art for example, lascaux from prehistory which provides evidence of ritual ceremonial behaviour. Some of these sources date from over 30,000 years ago, as established by carbon dating. Although there is scant direct evidence of sport from this source, it is reasonable to extrapolate that there was some activity at these times resembling sport (Fish et.al. 2003).

Definition of Sports

A particular form of activity involving physical exertion and skill that is governed by a set of rules or customs and often undertaken competitively (Anaheim, 1987) [8].

Sports, athletic games or tests of skill undertaken primarily for the diversion of those who take part or those who observe them. The range is great; usually, however, the term is restricted to any play, pastime, exercise, game or contest performed under given rules, indoors or outdoors, on an individual or a team basis, with or without competition, but requiring skill and some form of physical exertion.

Objevties of the Study

Thus, the objectives of the study were:

- To formulate suitable PNF stretching and own body exercises for the benefit of softball players.
- To determine the biomotor abilities such as muscular endurance, cardio respiratory variables such as, resting pulse rate.
- To find out the effect of PNF stretching and own body exercises on selected biomotor abilities and cardio respiratory variables on softball players.
- To find out the differences if any existed between PNF stretching exercises and own body exercises in altering selected biomotor and cardio respiratory variables of softball players.

Statement of the Problem

The purpose of the study would be to find out the effects of PNF stretching and own body exercises on selected muscular endurance, and resting pulse rate variables among softball players.

Hypothesis

For the purpose of this research, the following would be hypothesized.

- The PNF stretching and own body exercises would significantly alter bio motor abilities, such as muscular

endurance compared to control group.
- The PNF stretching and own body exercises would significantly alter cardio respiratory fitness abilities, such as, resting pulse rate consumption compared to control group.
- There would be no significant differences between PNF stretching and own body exercises on selected biomotor abilities and cardiorespiratory fitness variables among softball players.

Significance of the Study

The research would be significant in the following ways:
- The research would determine the influence of PNF stretching exercises on selected bio motor abilities, such as, muscular endurance, fitness variables such as, resting pulse rate of softball players.
- The research would determine the influence of own body exercises on selected bio motor abilities, such as muscular endurance, fitness variables such as, resting pulse rate of softball players.
- The research would make a comparative study to determine the influence of two experimental treatments and high light which of the exercise protocol has more influence on selected bio motor, and cardio respiratory fitness variables of softball players.
- The research would add up existing knowledge in the field of training methods for softball players.

Limitations

Uncontrollable factors associated with the study were accepted as limitation and the following were considered as limitation of the research study:
1. Certain factors like rational habits such as life style, daily routine, diet and climatic conditions were not taken into account in the study.
2. The influence of vigorous academic activity of students could have discouraged or motivated the subjects during training and during testing period.
3. The heterogeneous characters of the subjects in hereditary and environmental factors were recognized as a limitation.
4. The subject's body type and socio economic status of the students were not taken into consideration.

Delimitations

1. Softball players at school level alone were considered for the purpose of this study.
2. Only softball players in the age group of 13 to 15 would be selected for this study.
3. The influence of experimental treatments, namely, PNF stretching and own body exercises would be compared with control group to find out the influence of specific experimental treatment for this purpose, the randomly selected 60 school boys was divided into three groups, namely, experimental group I, experimental group II and control group consisting of 20 players in each group.
4. The following dependent and independent variables were selected for this study:

Dependent Variables

Biomotor Abilities

Muscular Endurance

Cardiorespiratory Fitness

Resting pulse rate

Independent Variables

1. 12 Weeks PNF stretching
2. 12 Weeks Own Body Weight Exercises

Methodology

In this chapter, the sources and selection of the subjects, selection of variables, experimental design, pilot study, training schedule, tester competency, subject reliability, test administration and statistical analysis have been explained.

Selection of Subjects

The purpose of the study is to find out the effect of PNF stretching and own body exercises on selected biomotor abilities and cardio respiratory fitness variables of softball players. For this purpose school softball players who participated at inter-school competitions were selected. 60 inter school softball players in the age group of 13 to 15 were randomly selected as subjects for this study. The subjects were randomly divided into three groups, namely, experimental group I, experimental group II and control group consisting of 20 in each.

The subjects were oriented for the purpose of the study and all the subjects volunteered to undergo the treatments as the research would further enhance their abilities and contribute for the training methods.

Experimental Design

The study was formulated as a true random group design consisting of a pre-test and post-test. The subjects (N=60) were randomly assigned to three equal groups of twenty. The selected subjects were divided into three groups randomly. Experimental Group I was considered as PNF stretching exercises group, experimental group II was considered as own body exercises group and control group was not involved in any special treatment. Pre-test was conducted for experimental Groups I and II and the control group on all the variables selected for the study, namely, muscular endurance, resting pulse rate. Experimental groups underwent the respective training for 12 weeks. Immediately after the completion of 12 weeks training, all the subjects were measured of their post test scores on the selected criterion variables. The differences between the initial and final scores were considered the effect of respective treatments. To find out statistical significance of the results obtained, the data were subjected to statistical treatment using ANCOVA. In all cases 0.05 level was fixed to test the significance of the study.

Criterion Measures

The tests used to assess the selected biomotor abilities, cardio respiratory fitness variables and the units of measures are given in Table I.

Table 1: Tests Used To Assess the Biomotor Abilities, Cardiorespiratory Variables

S.No	Variables	Tests	Units of Measure
1	Bio Motor Abilities Muscular Endurance	Sit ups	Numbers
2	Cardiorespiratory Fitness Resting Pulse Rate	Palpation Method	Beats/min

The intraclass correlation coefficient obtained for test-retest data are presented in Table II.

Table 2: Intra Class Correlation between Test and Retest for Tester Reliability

S.No	Variables	Tests	Obtained'r' Value
1	Bio Motor Abilities Muscular Endurance	Sit ups	0.83*
2	Cardiorespiratory Fitness Resting Pulse Rate	Palpation Method	0.83*

Required table value at 0.01 with 8 degrees of freedom 0.811 * Significant at 0.01 level

Muscular Endurance (Sit UPS Test)

Purpose

The purpose of the test was to measure the abdominal strength of the subjects.

Test Administration

The starting position of the test was a back lying position with knees flexed, feet on floor and heels between one foot from the buttocks. The hands are positioned behind the neck and fingers are clasped. A partner held the examinee's feet to keep him in contact with the testing surface. The examinee curled to a sitting position, touching the elbows to the opposite knee. The examinee curled back down to the floor until the mid-back contacted the testing surface another sit-up was then attempted.

Scoring

One point was scored for each correct sit-up. The score was the maximum of sit-ups completed in 60 seconds.

Resting Pulse Rate

The purpose of this test was to record the number of heart eat per minute. Resting pulse rate was measured by using the procedure prescribed below:

Equipment: A stop watch (1/100 of a second) and a chair.

Procedure

The Resting Pulse rate of all the subjects was recorded in sitting position in the morning session. Before taking the Resting Pulse rate, the subjects were asked to sit in a chair inside a room and release for 20 minutes. To record the heart rate, finger tips were placed on the radial artery at the subject's wrist in such a manner that palpation was clear and the number of palpation was counted for one minute.

Score

The number of beats per minute was recorded as score of the subjects.

Statistical Technique

The data obtained were analyzed by analysis of variance (ANOVA) and analysis of covariance (ANCOVA). The analysis of variance was used to assess the significance of difference between the pre-test and post-test, for each of the variables on the PNF stretching and own body exercises groups separately.

Analysis of covariance (ANCOVA) was computed for any number of experimental groups, the final means were adjusted for differences in the means were tested for significance. The analysis of variance was first computed to find out the difference between the initial and final means. The Analysis of Covariance was computed from the same population and is devoid of sampling bias. The obtained 'F' ratio compared with critical F value for significance, will provide confidence that the critical samples came from the same population and are devoid of sampling bias.

When the F ratio was found to be significant, Scheffe's post hoc test was used to find out the paired mean significant difference. (1998).

Scheffe post hoc test has the greatest power and is the most conservation with respect to Type 1 error: this method loads to the smallest number of significance differences. The difference between two means would be significant if it exceed Scheffe F. In order to be significant, F' must equal $(k - 1)$ $(F_{.05}$ or $F_{.01})$. Thus, the necessary F' ratios for the difference between paired adjusted mean (k-1) would be computed and compared for significance.

Results and Discussions

Results on Muscular Endurance

The statistical analysis comparing the initial and final means of Muscular Endurance due to PNF stretching exercises and own body weight exercises among softball players is presented in Table III

Table 3: Ancova Results on Effect of PNF Stretching Exercises and Own Body Weight Exercises Compared with Controls on Muscular Endurance

	PNF stretching	Own Body Weight Exercises	Control Group	Source of Variance	Sum of Squares	DF	Mean Squares	Obtaine df
Pre Test Mean	42.20	41.45	41.30	Between	9.30	2	4.65	0.34
				Within	782.35	57	13.73	
Post Test Mean	45.00	45.85	41.50	Between	212.63	2	106.32	7.49*
				Within	809.55	57	14.20	
Adjusted Post Test Mean	44.50	46.03	41.82	Between	181.62	2	90.81	32.71*
				Within	155.46	56	2.78	
Mean Diff	2.80	4.40	0.20					

\Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.16, 2 and 56 (df) =3.16.
*Significant

As shown in Table III, the obtained pretest means on Muscular Endurance on PNF stretching exercises group was 42.20, Own body weight exercises group was 41.45 was and control group was 41.30. The obtained pretest F value was 0.34 and the required table F value was 3.16, which proved that there was no significant difference among initial scores

of the subjects.

The obtained posttest means on Muscular Endurance on PNF stretching exercises group was 45.00, Own body weight exercises group was 45.85 was and control group was 41.50. The obtained posttest F value was 7.49 and the required table F value was 3.16, which proved that there was significant difference among post test scores of the subjects. Taking into consideration of the pretest means and posttest means adjusted posttest means were determined and analysis of covariance was done and the obtained F value 32.71 was greater than the required value of 3.16 and hence it was accepted that there was significant differences among the treated groups.

Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table IV.

Table 4: Multiple Comparisons of Paired Adjusted Means and Scheffe's Confidence Interval Test Results on Muscular Endurance

MEANS				Required . C I
PNF stretching exercises Group	Own body weight exercises Group	Control Group	Mean Difference	
44.50	46.03		-1.54*	1.31
44.50		41.82	2.68*	1.31
	46.03	41.82	4.21*	1.31

***** Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between PNF stretching exercises group and control group (MD: 2.68). There was significant difference between Own body weight exercises group and control group (MD: 4.21). There was significant difference between treatment groups, namely, PNF stretching exercises group and Own body weight exercises group. (MD: -1.54).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure I.

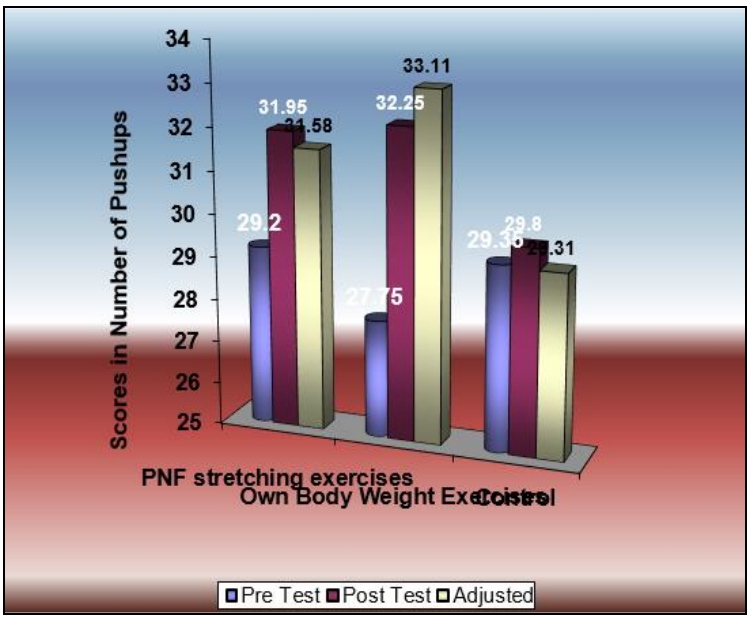

Fig 1: Bar Diagram Showing Pre Test, Post Test and Ordered Adjusted Means on Muscular Endurance

Discussions on Findings on Muscular Endurance

This study was to find out the effect of PNF stretching exercises and own body weight exercises on selected biomotor abilities and cardiorespiratory fitness of softball players. The results in table IV shows the effects of PNF stretching exercises and own body weight exercises on biomotor ability, Muscular Endurance. The obtained pre and posttest means were subjected to ANCOVA and post hoc analysis through Scheffe's confidence interval test.

The effect of PNF stretching exercises training and own body weight exercises on Muscular Endurance is presented in Table IV. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 32.71 was greater than the required table F value to be significant at 0.05 level. Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table IV proved that there was significant difference between PNF stretching exercises training group and control group (MD: 2.68) and Own body weight exercises group and control group (MD: 4.21). Comparing between the treatments groups, it was found that there was significant difference between PNF stretching exercises training and own body weight exercises group among softball players. Thus, it was found that Own body weight exercises was significantly better than PNF stretching exercises and control group in improving Muscular Endurance of the softball players.

Results on Resting Pulse Rate

The statistical analysis comparing the initial and final means of Resting Pulse Rate due to PNF stretching exercises and own body weight exercises among softball players is presented in Table V:

Table 5: Ancova Results On Effect of Pnf Stretching Exercises and Own Body Weight Exercises Compared With Controls on Resting Pulse Rate

	PNF stretching	own body weight exercises	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	72.15	73.05	73.20	Between	12.90	2	6.45	1.74
				Within	210.70	57	3.70	
Post Test Mean	70.85	69.95	73.00	Between	98.23	2	49.12	10.47*
				Within	267.50	57	4.69	
Adjusted Post Test Mean	70.91	69.93	72.96	Between	95.50	2	47.75	10.06*
				Within	265.88	56	4.75	
Mean Diff	-1.30	-3.10	-0.20					

Table F-ratio at 0.05 level of confidence for 2 and 57 (df) =3.16, 2 and 56 (df) =3.16.*Significant

As shown in Table V, the obtained pretest means on Resting Pulse Rate on PNF stretching exercises group was 72.15, Own body weight exercises group was 73.05 was and control group was 73.20. The obtained pretest F value was 1.74 and the required table F value was 3.16, which proved that there was no significant difference among initial scores of the subjects.

The obtained posttest means on Resting Pulse Rate on PNF stretching exercises group was 70.85, Own body weight exercises group was 69.95 was and control group was 73.00. The obtained posttest F value was 10.47 and the required table F value was 3.16, which proved that there was significant difference among post test scores of the subjects. Taking into consideration of the pretest means and posttest means adjusted posttest means were determined and analysis of covariance was done and the obtained F value 10.06 was greater than the required value of 3.16 and hence it was accepted that there was significant differences among the treated groups. Since significant differences were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table VI.

Table 6: Multiple Comparisons of Paired Adjusted Means and Scheffe's Confidence Interval Test Results on Resting Pulse Rate

MEANS				Required. CI
PNF stretching exercises Group	Own body weight exercises Group	Control Group	Mean Difference	
70.91	69.93		0.98	1.72
70.91		72.96	-2.06*	1.72
	69.93	72.96	-3.04*	1.72

***** Significant

The post hoc analysis of obtained ordered adjusted means proved that there was significant differences existed between PNF stretching exercises group and control group (MD: -2.06). There was significant difference between Own body weight exercises group and control group (MD: -3.04). There was no significant difference between treatment groups, namely, PNF stretching exercises group and own body weight exercises group. (MD: 0.98).

The ordered adjusted means were presented through bar diagram for better understanding of the results of this study in Figure II.

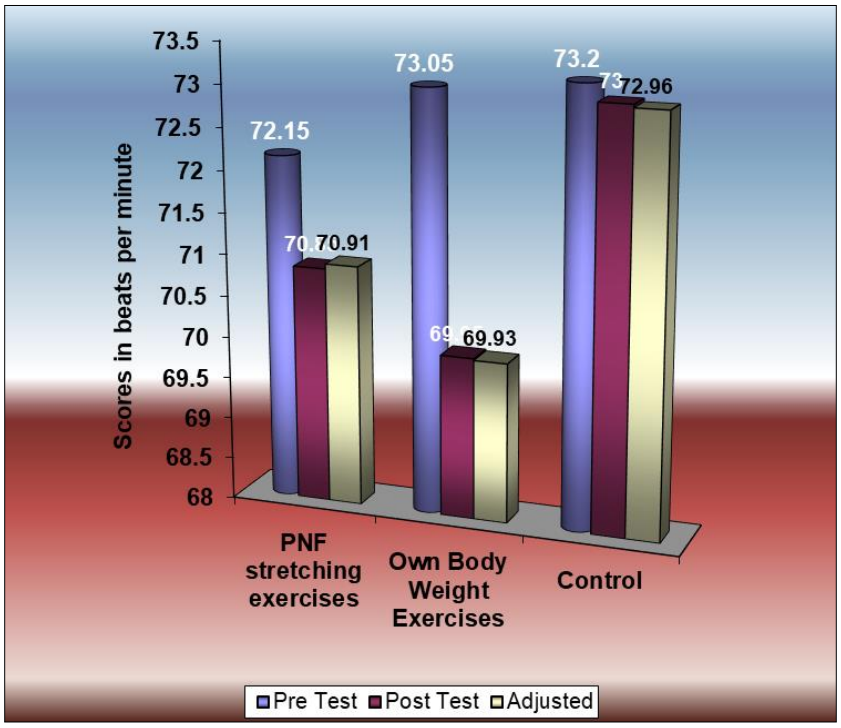

Fig 2: Bar Diagram Showing Pre Test, Post Test and Ordered Adjusted Means on Resting Pulse Rate

Discussions on Findings on Resting Pulse Rate

This study was to find out the effect of PNF stretching exercises and own body weight exercises on selected biomotor abilities and cardiorespiratory fitness of softball players. The results in tableVI shows the effects of PNF stretching exercises and own body weight exercises on biomotor ability, Resting Pulse Rate. The obtained pre and posttest means were subjected to ANCOVA and post hoc analysis through Scheffe's confidence interval test.

The effect of PNF stretching exercises training and Own body weight exercises on Resting Pulse Rate is presented in Table VI. The analysis of covariance proved that there was significant difference between the experimental group and control group as the obtained F value 10.06 was greater than the required table F value to be significant at 0.05 level.

Since significant F value was obtained, the results were further subjected to post hoc analysis and the results presented in Table VI proved that there was significant difference between PNF stretching exercises training group and control group (MD: -2.06) and Own body weight exercises group and control group (MD: -3.04). Comparing between the treatments groups, it was found that there was no significant difference between PNF stretching exercises training and own body weight exercises group among softball players.

Thus, it was found that PNF stretching and Own body weight exercises was significantly better than control group in improving Resting Pulse Rate of the softball players.

Conclusions

Within the limitations and delimitations of the study, the following conclusions were drawn.

- It was concluded that biomotor ability, such as, muscular endurance can be improved through PNF stretching and own body exercises compared to control group. It was also found that own body exercises was better than PNF stretching in improving muscular endurance of the softball players.
- It was concluded that cardio respiratory fitness, such as, resting pulse rate can be improved through PNF stretching and own body exercises compared to control group. It was also found that there was no significant difference in improving resting pulse rate between treatment groups.

Recommendations

The findings of this study proved that PNF stretching and own body exercises can beneficially alter selected biomotor abilities and cardio respiratory fitness variables of softball players. In view of these findngs, the following were recommended.

- Efforts may be taken by coaches, sports scientists and educational authorities to include the suggested PNF stretching and Own Body exercise schedules for softball players.
- In the light of the findings of the study, adequate short term PNF stretching may be provided to athletes before their competitions for better competition preparations.
- In the light of the findings of the study, efforts may be taken to provide long term Own Body Exercises as the same makes the players to participate in the programme more interestingly.
- Advantages of PNF stretching and Own Body Exercises may be popularized among softball players and athletes for their all-round development of bio motor and cardio respiratory fitness.

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