



Comparative Effect of Isotonic and Isokinetic Exercise on Strength of Pectoralis Major Muscle in Handball Players

Shailesh Kumar Singh*, Prabal Pratap Singh, Abhishek

¹ Assistant Professor, Lakshmibai National Institute of Physical Education, NERC Guwahati (Assam) 781005.

E-mail id: shaileshpro19@gmail.com

ABSTRACT

The purpose of this study was to investigate effect of isotonic and isokinetic exercise on Strength of Pectoralis Major Muscle. For the study 30 male university level handball players will be randomly selected from students of LNIPE, NERC Guwahati. The participants goes under six weeks of isotonic and isokinetic exercises training and no training will be given to control group. The Humac Norm Isokinetic Dynamometry was used for collecting the pre and post data with testing protocol at angular velocity was set on 180°/sec and for training protocol it is set at angular velocity was set on 240°/sec. The variables selected for this study were isokinetic and isotonic exercise as independent variables and strength as dependent variable further statistically tested on SPSS, descriptive statistics and one way analysis of covariance (ANCOVA) was used to measure the differences. The research objective investigated the extent to which training method and implementation principles and concept of different types of training (Isokinetic and Isotonic) are used to identify its impact on selected variables of strength. The findings of the study clearly indicate that there was significant effect of variation of training on strength of Pectoralis Major Muscle. After six weeks training programed the strength was increase in both the protocol but whereas the strength of Isokinetic training increase was more as compare to isotonic group. And there was no significance improves in control group because the group are basically doing the regular activity.

KEYWORDS: Isotonic, Isokinetic, Dynamometry, Handball, Strength, Pectoralis Major Muscle.

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INTRODUCTION

Strength is the most crucial motor ability in sports since it is a direct result of muscular contraction.

Several prior research have proven the varied benefits of resistance training; overload stress after resistance training apparently enhances muscular strength and the cross-sectional area of muscle fibers, as well as improving muscle function [1].

Muscle contraction is the source of all movement in sports. Strength training is often done to improve overall health and physique. Muscle strength increases in response to resistance training [2], which is influenced by changes in nerve effectiveness [3], [4], [5], [6].

Handball is a team sport that requires muscular strength, power, speed, and endurance. Throwing, diving, blocking, and ball handling are all physical talents of handball players. Seasonal differences in physical attributes, throwing velocity, and strength training have been the focus of handball study. Although athletic abilities do not necessitate continuous angular velocity muscle contractions (isokinetic strength has been measured in a variety of sports, not just for injury research), it has been used to assess muscular torque in relation to training and performance in basketball and soccer.

Isotonic exercise is characterized by continual tension, where iso means constant and tonic means tension. Isotonic contraction refers to a muscular contraction in which the movement of an item is observable. As a result, during isotonic contraction, the muscle length changes and outside movement is observable. Isotonic movement involves muscular contraction and shortening and can increase performance in a variety of sports and daily activities. Isotonic exercise promotes the growth of muscular endurance, tone, and strength.

Isokinetic strength training is a sort of strength training. It employs specialized workout machines that create a consistent pace regardless of how much effort you exert. These devices regulate the speed of an exercise by varying the resistance throughout your range of motion. Isokinetic training may be used to assess and increase your muscle strength and endurance. Isokinetic exercise is defined as movement that occurs at a constant pace independent of the force applied. Isokinetic contraction causes muscles to

contract and shorten at a consistent rate. Isokinetic training enables muscles to acquire strength uniformly across the range of motion. Isokinetic training has been shown to increase muscle strength, lean body mass, and body fat.

MATERIAL AND METHODS

For the purpose of the study subjects, 30 university level handball players will be randomly selected from Students of LNIPE, NERC Guwahati. For experimenting on strength of Pectoralis major muscles from Isotonic and Isokinetic exercises, three groups i.e. one experimental group for Isotonic, one experimental group for Isokinetic and one control group will be formed. Each group will contain 10 samples. Control group in the experimentation will take all their daily life style activities as usual while experimental group will additionally go for Isotonic and Isokinetic exercises.

On the basis of literature available in different libraries, handball coach & opinion of physical education scientists as well as personal experience of scholar, the following variable has been selected for the study. Strength of Pectoralis major muscle

| S. NO. | ITEM | EQUIPMENT | UNIT |
|--------|-------------------------------------|-----------------------------------|------|
| 1 | Strength of Pectoralis major muscle | HUMAC NORM ISOKINETIC DYNAMOMETRY | Nm |

DESIGN OF STUDY

The present study was experimental in nature. Keeping in mind of the nature of the research problem the researcher carried out the present investigation on the lines of Pretest – Posttest Randomized group design. The layout of this design as follows:

| | | | |
|----------------|----------------|----------------|----------------|
| O ₁ | T ₁ | O ₂ | G ₁ |
| O ₃ | T ₂ | O ₄ | G ₂ |
| O ₅ | - | O ₆ | G ₃ |

There were three groups of which G1 and G2 were Experimental Groups and G3 was control group. This design determined the amount of change in Experimental groups produced by treatment. Random sampling technique was used for selecting sample for this study and randomized group design was adopted to divide all the subject into three groups' i.e. Isokinetic training group (G1) Isotonic training group (G2) and control group (G3). The subjects were randomly selected from Lakshmibai National Institute of Physical Education, NERC, Guwahati. First experimental group was perform the shoulder abduction and adduction at training protocol of 240°/sec angular velocity and second experimental group was Isotonic training exercise i.e. Dumbbell fly (3 days in a week). Whereas no training was given to control group apart from their daily schedule for six weeks. Members of the experimental group exercise their Pectoralis major muscle up to six weeks duration under the proper supervision and guidance of the research scholar.

Training schedule for Quadriceps muscle

| Days | Group | Training protocol | No. of sets | No. of repetition |
|-----------|-----------------------|---|-------------|-------------------|
| Monday | Isokinetic Group | Isokinetic shoulder abduction and adduction | 5 | 30 |
| Tuesday | Isotonic Group | Dumbbell fly | | |
| Wednesday | Isokinetic Group | Isokinetic shoulder abduction and adduction | | |
| Thursday | Isotonic Group | Dumbbell fly | | |
| Friday | Isokinetic Group | Isokinetic shoulder abduction and adduction | | |
| Saturday | Isotonic Group | Dumbbell fly | | |
| Sunday | No training on Sunday | | | |

TESTING PROTOCOL

The Isokinetic Training protocol was 180°/sec angular velocity used for collection of pre and post data of strength of Pectoralis major muscle of all subjects. The HUMAC NORM ISOKINETIC DYNOMOMETRY was used for collecting the pre and post data. The detail of the testing protocol was:

- Angular velocity was set on 180°/sec
- Pectoralis major muscle was tested.
- Isokinetic shoulder abduction and adduction were used.
- Four trials were given before the test.

- 10 sec was given to each subject after trial.
- All subjects performed 10 Isokinetic shoulder abduction and adduction at 180°/sec
- Value of torque (in N-m) was recorded for each subject as per score.

TRAINING PROTOCOL

After taking pre- data, Isokinetic shoulder abduction and adduction exercises was given to **group I** and Isotonic training i.e. Dumbbell fly exercise was given to **group II** up to six weeks. Isokinetic Group (G1) performed the exercise at training protocol of 240°/sec angular velocity whereas no training was given to control group. The training programmed will performed will be personally supervised by the research scholar throughout the 6 weeks duration.

- 3 days a week training session for each group.
- Total training programme were of 6 weeks duration.
- For Isokinetic group was performed 5 set of Isokinetic shoulder abduction and adduction exercise.
- For Isotonic training group 5 set Dumbbell fly exercise.
- For Isokinetic and Isotonic group set was consisting of 30 repetitions.
- 10 sec recovery time will be given in between two successive sets.

RESULTS

In this chapter the Statistical Technique used for analyzing the data has been given. The present part is devoted to the presentation of Results their interpretation and Discussion of findings in separate captions to follow.

COMPARISON OF ADJUSTED MEAN SCORES OF STRENGTH OF PECTORALIS MUSCLE OF ISOKINETIC GROUP, ISOTONIC GROUP AND CONTROL GROUPS BY CONSIDERING PRE- STRENGTH OF PECTORALIS MUSCLE AS COVARIATE

The objective of the study was to compare adjusted mean scores of Strength of Pectoralis Major Muscle of Isokinetic Group, Isotonic Group and Control Groups by considering Pre- Strength of Pectoralis Major Muscle as covariate. The data was analyzed for Strength of Pectoralis Major Muscle with the help of One Way ANCOVA by considering Pre-Strength of Pectoralis Major Muscle as covariate and the results are given in difference captions to follow.

Comparison of adjusted mean scores of Strength of Pectoralis muscle of Isokinetic group, Isotonic group and control groups by considering pre- Strength of pectoralis Major Muscle as covariate

Isokinetic shoulder abduction and shoulder adduction was used for to measure Strength of pectoralis major muscle. Thus the data related to comparison of adjusted mean scores of Strength of Pectoralis major muscle of Isokinetic Group, Isotonic Group and Control Groups by considering Pre- Strength of Pectoralis muscle as covariate was analyzed by one way analysis of covariance (ANCOVA) and the results are given in Table 1.

Table 1: Summary of One Way ANCOVA of Strength of Pectoralis muscle by taking Pre- Strength of Pectoralis muscle of subjects as covariate

| Source | df | SS _{y,x} | MSS _{y,x} | F _{y,x} -Value | Significant Effect | Variance Level size |
|-----------------|----|-------------------|--------------------|-------------------------|--------------------|---------------------|
| Training Groups | 2 | 6153.313 | 3076.656 | 5.793 | p<0.05 | .308 |
| Error | 26 | 13809.327 | 531.128 | | | |
| Total | 30 | 92752.00 | | | | |

*Significant at 0.05 level

From the Table 1, it is evident that the adjusted F-value of Strength of pectoralis major muscle is 5.793 which is significant at 0.05 level with df =2, 26. It revealed that the adjusted mean scores of Strength of Pectoralis major muscle of subjects belonging to Isokinetic Group, Isotonic Group and Control Groups differ significantly when Pre - Strength of Pectoralis major Muscle was taken as covariate. 30.8% change of Strength of pectoralis major muscle can be attributed to Isokinetic Group, Isotonic Group and Control Groups. Thus the null hypothesis there is no significant difference in adjusted mean scores of Strength of pectoralis major muscle of Isokinetic Group, Isotonic Group and Control Groups by taking their Pre - Strength of pectoralis major muscle was taken as covariate is rejected. In order to know which group's adjusted mean score of Strength of Pectoralis major Muscle is significantly different, the data were further analyses with the help of Least Significant Difference Test (LSD) and the results are given in Table 2.

Table 2: Group-wise adjusted mean, SE and significance of difference between adjusted means scores of Strength of Pectoralis muscle of subjects

| Groups | Adjusted Mean | SE | Isotonic Group | Control Group |
|------------------|---------------|-------|----------------|---------------|
| Isokinetic Group | 61.719 | 7.302 | 11.005* | 34.353* |
| Isotonic Group | 50.714 | 7.325 | | 23.347* |
| Control Group | 27.367 | 7.385 | | |

*Significant at 0.05 level

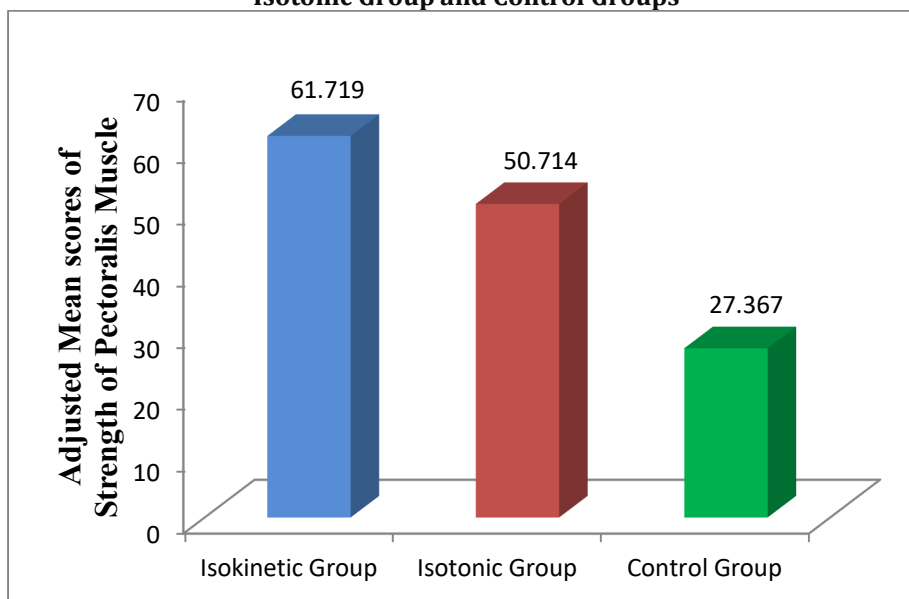
From Table 2, it can be seen that the adjusted mean scores of Strengths of Pectoralis major Muscle of Isokinetic Group and Isotonic Group differ significantly at 0.05 level. Further the adjusted mean score of Strength of Pectoralis major Muscle of Isokinetic Group is 61.719 which is significantly higher than that of Isotonic Group whose adjusted mean score of Strength of Pectoralis major Muscle is 50.714. It may, therefore, be said that subjects of Isokinetic Group were found to have higher Strength as compared to those of Isotonic Group. The same can also be seen from Bardigram Figure 3.1

Also the adjusted mean scores of Strengths of Pectoralis major Muscle of Isokinetic Group and Control Group differ significantly at 0.05 level (Vide Table 2). Further the adjusted mean score of Strength of Pectoralis major Muscle of Isokinetic Group is 61.719 which is significantly higher than that of Control Group whose adjusted mean score of Strength of Pectoralis major Muscle is 27.367. It may, therefore, be said that subjects of Isokinetic Group were found to have significantly higher Strength of Pectoralis major Muscle as compared of Control Group.

Lastly the adjusted mean scores of Strengths of Pectoralis major Muscle of Isotonic Group and Control Group differ significantly at 0.05 level (Vide Table 2). Further the adjusted mean score of Strength of Pectoralis major Muscle of Isotonic Group is 50.714 which is significantly higher than those of Control Group whose adjusted mean score of Strength of Pectoralis major Muscle is 27.367. It may, therefore, be said that subjects of Isotonic Group were found to have significantly higher Strength of Pectoralis major Muscle as compared of Control Group.

On the whole it may be said that Subjects of Isokinetic Group were found to have significantly higher Strength of Pectoralis major Muscle as compared to their counter parts of Isotonic Group and Control Group. Also the Strength of Pectoralis major Muscle of subjects of Isotonic Group was found to be significantly higher than those of Control Group. The same can also be seen from Bardigram Figure 1

Figure 1: Adjusted mean scores of Strength of Pectoralis major Muscle of Isokinetic Group, Isotonic Group and Control Groups



DISCUSSION

In our study, after six weeks of training, both the isokinetic and isotonic groups' strength increased, but the isokinetic group's strength increased more than the isotonic group's. This occurred because, in isotonic contractions, the load is constant but the velocity varies, whereas in isokinetic contractions, the velocity is constant but the load varies. Isokinetic and isotonic contractions are both dynamic. So muscle length varies in each of these contractions, despite the fact that isotonic and isokinetic contractions have different biomechanical properties, they both burden the neuromuscular system. The quantity and frequency of motor units increased following both isotonic and isokinetic strength training, suggesting that isokinetic strength may have improved due to neuromuscular system stress and the dynamic character of isotonic training.

It indicates that Isokinetic training programed has a greater effect than isotonic training programed because Isokinetic training programed controls the tempo of an activity by altering resistance throughout the range of motion while speed remains constant.

[7] Quadriceps strength improved considerably over time in all three therapies (isotonic training, isokinetic training, and isometric training). When isokinetic testing was performed, the Isokinetic training group showed the greatest improvement. And, of the isotonic and isometric training groups, the isotonic training group improved much more. [8] Assess the effects of two distinct training protocols: isokinetic and isotonic training. The initial strength balance in both groups improved dramatically once the treatments were applied. This condition improved more in the Isokinetic group than in the isotonic group.

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