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# EFFECTS OF PLYOMETRIC TRAINING AND RESISTANCE TRAINNG ON AGILITY OF TENNIS PLAYERS

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**ABSTRACT :-**

*The purpose of the study was to find out the effects of Plyometric Training and Resistance Training on Agility of Tennis Players. For the purpose of the study 60 male Tennis players of Gwalior, who had participated in various tournaments in Tennis at the national, inter-varsity, or state level were selected. Their age ranged from 18-23 years. Agility was selected as a dependent variable and plyometric training and resistance Training was considered as Independent Variables. For the study pre test-post test randomized group design comprising of two experimental groups (n=20 in each group) namely plyometric training group (PT) and resistance training group (RT) and one active control group (n=20) were adopted. To test the Agility of Tennis players, Illinois Agility Test was used. To compare the effects of plyometric training and resistance training on agility of Tennis players, Analysis of co-variance (ANCOVA) was used. The level of significance was set at 0.05. The result reveals that there was significant effect of the plyometric training programme on agility of Tennis players but no significant effect was found by resistance training programme. Based on the findings and within the limitation of the study it was noticed that plyometric training help to improve agility of Tennis players since the agility performance of the subjects of experimental groups were found statistically significant.*

**KEYWORDS :** *Plyometric training, Resistance training, Agility.*

## INTRODUCTION:-

To improve and refine a player's Tennis skills which are crucial for enhancing the quality of play, it is essential to improve the athletic skills that allow him to elevate his play to a higher level. Athletic skills include variables such as speed, power, endurance, agility, coordination, balance and reaction time that contribute to the total development of the player. The level at which Tennis skills are performed is directly related to the level of the athlete's total conditioning (Brittenham G., 1996). Plyometric is a rapid pre

stretching of a muscle during an eccentric action, followed immediately by a concentric action of same muscle and connective tissue. This system involves stretch-shortening cycle of the muscle. It is a form of exercise which links strength with speed of movement. Plyometric or reactive jumps are known to be effective for development of explosive strength. Resistance training involves exercise programme that causes the muscles to contract against an external resistance with the expectation of increasing strength, tone, mass, and endurance. Agility is now considered a multidimensional component that involves balance, coordination, speed, reflexes, strength, endurance, acceleration ability and deceleration ability. Agility is the ability to change the body's position, and requires a combination of balance, coordination, speed, reflexes, and strength. Agility is usually achieved when a person is using his ATP-PC or lactic acid (anaerobic) systems. It is described in terms of response to an opposing player, moving target, as seen in field sports and racket sports. It is a rapid whole body movement with change of velocity or direction in response to a stimulus. The basic need of a Tennis player in the competitive world is the ability to rapidly switch between forward, backward, lateral and vertical movements. To enhance such movement qualities in Tennis, high levels of power, strength, endurance, flexibility and agility are required to achieve the goal. Undoubtedly, such components are inter-dependent and as such may be developed through common training regimen. Thus, it was thought reasonable to investigate whether, and if so, how much plyometric training and resistance training can improve agility of Tennis players.

## METHODOLOGY

Sixty male Tennis players from Gwalior, ranging the age between 18-23 years who had participated in various Tennis tournaments at the national, inter-varsity or state level, were selected as the subjects of the study. Agility was selected as a dependent variable and plyometric training and resistance training were considered as independent variables. To test the agility, Illinois Agility Test was used and measured in seconds.

The pre test- post test randomized group design which consisted of two experimental groups (n=20 in each group) namely plyometric training group (PT) and resistance training group (RT) and one active control group (AC) was used in the study.

The treatment was administered on both the experimental groups for three days a week (45 min/day) for the period of eight weeks while the active control group underwent traditional practice of Tennis. The plyometric training group was given training using equipment like ladder, mini hurdles, cones etc. and resistance training group was given resistance exercises with the use of elastic bands, weight training equipments and partner's body weight. Before the administration of training schedule, pre test data on agility was collected from both the experimental groups and active control group. Similarly after the completion of eight weeks post training data of all the groups were collected.

To find out the effects of plyometric training and resistance training on agility of Tennis players, Analysis of Co-Variance (ANCOVA) was used. The LSD post hoc test was used to find out the paired mean difference. The level of significance was set at 0.05.

Findings: The findings pertaining to the study are presented in Tables 1 and 2.

**TABLE-1**

**Descriptive statistics and mean gains of agility of different groups of Tennis players**

| | PT | | RT | | AC | |
|---|---|---|---|---|---|---|
| | Pre Test | Post Test | Pre Test | Post Test | Post Test | Pre Test |
| M | 18.706 | 16.583 | 18.269 | 16.772 | 18.554 | 17.134 |
| SD | 0.686 | 0.437 | 0.665 | 0.557 | 0.709 | 0.875 |
| HS | 17.28 | 15.64 | 16.85 | 15.87 | 17.22 | 15.78 |
| LS | 19.78 | 17.69 | 19.32 | 17.74 | 19.84 | 19.16 |

M-mean, SD-standard deviation, HS-Highest score, LS-lowest score

Table No. 1 depicts the descriptive statistics on agility of the two experimental groups and one active control group.

**TABLE-2**

**Analysis of co-variance among the two Experimental groups and Active control group on Agility**

(in seconds)

| Mean | PT | RT | AC | Sum of Square | | Df | Mean Sum of Square | F-ratio |
|---|---|---|---|---|---|---|---|---|
| Pre Test | 18.706 | 18.269 | 18.554 | A | 1.973 | 2 | 0.986 | 2.087 |
| | | | | W | 26.937 | 57 | 0.472 | |
| Post Test | 16.583 | 16.772 | 17.134 | A | 3.129 | 2 | 1.564 | **3.700*** |
| | | | | W | 24.106 | 57 | 0.422 | |
| Adjusted Post Test | 16.514 | 16.857 | 17.118 | A | 3.627 | 2 | 1.813 | **4.979*** |
| | | | | W | 20.765 | 56 | 0.364 | |

*Significant at 0.05 level F0.05 (2, 57) =3.15, F0.05 (2, 56) =3.16

Table 2 revealed no significant difference in agility in pre test phase among PT group, RT group and AC group. The obtained 'F' value 2.087 was found lesser than the tabulated 'F' value 3.15 at 0.05 level of significant with 2, 57 degree of freedom. However, the 'F' ratio values in post test phase (3.700), and adjusted post-test phase (4.979) were found significant for being greater than the tabulated 'F' values 3.15 and 3.16 at 0.05 level of significant with 2, 57 and 2, 56 degree of freedom respectively. As in analysis of co-variance the significant improvement in agility in adjusted post-test means among PT group, RT group and AC group were found, further in order to find out the significant difference among the paired adjusted final means, the post-hoc test were computed, which is presented in table 3.

**Table-3**

**Paired means among the two experimental groups and one active control group on agility (Seconds)**

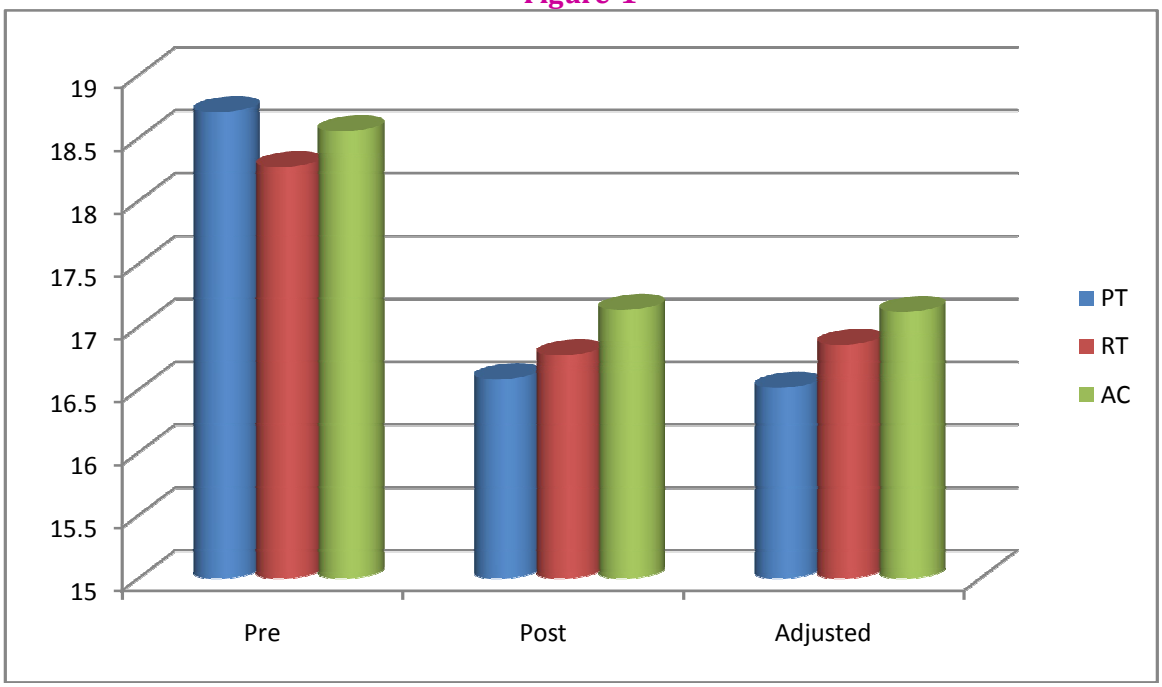
| PT | RT | AC | Mean Difference | Critical Difference |
|---|---|---|---|---|
| 16.514 | 16.857 | | 0.343 | 0.381 |
| 16.514 | | 17.118 | **0.604*** | 0.381 |
| | 16.857 | 17.118 | 0.261 | 0.381 |

*Significant at 0.05 level of confidence.

The Table 3, (post-hoc test) in respect to the paired adjusted final mean differences in agility clearly indicates significant difference between PT group and AC group (0.604), which was found greater than that of the critical value 0.381.

However, no significant difference between RT group and AC group (0.261) and PT group and RT group (0.343) were observed in the difference of mean values which were found lesser than that of the critical value (0.381).

**Figure-1**




Graphical representation of agility between pre and post test means among the three groups

## DISCUSSION ON FINDINGS

As the result reveals significant improvement in Experimental groups in comparison to the Active Control group in selected variable of agility, it may be attributed to the fact that the plyometric training and resistance training were effective in developing agility of Tennis players. However, no significant difference was noticed between two experimental groups i.e. plyometric and resistance training groups in improving agility.

The result of developing agility by plyometric exercises might be due to the fact that the phenomenon of the stretch-shortening cycle (SSC) and is especially prevalent in intermittent game like Tennis. SSC actions exploit the myotatic reflex as well as the elastic qualities of tendons and muscle, and the resulting performance is independent of maximum strength in players. Plyometric drills involved stopping, starting, and changing directions in an explosive manner. These movements were components that could assist in developing agility

Besides, the improvement of agility of Tennis players is not significant by resistance training was observed probably due to the stiffness of muscles, ligaments and tendons that may reduce its elasticity. The result is supported by the study of Faigenbaum et al (2007) who studied on the effects of a short-term plyometric and resistance training program on fitness performance in boys age 12 to 15 years and they

concluded that The plyometric training group made significantly ($p < 0.05$) greater improvements than resistance training in long jump (10.8 cm vs.2.2 cm), medicine ball toss (39.1 cm vs. 17.7 cm) and pro agility shuttle run time (-0.23 sec vs. -0.02 sec) following training.

The results showed that except for agility, both resistance training types led to change in lower-body explosive power, lower-body muscle endurance, running speed, maximum lower-body strength, and abdominal muscle endurance.

## CONCLUSIONS

Within the limitations of the study, it may reasonably be concluded that plyometric training is effective in significantly improving agility of Tennis players whereas resistance training does not significantly improve it.

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