

## EFFECTIVENESS OF TWO SHORT DURATION (4 WEEK & 6 WEEK) PLYOMETRIC TRAINING ON AGILITY PERFORMANCE IN SEMI - PROFESSIONAL FOOTBALL PLAYERS (A COMPARATIVE STUDY)

### Physiotherapy

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### ABSTRACT

**Background:** Plyometric training (PT) has been shown to improve agility among sports which require aerobic endurance. Semi-professional football players need a short-term training program which will improve their performance in competitive matches even due to time constraint or lack of professional training. The study aims to identify effectiveness of two short duration program 4 week or 6-week plyometric training on agility in semi-professional football players.

**Method:** In this comparative experimental study, 45 semi-professional football players were selected and randomly divided into three groups. One group underwent 4 weeks of plyometric training, other group 6 weeks of plyometric training and control was third group. All the participants performed Agility T test before and after completion of training.

**Result:** Data was recorded and used for statistical analysis. There was statistically significant difference between pre (15.05 + 0.81) seconds and post (14.8 + 0.58) seconds values after 4- weeks of Plyometric training & pre (15.05 + 0.81) seconds and post (14.4 + 0.70) seconds values after 6-weeks of plyometric training. Intergroup comparison between all three groups showed no difference between 4 weeks and 6 weeks of plyometric training. ( $p > 0.05$ )

**Conclusion:** Thus, our study shows that both the short-term training programs are equally effective in improving agility among semi – professional football players.

### KEYWORDS

Agility T test, semi-professional footballer players, plyometrics

### INTRODUCTION

Plyometric training (PT) also called as stretch-shortening drills or stretch-strengthening drills, employs high-velocity eccentric to concentric muscle loading, reflexive reactions, and functional movement patterns.<sup>1,2,3</sup> Plyometric training is defined as a system of high-velocity resistance training characterized by a rapid, resisted, eccentric muscle contraction, followed immediately by a rapid resisted concentric of the same muscle.<sup>2,4,5</sup> It utilizes the viscoelastic properties of connective tissues and the stretch reflex mechanism of the neuromuscular unit. This augments the force production of the concentric muscle contraction.<sup>1,4</sup> Studies have shown that plyometric training enhances physical performance and decreases incidence of lower extremity injury.<sup>4,7,8,9,10</sup>

Physical performance is function of individuals' size, shape, sex, age and fitness. Fitness for any sport has five common elements- strength, speed, flexibility technique and skill. Along with skill and technique, agility is one of the key determinants of physical performance among football players. Agility is the ability to maintain and control correct body position while quickly changing direction through a series of movements.<sup>11</sup> It requires quick reflexes, coordination, balance, speed and correct response to the changing situation.

Football players perform a large number of actions such as changing directions, jumping, sprinting and shooting during the match. Almost every explosive action in football involves a stretch-shortening cycle (SSC).<sup>12,13</sup> Many studies have shown that plyometric training has improved agility among Football players.<sup>14,15,16,18</sup>

Semi-professional Football players are those players not participating on full time basis. They are not amateur but need to balance two competing demands, that of their work/career and that of the football team. Each will have their own daily demands, travel schedules, and time requirements that may, at times, conflict with each other. These players need a program which will help them to develop these necessary skills without getting injured within short period of time. The demands of training (intensity, duration, frequency) are likely to be less than that of full-time professionals. Many short-term plyometric training programs have been devised either changing the duration, frequency or intensity.<sup>19</sup> It has been studied that independently both 4-week and 6-week plyometric training have

improved Agility among football players. But there is need to identify the superiority of one short duration program over the other which can help the semi-professional players to effectively perform even after a short period of training. Thus, the aim of our study was to identify effectiveness of two short duration 4 week & 6-week plyometric training on Agility in Semi-professional Football Players.

### METHODOLOGY:

Participants:

45 male Semi- professional football players were selected with a mean age  $\pm$  SD of (23.28  $\pm$  2.33) and years of experience mean  $\pm$  SD (9.55  $\pm$  2.24) were randomized into three groups (Group A- Control, Group B- 4 weeks of Plyometric training, Group C- 6 weeks of plyometric training). Prior to commencing the study, it was approved by DPO's NETT College of Physiotherapy, ethics committee. Informed consent was taken from the participant. Each group consisted of 15 players which were selected on the basis of Inclusion & exclusion Criteria. Inclusion criteria was 18-28 years male playing for college or metropolitan clubs, who are not trained for plyometrics or specific training program were selected. Those with recent injuries or surgeries, recreational players, who regularly skipped their fitness and coaching sessions were excluded from the study. Participants were given detailed information about the study. Informed written consent was taken from all the participants. All the participants were instructed that they should not change their regular training habits and not to start any lower limb strengthening exercises. Only control group did not participate in plyometric training while experimental group B underwent plyometric training program for 4 weeks & group C underwent plyometric training program for 6 weeks. No drop-outs were observed in this study.

### T-Test procedure:

All the groups underwent Pre and post Agility T-test. T test has a high reliability (0.98) as a measure of leg power, leg speed and agility.<sup>16</sup>

Three cones were set up 5 meters apart in a straight line. The fourth cone was placed at 10 metres from the middle cone. Participant started at base of T. Examiner gave the signal to go and when athlete crossed the photocell the time began. Athlete ran to middle cone and touched it. Then side stepping 5 meters to the right cone and touched it. Then sides stepping 10 metres to the far cone and touched it. Then

again side stepping 5 meters to the middle cone and touched it. Then ran 10 meters backwards and touched the cone at the base of T. Time stops when the athlete crossed the photocell. (Figure 1)

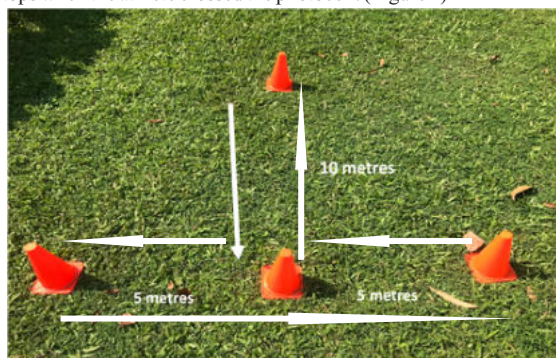


Figure 1: T test photo

### Plyometric Training Program:

It was administered for 2 days in a week for 4 and 6 weeks. The training program was based on recommendations of intensity and volume, using similar drills, sets, and repetitions. (Piper and Erdmann, 1998)<sup>14</sup> Grass surface was the training surface. Before training, T test was administered, practice trials were given and then test was administered. Subjects performed each test 3 times and mean was calculated pre and post-test. The training included Warm-up session like Sub maximal running, active stretching, and jumping exercises. This warm-up was chosen because of its positive effects on power production. Then plyometrics were administered as given in Table 1 followed by cool down session that concluded slow walking and slow stretching. Group B completed the 4 weeks program while Group C completed the 6 weeks program.

Table 1:

| Training Week | Training Volume | Plyometric Drill                                                                                                                                                                                                                                       | Sets x reps                            | Training Intensity                                |
|---------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------|---------------------------------------------------|
| Week 1        | 90              | <ul style="list-style-type: none"> <li>Side to side ankle hops</li> <li>Standing jump and reach</li> <li>Front cone hops</li> </ul>                                                                                                                    | 2x15<br>2x15<br>5x6                    | Low<br>Low<br>Low                                 |
| Week 2        | 120             | <ul style="list-style-type: none"> <li>Side to side ankle hops</li> <li>Standing long jump</li> <li>Lateral jump over barrier</li> <li>Double leg hops</li> </ul>                                                                                      | 2x15<br>5x6<br>2x15<br>5x6             | Low<br>Low<br>Medium<br>Medium                    |
| Week 3        | 120             | <ul style="list-style-type: none"> <li>Side to side ankle hops</li> <li>Standing long jump</li> <li>Lateral jump over barrier</li> <li>Double leg hop</li> <li>Lateral cone hops</li> </ul>                                                            | 2x12<br>4x6<br>2x12<br>3x8<br>2x12     | Low<br>Low<br>Medium<br>Medium<br>Medium          |
| Week 4        | 140             | <ul style="list-style-type: none"> <li>Diagonal cone hops</li> <li>Standing long jump with lateral sprint</li> <li>Lateral cone hops</li> <li>Single leg bounding</li> <li>Lateral jump single leg</li> </ul>                                          | 4x8<br>4x8<br>2x12<br>4x7<br>4x6       | Low<br>Medium<br>Medium<br>High<br>High           |
| Week 5        | 140             | <ul style="list-style-type: none"> <li>Diagonal cone hops</li> <li>Standing long jump with lateral sprint</li> <li>Lateral cone hops</li> <li>Cone hops with 180 degrees turn</li> <li>Single leg bounding</li> <li>Lateral jump single leg</li> </ul> | 2x7<br>4x7<br>4x7<br>4x7<br>4x7<br>2x7 | Low<br>Medium<br>Medium<br>Medium<br>High<br>High |
| Week 6        | 120             | <ul style="list-style-type: none"> <li>Diagonal cone hops</li> <li>Hexagon drill</li> <li>Cone hops with change of direction sprint</li> <li>Double leg hops</li> <li>Lateral jump single leg</li> </ul>                                               | 2x12<br>2x12<br>4x6<br>3x8<br>4x6      | Low<br>Low<br>Medium<br>Medium<br>High            |

### Statistical Analysis:

Pre and Post Agility T test values for three groups were statistically analysed. The data was explored for normality by the Shapiro Wilk test. Depending on distribution, parametric or non-parametric tests was used. Levene's test was done to identify equality of error

variances. There was no statistically significant difference between groups in baseline values indicating that randomisation was effective. Intra group comparison was done using Wilcoxon Signed rank test. Intergroup comparison was done using Kruskal Wallis test. Post hoc analysis for multiple comparison was done using Holm Adjusted - Mann Whitney Rank sum test. The statistical packages used were Medcalc Statistical version 19.1.7 (Ostend, Belgium) and Primer of Biostatistics: version 5.0.

### RESULTS:

Table 2 shows that there was statistically significant difference in Pre and Post values of Agility T test after 4 weeks and 6 weeks of plyometric training in Group B and Group C. (p<0.05) There was improvement in Agility T test after 4 weeks and 6 weeks of plyometric training. Intergroup comparison of post values showed that there was statistically significant difference between Group A & B (4-week plyometric training), Group A & C (6 week plyometric training) but no significant difference on Agility T test between Group B & C (Table 3 & 4). There was no weekly difference in Agility T test between 4 and 6 weeks of plyometric training.

Table 2: Intragroup Comparison Of 4-week & 6 Week Plyometric Training

|           | Group B (4 weeks Training) |             | Group C (6 weeks Training) |             |
|-----------|----------------------------|-------------|----------------------------|-------------|
|           | Pre                        | Post        | Pre                        | Post        |
| Mean (SD) | 15.44 (0.53)               | 14.8 (0.58) | 15.05 (0.81)               | 14.4 (0.70) |
| Median    | 15.43                      | 15.43       | 15.18                      | 14.51       |
| Z- value  | - 3.39                     |             | -3.40                      |             |
| p         | 0.00*                      |             | 0.00*                      |             |

\*- statistically significant

Table 3: Intergroup Comparison Between Groups Post Training

| Groups | Mean (SD)   | Median | H (df)   | p value |
|--------|-------------|--------|----------|---------|
| A      | 0.00 (0.04) | 0      | 31.26(2) | 0.001*  |
| B      | 0.63 (0.26) | 0.57   |          |         |
| C      | 0.65 (0.14) | 0.63   |          |         |

Table 4: Post Hoc Analysis For Multiple Comparison Of All Groups

| Comparison | z sub T | Pvalue |
|------------|---------|--------|
| A vs C     | 4.64    | 0.00*  |
| A vs B     | 4.64    | 0.00*  |
| B vs C     | 1.88    | 0.06   |

\*- statistically significant p < 0.05

### DISCUSSION:

The aim of our study was to find effectiveness of short duration 4 week or 6 weeks of plyometric training on agility in semi -professional football players. We had selected 45 semi-professional football players who showed significant difference in pre and post agility after 4 and 6 weeks of plyometric training in semi-professional football players. The probable reason could be better motor recruitment and neural adaptations. Neural adaptations usually occur when athletes respond or react as a result of improved coordination between the CNS signal and proprioceptive feedback (Craig, 2004).<sup>21</sup>

But intergroup comparison showed no difference in test values which proves that both 4 week and 6 weeks short duration plyometric program was equally effective in improving agility among semi-professional football players. Study done by Siddhi Tendulkar et al found that 3 weeks of plyometric training also improved agility in Football players.<sup>22</sup> A reviewed study has shown that short plyometric training < 8 weeks has potential to enhance agility and athletic performance in young amateur players. Greater effects have been found in short term plyometric training alone on agility than combination of trainings.<sup>23</sup>

A study done by Abbas Asadi showed the importance of using 6 weeks in season plyometric training to improve power and agility among young male basketball players.<sup>24</sup> In our study, semi-professional football players and coaches are restricted to train only for short preseason, short duration 4 or 6 weeks of plyometric training program will thus be beneficial for the players to improve their performance.

Similar supporting evidence by Michael Miller et al states that improvements in agility can occur in as little as 6 weeks of plyometric

training which can be useful during the last preparatory phase before in-season competition for athletes.<sup>14</sup>

Football players requires maximal aerobic power. Wang et al in his study mentioned that plyometric agility training program might increase the percentage of VO<sub>2</sub> peak, increased several muscle powers and endurance after a 6-week PT program in young soccer players thereby confirming the place of Plyometric training in skill performance and activating neuromechanical response.<sup>25,26</sup>

Many Studies done in basketball players have also shown similar effect on agility after 6 weeks of plyometric training. Similar study done by S.Poomsalood et al found that 4 weeks of plyometric training was effective in improving agility, speed and muscle leg power.<sup>15</sup> Again, this short duration might be beneficial for last preparatory phase before in season competition. Thus, both short duration 4 week and 6-week Plyometric training can be significant contributor to coach as well as players for developing agility if the duration for training before the competition is limited as in our case with semi-professional football players.<sup>27,28</sup>

## CONCLUSION:

Our study thus concludes that both short duration plyometric program 4 week or 6 weeks are equally effective in improving agility among semi-professional football players. Either of the two short training duration can a player choose depending upon the time constraints or during last preparatory phase to participate in the competitive game.

## Conflicts Of Interest: None

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