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COMPARING EFFECT OF PLYOMETRIC EXERCISE WITH COMBINED RESISTANCE AND SPEED TRAINING ON SPEED, AGILITY, ENDURANCE, STRENGTH, FLEXIBILITY OF FOOTBALL PLAYERS USING "YO - YO" TEST, SIT AND REACH TEST AND VERTICAL JUMP TEST

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BACKGROUND & PURPOSE: FOOTBALL game is excessively based on leg exercises like; kicking jumping and sprinting almost 10km of area is covered by a player during the game and is required to sprint repeatedly within arbitrary intervals during the games. So, the players need an appropriate strength, endurance, flexibility, agility and speed to enhance their performance. For their better performance plyometric, combined resistance and speed training will improve their jump, leg strength, power, change of direction pick-up and stop will improved by this training protocol. Evaluated by yo-yo intermittent recovery test level1, vertical jump test and sit and reach test. So, that we will measure the improvement of the performance of the athletes. **METHODOLOGY:** 60 players were recruited based on inclusion and exclusion criteria with the age group 18-25 years. 30 participants have completed the plyometric training 2 days/week for 6 weeks. Vertical jump test, sit and reach test and YO-YO IRTL1 were taken as an outcome measure. All the parameters were used pre and post treatment**. RESULT:** Result were statistically analyzed using paired t test by using SPSS version 25 and excel 2019, there was significant improvement in vertical jump test, sit and reach test and YO-YOIRTL1 in football players and significance level was kept at $P<0.05$. **CONCLUSION:** This study concludes that 6 weeks of plyometric, combined resistance and speed training has shown the significant effect on improving jump, flexibility, endurance, strength, agility and speed in football players. Plyometric training is more effective than combined resistance and speed training this training was improving the sports performance of the players. **KEY-WORDS**: plyometric, YO-YO IRTL1, football

INTRODUCTION:

Football is a most popular sport in all over the world. Because of this fact, many of the studies have been supervised to provide mastery of the vital skills which required by the players and it is a game played between 2 teams and excessively based on leg1. Likewise; the actions followed by the game is acceleration, deceleration, direction change, jumping, leg extension, fast pick-ups and stop this movements may cover about Ten km on the field and need to run again and again within uneven intervening time2,3. Plyometric drills included starting(pickup), stopping, direction change in an explosive manner and this action modules will assist to develop the power and other components of game to improve the sports skill6. Some of the sports physiologists believe those 4 to 6 weeks of high intensity training program is the highest length of the time for CNS to be stressed without fatigue.6 The term stretch-shortening cycle instead of plyometric to differentiate from translation of Greek word ply= more, plythein=increase, metric= measure meaning, to improve the measurement. plyometric training done with rapid force absorption like landing from jump and force- like; push off a jump. Resistance training and plyometric training are safe and suitable techniques to develop the better skills of players10, 11. Explosive exercise may improve endurance and kicking and balance. Accordingly, explosive exercises are showed positive effect on kicking performance but, in endurance it is still debatable. Many of the studies are not showing any enhancement in Vo2 max or lactate thresholds, although other improvement in a YO-YO intermittent recovery level 1 test (YO-YO IR1) also, balance may be basic quality for both exertion of technical action and injury prevention; still the effect of plyometric training on balance is currently unspecified14. Agility is the ability to change the direction of the body n an efficient and effective manner and to achieve the combination of balance, speed, strength and endurance. When football players have good agility, they can stop on a dime. The reason of vertical jump test for football players is that the player has to perform fast and high jumps during match so, they require explosive jump ability. To evaluate jump ability, lower body power and neuromuscular coordination is the use of vertical jump test. It's simple, reliable, practical, and valid20.

METHODOLOGY:

Subjects were randomly allocated and assigned to either Group A or Group B with 30 subjects in each group respectively. The subjects for the study were selected from ARA F.C Ahmedabad who was under football learning. 60 male soccer players volunteered to participate and subjects were randomly selected into 2 groups Group-A plyometric training group, Group-B combined resistance and speed training group. Players were 18 to 25 years of age. Subjects were selected as without any lower limb injuries and were not involve any type of plyometric or jumping exercises rather than which training sessions included in the study. All 60 players of Group-A and Group-B were participated in the six weeks of training program to perform various types of plyometric exercise and lower limb strength speed training. Prior to the study, the experimental procedure was performed with all ethics guideline and follow COVID-19 protocol with all the hygiene and safety. Training procedure and other information were presented orally and in written approved consent form. Players were agreed to participate institutionally.

GROUP A

Side to side ankle hops
Standing jump and reach
Front cone hops
Standing long jump
Lateral jump over barrier
Double leg hops
Lateral cone hops
Diagonal cone hops
Standing long jump with lateral sprint
Single leg bounding
Lateral jump single leg
Cone hops with 180degree turn
Hexagon drill
Cone hops with change of direction sprint

GROUP B

Warm up
Resistance training
Active recovery using football skills
Speed program
Active recovery

GROUP-A PLYOMETRIC SIX WEEKS TRAINING

Training Week	Training volume (foot contacts)	Plyometric drill	Sets x Reps	Training intensity
Week 1	90	Side to side ankle hops	2 x 15	Low
		Standing jump and reach	2 x 15	Low
		Front cone hops	5 x 6	Low
Week 2	120	Side to side ankle hops	2 x 15	Low
		Standing long jump	2 x 6	Low
		Lateral jump over barrier	2 x 15	Medium
		Double leg hops	5 x 6	Medium
Week 3	120	Side to side ankle hops	2 x 12	Low
		Standing long jump	4 x 6	Medium
		Lateral jump over barrier	2 x 12	Medium
		Double leg hops	3 x 8	High
		Lateral cone hops	2 x 12	High
Week 4	140	Diagonal cone hops	4 x 8	Low
		Standing long jump with lateral sprint	4 x 8	Medium
		Lateral cone hops	2 x 12	Medium
		Single leg bounding	4 x 7	High
		Lateral jump single leg	4 x 6	High
Week 5	140	Diagonal cone hops	2 x 7	Low medium
		Standing long jump with lateral sprint	4 x 7	Medium
		Lateral cone hops	4 x 7	Medium
		Cone hops with 180 degree turn	4 x 7	High
		Single leg bounding	4 x 7	High
		Lateral jump single leg	2 x 7	High
Week 6	120	Diagonal cone hops	2 x 12	Low
		Hexagon drill	2 x 12	Low
		Cone hops with change of direction sprint	4 x 6	Medium
		Double leg hops	3 x 8	High
		Lateral jump single leg	4 x 6	High

A 6 week of training program with 2 sessions per week for both the groups (A and B). Training volume ranged from 90foot contacts to 140foot contacts per session and the intensity of the exercises raised by 5 weeks before the end of the training.

GROUP-B: COMBINED RESISTANCE AND SPEED TRAINING

For each exercise there is 1 RM (1 repetition maximum) is determined. Participants performing the specific warm up programs, which includes submaximal intensity performance for the tested exercise up to the levels of 50%, 75% and 85% for each participant of 1 RM, followed after the general warm up sessions. The repetitions for exercises were 12, 8 and 3 respectively, which was very relevant. For each particular intensity. 4 sets were performed. The resistance was gradually increased after these exercises, from a critical value 5% below expected 1RM. Observing the successful performance, the intensity gradually increased from previous to plus 2%, until there was a failure in lifting the same load. Talking about the time intervals, there was a gap of 3 minutes between each repetition. To estimate the final value of 1RM, the number of trials used was 3 times. To define the failure, the parameter used was to check the performance and the failure, which was known when the participant failed to perform the full range of motion.

Periods	Combined resistance and speed training
First period (general)	Endurance, strength endurance, coordination, flexibility
Second period (experimental) first sub period	1. Warm up (15 min) 2. Resistance training (8 RM, 60 min) 3. Active recovery using soccer skills (10 min) 4. Speed program (15 min) 5. Active recovery (10 min) 6. Cool down
Second period (experimental) second sub period	1. Warm up (15 min) 2. Resistance training (6 RM, 60 min) 3. Active recovery using soccer skills (10 min) 4. Speed program (15 to 20 min) 5. Active recovery (10 min) 6. Cool down
Second period (experimental) third sub period	1. Warm up (15 min) 2. Resistance training (3 RM, 60 min) 3. Active recovery using soccer skills (10 min) 4. Speed program (20 min) 5. Active recovery (10 min) 6. Cool down

STATISTICAL ANALYSIS

The collected data were analyzed using statistically package of social sciences (SPSS) version 25.0 and Excel version 2019. The parametric test was used in statistical analysis because the distribution of data was normal. Demographic values were compared within and between groups using paired and unpaired t-test with p value<0.01

RESULT:

In this study 60 male football players were involved by following inclusion criteria and randomly the players were selected in both the groups of the study (group-a plyometric exercise & group-b combined resistance and speed training).

Table 1: Mean age of participants according to gender.

AGE GROUP	GROUP A	GROUP B
	19.03	18.63

Table 2: Comparison of pre and post mean of srt and vjt of between groups (group a: plyometric training) (group b: combined resistance and speed training)

OUTCOME	**GROUP A**	**GROUP B**	**T VALUE**	**PVALUE**
SRT	42.13	34.07	5.332	0.001
VJT	61.57	51.10	5.299	0.001

Table 3: Comparison of pre and post mean of yo- yo of between groups (group a: plyometric training) (group b: combined resistance and speed training)

YO-YO	**GROUP A**	**GROUP B**	**T VALUE**	**P VALUE**
LEVEL	17.047	15.573	4.946	0.001
RESTING PR	84.37	82.20	7.727	0.470
END PR	145.30	131.27	3.486	0.001
AFTER 1 MIN PR	131.23	112.33	5.440	0.001

DISCUSSION:

The purpose of the study was to do plyometric and resistance speeds training to enhance the productivity of the game on the players. As we know that football players need change of directions, need more leg power and explosiveness to perform high jumps, acceleration action powerful kicks and sprints. This study suggests that 6 weeks of plyometric training, combined resistance and speed training improved the performance of players. This training works on speed, strength, flexibility, agility and endurance. Both experimental group shows the effect of combined resistance and speed training in improvement of vertical jump, flexibility, strength, endurance, agility and speed by applying 6 weeks of plyometric and strength speed training for 2 sessions per week (group-A and GROUP-B). A footballer needs to be focused on his jumping, change of directions, kicking, and acceleration (pick up and stop actions) sprits because it is an intermittent sport and it requires powerful actions during 90mins. Vertical jump test, is commonly assessed in the strength and conditioning field.to rule out the lower limb functionality. Immediate after resistance training we applied speed training on the players and both speed and resistance put in the same session give better effect of the outcome that's why the combined resistance and speed training will improve the speed, jumping ability of the player. Result shows that the combination of plyometric and strength speed training will enhance the explosive strength and endurance accommodate in footballers. From now it has been recommended that plyometric training should be there in the running days of the sessions, it may have more focus on the endurance, strength, jumps, flexibility, and agility (change of direction). To determine the components of sports performance we used vertical jump test, sit and reach test and YO-YO intermittent recovery test level1. The YO-YO IRT level 1 is to assess the ability to perform repeatedly intense actions to a maximal activation of aerobic system. The YO-YO IR gives more accurate and sensitive measurements of the player's performance rather than oxygen uptake. Sit and reach test is to determine the flexibility of the muscle mainly back of thigh (hamstring) and back was involved in the test. Our study says that the overall components of sports which were included in the study was improved likewise; speed gives beneficial effect in both plyometric and combined resistance and speed training, it improves flexibility ranges due to the development of the intramuscular and intermuscular coordination by the training. Flexibility increased in both comparative groups it was significantly improved when elite players were participating in the study, they already taking care about their muscle strength and flexibility. When this player starts their practice sessions, they have included 10 to 15 minutes of activation warm up depend on the session means what session they were performing on the day and 90 to 100 minutes of overall practice session and then they have a cool down for 10 to 15 minutes. So, after following these sessions they obviously taking care about their flexibility rather than their on-field sessions too. After 1 minute rest pulse rate is so significant statistically but resting PR and PR (when exhaust or completing their YO-YO test level) were not so significant because plyometric and combined resistance and speed training were not aerobic based training which increases $VO_{2\ max.}$ (PR). In the study pulse rate values were found near to significant is thought to be that football players regularly attend their sessions which may develop $VO_{2\ max.}$ This study chose three outcomes to rule out the performance were vertical jump test, sit and reach test and YO-YO IR test in view of the fact that this outcome measures has superior reliability and validity

Overall study shows up that Group-A were more effective than Group-B.

CONCLUSION:

This study showed that there is significant difference in plyometric training, combined resistance and speed training on football players for improving their sports performance. But the result shows that group-A is more significant than group-B. So, this study concluded that plyometric training is more efficient than combined resistance and speed training. Recently, plyometric trainings have been included in strength trainings.

LIMITATIONS AND FUTUTE RECOMMENDATIONS

LIMITATIONS:

The long term follow up was not taken. Control group was not taken. Only asymptomatic tennis players were included.

FUTURE RECOMMENDATIONS:

This study can be done for longer duration to check long term effect. Further studies can be done with control group. This study can be done with symptomatic tennis players.

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