

Effect of Functional Training on Speed Agility Explosive Power and Aerobic Endurance In Recreational Soccer Players

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ABSTRACT

Background: Recreational soccer is characterized by fewer players per side and played on a smaller field than a standard competitive soccer game. Work to date indicates that recreational soccer positively motivates individuals and facilitates social interaction, which may enhance compliance and adherence to the activity and contribute to a physically active lifestyle. Functional training is becoming increasingly popular now a days and was ranked among the top 10 most popular fitness trends.

Context and purpose: The popularity of recreational soccer is increasing day by day. There is scarcity of studies regarding exercise program for conditioning recreational soccer players. Specific exercise program for conditioning the recreational soccer players may improve their performance level and reduce the risk of injury. So this study aims to determine the effect of functional training on speed, agility, explosive power and aerobic endurance in recreational soccer players.

Results: The results projected a significant improvement in speed, agility, explosive power in both groups. Even though both groups showed improvement, Group A, the experimental group showed statistically significant improvement in speed, agility, explosive power and aerobic endurance than Group B, the conventional group. The improvement in movement pattern, proprioceptive loading and specific changes in the mechanism responsible for oxygen transport and utilization during Functional training may be the reason for improvement in Group A than Group B.

Conclusion: The study concluded that functional training along with conventional training is effective in improving speed, agility, explosive power and aerobic endurance in recreational soccer players.

KEY WORDS: Functional Training, Recreational Soccer, Speed, Agility, Explosive Power, Aerobic Endurance.

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BACKGROUND

Soccer has long been considered the world's number one sports [1]. Recreational soccer (RS) includes fewer players played on a smaller field than a standard competitive soccer game [2]. Work to date indicates that RS has a positive effect on individuals and helps to develop a physically active lifestyle [2].

The objectives of recreational soccer is that it provides an opportunity for many participants to be involved in the game and develop more social interactions and to lead a healthy life [3]. The components of physical performance such as speed, agility, explosive power and aerobic endurance are some of the important factors that determine the physical performance level of soccer players [4,5]. Evidences suggest that recreational soccer players have less physical performance level than elite soccer players [6].

Functional training (FT) is becoming increasingly popular nowadays and was ranked among the top 10 most popular fitness trends [7]. It is been considered to be a better alternative for traditional resistance training for improving various measures of muscular fitness.8 Thus functional training should be designed to mimic task or activities that occur in a person's daily life to make training adaptation more effective [8]. FT emphasis on multiple muscles and joint activities consisting of upper body and lower body movements. FT is also known by a variety of other names which include Functional resistance training (FRT), Functional strength training (FST) etc [9].

FT includes multiple muscle and multiple joint exercises that stimulates movement pattern.10 Through this training method the target movement itself is improved rather than specific muscle [11,12]. Muscle strength, flexibility, endurance, coordination, balance and movement efficiency are the important components of physical performance to achieve the functional movement in skill related to sports [13].

METHODS

This pre-test post-test experimental study design was conducted at the Educational

Institutions under Little Flower Hospital and Research Centre, Angamaly for a duration of 6 months.

Ethical clearance was obtained from the central ethical committee of the institution. 30 recreational male soccer players aged between 17 to 25 years were recruited for the study based on the inclusion and exclusion criteria by using simple random sampling technique and were divided into 2 groups of 15 each. We included male college students who play soccer for at least twice per week, sargent jump test score between 12 inch to 24 inch and T-test score for agility between 13.5seconds to 10.5seconds. The subjects were excluded if they were medically unstable subjects, and had musculoskeletal injuries in past 6 months, subjects participating in any other exercise program, any recent surgeries, subjects with acute inflammatory, degenerative and musculoskeletal disorders, chronic respiratory conditions, subjects having any visual or hearing impairment, malignancy, psychiatric and non-cooperative subjects were also excluded.

A total of 37 subjects were assessed for eligibility. And 30 subjects who fulfilled the inclusion criteria were randomly assigned into two groups: 15 in group A (experimental) and 15 in group B (control). Written informed consent was obtained from the subjects. Group A received functional training along with conventional training, whereas, Group B received conventional training alone for a duration of 8 weeks. Pre scores were taken on the first day before the training session and post scores, on the last day after the training program. Speed was measured using 30 meter sprint test, agility by T-test, explosive power by Sargent jump test, and aerobic endurance by Yo-yo intermittent recovery test level 1.

Group A: Subjects in the Group A received functional training along with conventional training for about 60 minutes.

It includes 10 minutes warm-up, 15 minutes conventional training, 30 minute functional training session, and 5 minutes cool-down.

· Warm-up includes jogging, active mobility exercises for all four limbs and stretching.

Conventional training exercises were given and the intensity was increased gradually.

The resistance was given using free weights and intensity was increased gradually.

Exercise protocol

Frequency: 3 times per week for 8 weeks

Intensity:

For conventional training- 1 set with 8 repetition (repetition increased by 2 in every 2 weeks).

For functional training- 3 set with 10 repetition.

30 second rest after each set.

Duration: 50 minutes.

Cool down includes general body relaxation techniques and stretching (i.e maintaining muscle elongation for 30s).

Table 1: Functional Training Exercises Programs: Day 1.

SL.NO	Name of Training	Repetition	Sets	Recovery	Total Time
1	Push up with stability ball	10	3	Walk back/20m	3 min
2	Hamstring curl with stability ball	10	3	Walk back/20m	3 min
3	Multi-directional lunge with weights(2kg+2kg)	10	3	Walk back/20m	3 min
4	Dumbbell step-ups	10	3	Walk back/20m	3 min
5	One leg bench squat	10	3	Walk back/20m	3 min
6	Oblique bridge	30sec	3	Walk back/20m	3 min
7	Squats	10	3	Walk back/20m	3 min

Table 2: Functional Training Exercises Programs: Day 2.

SL.NO	Name of Training	Repetition	Sets	Recovery	Total Time
1	Push up with stability ball	10	3	Walk back/20m	3 min
2	One leg bench squat	10	3	Walk back/20m	3 min
3	Oblique bridge	10	3	Walk back/20m	3 min
4	single leg dead-lift	10	3	Walk back/20m	3 min
5	single leg split squat	10	3	Walk back/20m	3 min
6	Planks	30sec	3	Walk back/20m	3 min
7	step up with heel raise	10	3	Walk back/20m	3 min

Table 3: Functional Training Exercises Programs: Day 3.

SL.NO	Name of Training	Repetition	Sets	Recovery	Total Time
1	Side plank	30sec	3	Walk back/20m	3 min
2	Multidirectional lunge	10	3	Walk back/20m	3 min
3	Single leg dead lift	10	3	Walk back/20m	3 min
4	Split squat jump	10	3	Walk back/20m	3 min
5	Step up with heel raise	10	3	Walk back/20m	3 min
6	Squatting	10	3	Walk back/20m	3 min
7	Hamstring curl with stability ball	10	3	Walk back/20m	3 min

Group B

Subjects in Group B received the above mentioned conventional training session alone for about 45 minutes.

It included 10 minutes warm-up, 30 minutes treatment session, and 5 minutes cool-down.

Exercise protocol

Frequency: 3 times per week for 8 weeks

Intensity:

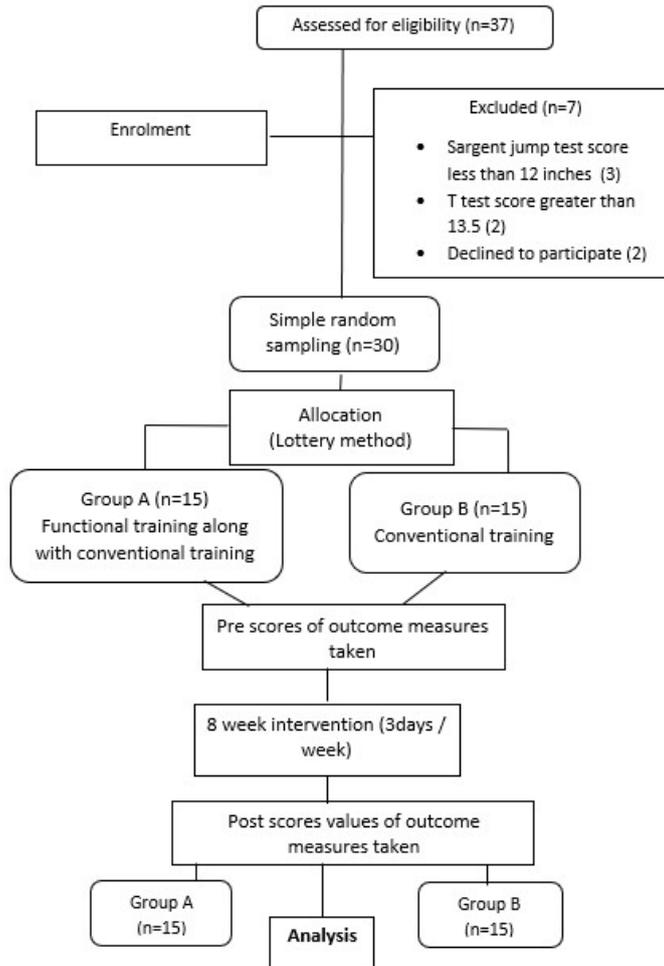
3 sets with 8 repetition and 30 second rest after each set.

Repetition increased by 2 in every two weeks

Intensity: low to high intensity gradually.

Duration of treatment session: 45 minutes

CONSORT FLOWCHART



RESULTS

Table 4: pre-test post-test comparison of group A.

GROUP A (paired t test)						
No:	Outcome	Pre-test	post test	Mean difference	t value	P value
1	Speed	5.01±0.326	4.75±0.243	0.257±.188	5.27	0
2	Agility	12.59±0.654	12.1±0.0492	0.585±.341	6.64	0
3	Explosive power	15.67±1.86	16.75±1.52	1.08±.498	8.38	0
4	Aerobic endurance	693.33±164.69	776±151.79	82.66±43.99	7.27	0

Table 5: pre-test post-test comparison of group B.

GROUP B (paired t test)						
NO:	OUTCOME	pre-test	post-test	Mean difference	T value	P value
1	Speed	5.15±0.297	5.06±0.295	0.089±.105	3.276	0.005
2	Agility	12.78±0.666	12.45±0.594	0.330±.245	5.209	0
3	Explosive power	15.28±1.50	15.72±1.58	0.440±0.354	4.812	0
4	Aerobic endurance	653.33±110.75	666.67±105.47	13.33±32.33	1.581	0.136

Table 6: Intergroup comparison of speed and aerobic endurance

GROUP A AND B (MANN-WHITNEY U TEST)						
OUTCOMES	GROUPS	N	Mean Difference	Standard deviation	z Statistic	p Value
SPEED	Group A	15	0.26	0.19	2.826	0.004
	Group B	15	0.1	0.1		
AEROBIC ENDURANCE	Group A	15	82.67	43.99	3.287	0.002
	Group B	15	29.33	18.31		

Graph 1: Intergroup comparison of speed.

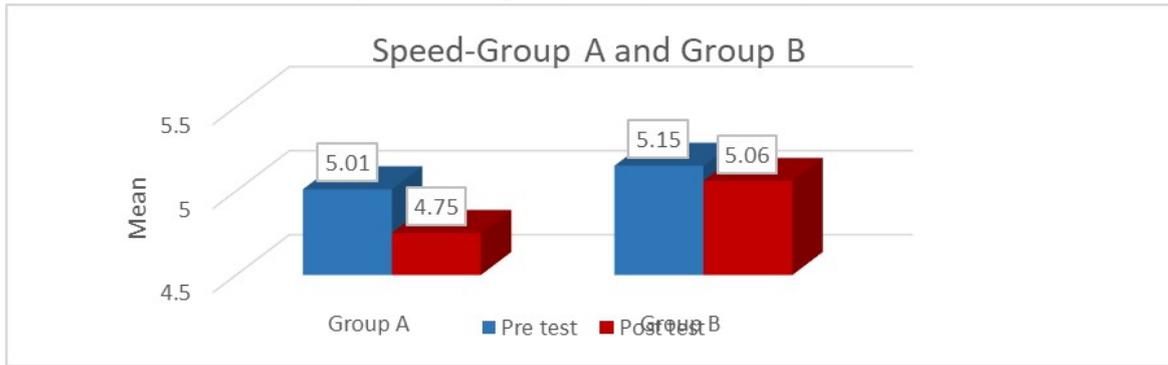
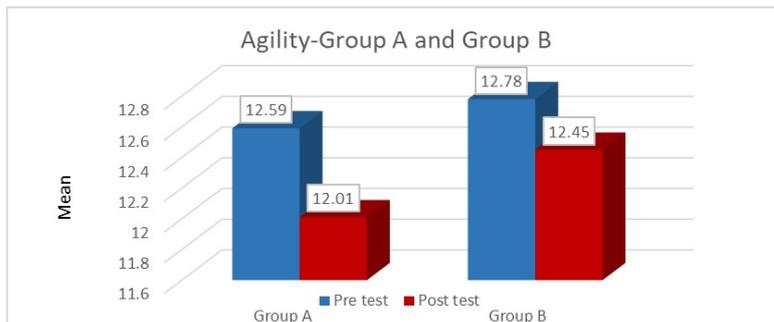
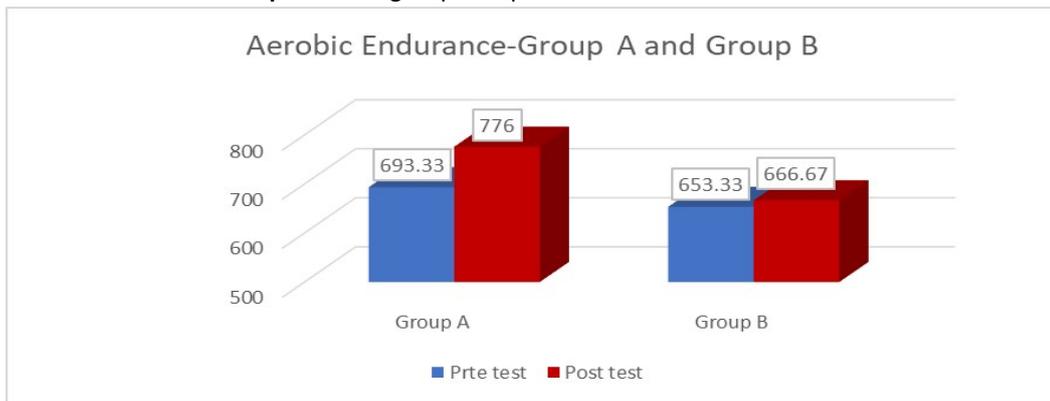


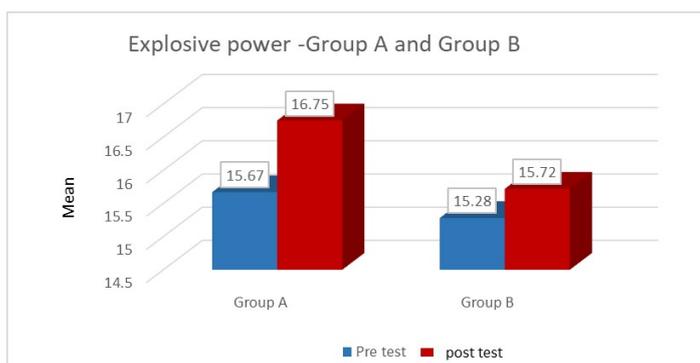
Table 7: Intergroup comparison of agility and explosive power

BETWEEN GROUP A AND B (INDEPENDENT T TEST)						
OUTCOMES	GROUPS	N	Mean Difference	Standard deviation	t value	p Value
AGILITY	Group A	15	0.59	0.34	2.346	0.026
	Group B	15	0.33	0.25		
EXPLOSIVE POWER	Group A	15	1.08	0.5	4.052	0
	Group B	15	0.44	0.35		

Graph 2: Intergroup comparison of aerobic endurance.



Graph 3: Intergroup comparison of agility.



Graph 4: Intergroup comparison of explosive power.

The obtained data was analysed using SPSS Version 20.00. Descriptive statistics were used to present the baseline characteristics of the data. All quantitative variables were presented as mean and standard deviation and qualitative variables as frequency and percentages.

Within group comparison of outcome measures were done using Paired t-test for normal data.

For between group comparisons, Mann Whitney U test was used for speed and aerobic endurance because the paired differences were non-normal and Independent t-test was used for agility and explosive power because the difference were normal. A p-value less than 0.05 was considered as statistically significant. Even though both groups showed improvement, Group A, the experimental group showed statistically significant improvement in speed, agility, explosive power and aerobic endurance than Group B, the conventional group.

DISCUSSION

The present study aimed to find the effect of FT on speed, agility, explosive power and aerobic endurance in recreational soccer players. 30 recreational male soccer players aged between 17 to 25 and those who fulfilled the inclusion criteria were recruited for the study. Subjects were divided into 2 groups, Group A and Group B with 15 in each group. Group A received functional training along with conventional training, whereas Group B received conventional training alone. The total duration of the intervention was 8 weeks. The outcome measures used were 30 meter sprint test, T-Test, Sargent jump test and Yo-yo intermittent recovery test level 1. Assessments were taken on the first day before the training session and last day after the training. The results projected a significant improvement in speed, agility, explosive power in both groups. Aerobic endurance also improved in both groups but significant improvement was seen in Group A. Even though both groups showed improvement, the Group A showed more statistically significant improvement in speed, agility, explosive power

and aerobic endurance than Group B.

Subjects in both groups showed improvement in speed. But more statistically significant improvement was seen in Group A. This may be because of improvement in movement pattern attained from functional training given to subjects in Group A. According to Jakub Baron et al 2019, 12 weeks of functional training intervention had positive effect on speed in young footballers and which may be attributed to the improvement in movement pattern in functional training [14]. Thus improved movement pattern by functional training may have helped in improving speed in Group A.

Agility which was measured using T test, also showed improvement in both groups. But more significant improvement was seen in Group A. The possible mechanism for improvement in Group A may be enhanced postural control. According to Mario Tomljanovic et al 2011, 5 weeks of functional training showed positive effect on motor performance variables such as agility which is mainly related to neurological adaptation of proprioception and sensory enhancement [15]. Antonio Gomes de Resende-Neto et al 2019 suggested that the instability and change of direction in functional training can stimulate proprioceptive receptors present in the body which helps in development of postural control and increases the activation of stabilizing muscles.¹⁶ Kevin E Wilk et al suggested that in proprioception the mechanoreceptors detect changes and rate of changes as opposed to steady state conditions. This input is then analysed in the CNS to determine joint position and movement. When processed and evaluated, this proprioceptive information become capable of influencing muscle tone, motor execution programs and kinaesthetic awareness [17]. Thus adding functional training may have helped in improving agility in Group A over Group B.

In explosive power, there was improvement in both groups but more significant improvement was found in Group A. Improvement in lower limb strength as a result of our functional training program can be a reason for improvement in explosive power. According to Drazen Cular 2013, improvement in explosive power can be related to the specific neural

adaptation such as an increased rate of activation of motor units which will potentially affect muscle power and movement economy [18]. Thus adding functional training may have helped in improving explosive power in Group A over Group B.

Aerobic endurance was assessed by yo-yo intermittent recovery test level-1 and the result showed improvement in both groups, more statistically significant improvement was seen in Group A. This can be related to the overall increase activities in the functional training. According to S Newton et al 2011 the possible mechanism in the aerobic endurance may be the adaptation found in the body's physiological system with training [19].

Antonio Gomes de Resende-Neto et al 2019 suggested that changes in the mechanism responsible for oxygen transport and utilization by functional training improved aerobic endurance.¹⁶ Therefore this may be the reason for more improvement of aerobic endurance in Group A than Group B.

CONCLUSION

Statistical analysis of the data collected recommends that there is significant improvement in both groups, except for aerobic endurance in Group B. Group A shows more significant improvement in all outcomes when compared to group B. The study reveals that addition of functional training to conventional training enhances the physical performance level in recreational soccer players.

ABBREVIATIONS

ACSM - AMERICAN COLLEGE OF SPORTS MEDICINE

AE - AEROBIC ENDURANCE

EP - EXPLOSIVE POWER

FRT - FUNCTIONAL RESISTANCE TRAINING

FST - FUNCTIONAL STRENGTH TRAINING

FT - FUNCTIONAL TRAINING

RS - RECREATIONAL SOCCER

YYIR1 - YO-YO INTERMITTENT RECOVERY TEST LEVEL 1

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