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EFFECT OF CIRCUIT TRAINING ON GRASS, GRAVEL AND SYNTHETIC FIELD ON MOTOR FITNESS AND PERFORMANCE VARIABLES OF COLLEGE MEN HOCKEY PLAYERS

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ABSTRACT

The purpose of this study was to find out the effect of circuit training on grass, gravel and synthetic field on motor fitness and performance variables among college hockey players. To achieve the purpose of the study 80 male hockey players from different arts and science and engineering colleges in Tamil Nadu the selected as subjects and their age group of 18 -25 years. The study was formulated as a true random group design consisting of a pre-test and post test. The subjects (N=80) were randomly assigned to four equal groups of twenty subjects in each group. Namely, Experimental group I was circuit training on grass field (DSEC,Trichy), experimental group II was circuit training on gravel field(SRM college of Engg,Trichy), experimental group III was circuit training on synthetic field (JJ College of Engg,Trichy) and the control group was not given any experiment. Pre tests were conducted for all the subjects on selected motor fitness variables such as speed and Cardio Vascular endurance and Performance variables of dribbling. The training programme alternate days of twelve weeks. The post tests were conducted on the above said dependent variables after the experimental period of twelve weeks for all the three groups. It is concluded that three experimental groups have achieved significant improvement as compared to control group towards improving motor fitness variables and performance variables. The significance difference between the circuit training on grass is better than circuit training on gravel. Circuit training on gravel is better than compared with circuit training on synthetic fields. Circuits training on synthetic field have shown statistically better for motor fitness variables and performance variables.

Key words: Speed, Endurance, Hockey and Dribbling.

1. INTRODUCTION

A sport is an organized, competitive, entertaining and skillful physical activity requiring commitment, strategy and fair play in which a winner can be defined by objective means. Sports training therefore directly and indirectly aim at improving the personality of the sportsman. No wonder, therefore sports training is an educational process (**Singh, 1991).** Motor fitness means to share responsibility without undue stress, fatigue and help in the quality of health and wellbeing. So that the players should have motor fitness such as speed, agility, power and flexibility. Apart from that player should be sound in technique at the time of play no player speed and movement of the ball and change their technique and fundamental skill in order to execute the movement successfully and it also for the defensive arts skill. Different people have different points of view regarding physical fitness. For a common man a good physique is symbol of physical fitness. In fact physical fitness of a person means the capacity to do the routine work without any fatigue or exertion and after doing his work he has a power to do some more work and recovery is quicker Physical fitness having health plus the capacity to do one's everyday task to engage in recreational pursuits and to meet emergencies when they arise. Physical fitness is used in two close meanings - general fitness and specific fitness based on the ability to perform specific aspects of sports or occupations **(Deason, 1991).**

1.1 Justification of Study

The 'circuit' is split into different exercises, which are known as 'workstations'. An exercise "circuit" is one completion of all prescribed exercises in the program. When one circuit is complete, one begins the first exercise again for the next circuit. It is felt that the plight of Indian hockey is inconsistent. Because the ignorance of latest techniques for our team to play on the synthetic field for which the game is now played. For coaches and also for players ignorant of the new techniques that have to be mastered before they can overwhelm in International outfits. Artificial turf has completely revolutionized the style and system of play. Our players however learned to play hockey on grass and gravel grounds.

1.2 Statement of the Problem

The purpose of the study was find out the effect of circuit training on grass, gravel and synthetic field on motor fitness and performance variables of college Men hockey players.

1.3 Objectives

1.3.1 To find out the effectiveness of circuit Training on grass, gravel and synthetic field on selected motor fitness variables (speed and endurance) of college Men hockey players.

1.3.2 To find out the effectiveness of circuit Training on grass, gravel and synthetic field on selected performance variable (Dribbling) of college Men hockey players.

1.3.3 To find out the superiority effectiveness of circuit Training on grass, gravel and synthetic field on selected motor fitness variables (speed and endurance) and performance variable (Dribbling) of college Men hockey players.

2. METHODOLOGY

2.1 Selection of the Subjects

To achieve the purpose of this study was Effect of Circuit Training on Grass, Gravel and Synthetic Field on Motor Fitness and Performance Variables of College Men Hockey Players. The 80 subjects were randomly selected from 20 subjects grass field in Dhanalakshmi srinivasan of Engineering in Trichy, 20 subjects gravel field in SRM college of Engineering ,Trichy and 20 subjects synthetic turf field in J J college of Engneering, Trichy, tamil nadu, during the academic year 2019 - 2020. The subject's age ranged between 17-24 years only. They were randomly divided into four equal groups. Circuit training group in different fields such as Grass, Gravel and Synthetic Fields

and the other group was control group. All the subjects were healthy and physically fit. The nature and importance of the study was explained to the subjects and subjects expressed their willingness to serve as subjects in this study. The study was formulated as pre and post test random group design.

2.2 Selection of Variables

2.2.1 Dependent Variables

Fitness Variables- Speed and Cardiovascular Endurance

Performance Variable- Dribbling

2.2.2 Independent Variables

Experimental group I - Circuit training on grass field

Experimental Group II - Circuit training on gravel field

Experimental Group III - Circuit training on synthetic field

Group IV -Control Group.

2.3 Research Design

The study was formulated as a true random group design, consisting of a pre test and post test. The subjects (n=80) were randomly assigned to three equal groups of twenty college men hockey players for each. The groups were assigned as three Experimental Groups respectively the Experimental group I underwent circuit training on grass field whereas experimental group II underwent circuit training on gravel field and experimental group III underwent circuit training on synthetic field. The different stations for both experimental group I, experimental group II and experimental group III were similar and the duration of exercises also was the same, only thing which differentiated both was the different fields. The training was carried out only on week days. Group III was the control group which did not participate in any training except their daily routines. Pre tests were conducted for all the subjects on selected motor fitness variables such as speed and Cardio Vascular endurance and Performance variable of dribbling. The experimental groups participated in their respective circuit training in different fields like that grass, gravel and synthetic field. The training programme alternate days of twelve weeks. The post tests were conducted on the above said dependent variables after the experimental period of twelve weeks for all the three groups. The training programme was scheduled at 6.30 to 7.30 a.m. on week days excluding Sundays.

TABLE 1
NAMES OF VARIABLES, TESTS/ TOOLS ADMINISTERED AND THE UNIT MEASUREMENT

SL. No	Criterion Variables	Test Items	Unit of measurements
1.	Speed	50 mts run	In seconds
2.	Cardio vascular Endurance	Harvard step test	Pulse counted
3.	Dribbling	"W" form dribbling test	In seconds

2.4 Training Programme

TABLE 2
LAYOUT OF THE STUDY DESIGN

1	Treatments	Circuit training exercise
2	Frequency	3 days/week
3	Total duration	12 weeks
4	Duration /session	40 minutes
5	Intensity	45-60%HRmax
6	Exercise days	Alternate days
7	Time of training	Morning (6:20-7.20:00 am)

2.5 Training Schedule

TABLE 3
EXPERIMENTAL GROUP OF CIRCUIT TRAINING ON GRASS, GRAVEL AND SYNTHATIC FIELDS

Period	Exercise	Duration (Seconds)	Intensity	Repetition	Set	Recovery Period
1-3	Sit ups, Half squats, Stick jumps, Burpees Body squats, Pushups, Mountain climber and Two legged low hops on spot.	40	45%	3	3	3 Minutes
4-6	Sit ups, Half squats, Stick jumps, Burpees Body squats, Pushups, Mountain climber and Two legged low hops on spot.	45	50%	3	3	3 Minutes
7-9	Sit ups, Half squats, Stick jumps, Burpees Body squats, Pushups, Mountain climber and Two legged low hops on spot.	50	55%	3	3	3 Minutes
10-12	Sit ups, Half squats, Stick jumps, Burpees Body squats, Pushups, Mountain climber and Two legged low hops on spot.	55	60%	3	3	3 Minutes

2.6 Statistical Techniques

The initial and the final readings derived from the experimental and the control group underwent a procedure of statistical analysis using ANCOVA i.e. The SPSS Package version 24.00. The level of significance chosen was at 0.05 level. To find out the significant differences Scheffe's post hoc test was used as suggested by Clarke and Clarke.

3. RESULTS

TABLE 4
ANALYSIS OF COVARIANCE ON SPEED

	Control Group	Grass field	Gravel field	Synthetic field	SOV	SS	df	MS	F Ratio
Pre test mean	7.70	7.74	7.73	7.69	**B**	0.026	3	0.009	**0.244**
					W	2.691	76	0.035	
Post test mean	7.71	7.31	6.88	6.54	**B**	15.542	3	5.181	**99.78***
					W	3.946	76	0.052	
Adjust post test mean	7.71	7.30	6.87	6.55	**B**	15.305	3	5.102	**113.5***
					W	3.371	75	0.045	
Mean difference	0.01	0.43	0.85	1.15					

* Significant at .05 level

(The table values required for significance at 0.05 level of confidence for 3 and 76 and 3 and 75 are 2.73 and 2.72 respectively).

An examination of Table 4 indicates that the speed scores of pre test means of control, grass, gravel and synthetic groups were 7.70, 7.74, 7.73 and 7.69 respectively. The obtained F-ratio of was 0.244. Since, the 'F' value was less than the required table value of 2.73 for the degrees of freedom 3 and 76, it was found to be statistically insignificant at 0.05 level of confidence.

The post-test means of the control, grass, gravel and synthetic groups were 7.71, 7.31, 6.88 and 6.54 respectively. The obtained F-ratio of was 99.78. Since, the 'F' value was higher than the required table value of 2.73 for the degrees of freedom 3 and 76, and it was found to be statistically significant at 0.05 level of confidence.

The adjusted post-test means of the control, grass, gravel and synthetic groups were 7.71, 7.30, 6.87 and 6.55 respectively. The obtained F-ratio of was 113.51. Since, the 'F' value was higher than the required table value of 2.72 for the degrees of freedom 3 and 75, it was found to be statistically significant at 0.05 level of confidence.

TABLE 5
SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED PAIRED MEANS OF POST-TEST ON SPEED OF CONTROL GROUP AND EXPERIMENTAL GROUPS

Means				Mean Difference	C I value
Control Group	Grass field	Gravel field	Synthetic field		
7.71	7.30			**0.41***	**0.19**
7.71		6.87		**0.84***	
7.71			6.55	**1.16***	
	7.30	6.87		**0.43***	
	7.30		6.55	**0.75***	
		6.87	6.55	**0.32***	

* Significant at 0.05 level

Table 5 reveals the Speed mean differences between the paired adjusted post test means of all. The mean difference between control group and grass field, control group and gravel field, control group and synthetic field, grass field and gravel field, grass field and synthetic field, gravel field and synthetic field were 0.41, 0.84, 1.16, 0.43, 0.75 and 0.32 respectively. Since, the values of mean difference were higher than the confidential interval value of 0.19, it was found to be statistically significant at 0.05 level of confidence.From these results, it was inferred that synthetic field produced better improvement on than the other training groups of gravel, grass and control group.

TABLE 6
ANALYSIS ON CARDIO VASCULAR ENDURANCE COMPUTATION OF ANALYSIS OF COVARIANCE ON CARDIO VASCULAR ENDURANCE

	Control Group	Grass field	Gravel field	Synthetic field	SOV	SS	df	MS	F Ratio
Pre test mean	78.49	77.77	77.73	77.55	**B**	10.293	3	3.431	**2.621**
					W	99.485	76	1.309	
Post test mean	78.40	82.15	86.21	92.53	**B**	2192.89	3	730.936	**178.86***
					W	310.581	76	4.087	
Adjust post test mean	78.02	82.22	86.31	92.73	**B**	2192.25	3	730.762	**201.51***
					W	271.973	75	3.626	
Mean differance	0.09	4.38	8.48	14.98					

* Significant at .05 level

(The table values required for significance at 0.05 level of confidence for 3 and 76 and 3 and 75 are 2.73 and 2.72 respectively).

The Table 6 indicated that the Cardio Vascular Endurance scores of pre test means of control, grass, gravel and synthetic groups were 78.49, 77.77, 77.73 and 77.55 respectively. The

obtained F-ratio of was 2.62. Since, the 'F' value was less than the required table value of 2.73 for the degrees of freedom 3 and 76, it was found to be statistically insignificant at 0.05 level of confidence.

The post-test means of the control, grass, gravel and synthetic groups were 78.40, 82.15, 86.21 and 92.53 respectively. The obtained F-ratio of was 178.86. Since, the 'F' value was higher than the required table value of 2.73 for the degrees of freedom 3 and 76, and it was found to be statistically significant at 0.05 level of confidence.

The adjusted post-test means of the control, grass, gravel and synthetic groups were 78.02, 82.22, 86.31 and 92.73 respectively. The obtained F-ratio of was 201.51. Since, the 'F' value was higher than the required table value of 2.72 for the degrees of freedom 3 and 75, it was found to be statistically significant at 0.05 level of confidence.

TABLE7

SIGNIFICANCE OF DIFFERENCES BETWEEN ORDERED PAIRED MEANS OF POST -TEST ON CARDIO VASCULAR ENDURANCE OF CONTROL GROUP AND EXPERIMENTAL GROUPS

Means				Mean Difference	C I value
Control Group	Grass field	Gravel field	Synthetic field		
78.02	82.22			**4.2***	**1.71**
78.02		86.31		**8.2***	
78.02			92.73	**14.7***	
	78.02	86.31		**4.09***	
	78.02		92.73	**10.5***	
		86.31	92.73	**6.4***	

* Significant at 0.05 level

Table 7 reveals cardio vascular endurance mean differences between the paired adjusted post test means of all groups. The mean difference between control group and grass field, control group and gravel field, control group and synthetic field, grass field and gravel field, grass field and synthetic field, gravel field and synthetic field were 4.2, 8.2, 14.7, 4.09, 10.5 and 6.4 respectively. Since, the values of mean difference were higher than the confidential interval value of 1.71, it was found to be statistically significant at 0.05 level of confidence. From these results, it was inferred that synthetic field produced better improvement on than the other training groups of gravel, grass and control group.

TABLE 8

ANALYSIS ON DRIBBLING COMPUTATION OF ANALYSIS OF COVARIANCE ON DRIBBLING

	Control Group	Grass field	Gravel field	Synthetic field	SOV	SS	df	MS	F Ratio
Pre test mean	15.51	15.45	15.46	15.47	**B**	0.038	3	0.013	**2.00**
					W	0.480	76	0.006	
Post test mean	15.50	15.23	15.07	14.87	**B**	4.149	3	1.383	**120.04***
					W	0.876	76	0.012	
Adjust post test mean	15.48	15.23	15.07	14.87	**B**	3.956	3	1.319	**117.34***
					W	0.843	75	0.011	
Mean differance	0.01	0.22	0.39	0.60					

* Significant at .05 level

(The table values required for significance at 0.05 level of confidence for 3 and 76 and 3 and 75 are 2.73 and 2.72 respectively).

The Table 8 indicated that the Dribbling scores of pre test means of control, grass, gravel and synthetic groups were 15.51, 15.45, 15.46 and 15.47 respectively. The obtained F-ratio of was 2.00. Since, the 'F' value was less than the required table value of 2.73 for the degrees of freedom 3 and 76, it was found to be statistically insignificant at 0.05 level of confidence.

The post-test means of the control, grass, gravel and synthetic groups were 15.50, 15.23, 15.07 and 14.87 respectively. The obtained F-ratio of was 120.04. Since, the 'F' value was higher than the required table value of 2.73 for the degrees of freedom 3 and 76, and it was found to be statistically significant at 0.05 level of confidence.

The adjusted post-test means of the control, grass, gravel and synthetic groups were 15.48, 15.23, 15.07 and 14.87 respectively. The obtained F-ratio of was 117.34. Since, the 'F' value was higher than the required table value of 2.72 for the degrees of freedom 3 and 75, it was found to be statistically significant at 0.05 level of confidence.

TABLE 9
SCHEFFE'S POST TEST FOR THE DIFFERENCE BETWEEN THE ADJUSTED POST-TEST PAIRED MEANS OF DRIBBLING (SCORES IN SECONDS)

Means				Mean Difference	CI value
Control Group	Grass field	Gravel field	Synthetic field		
15.48	15.23			**0.25***	0.09
15.48		15.07		**0.41***	
15.48			14.87	**0.61***	
	15.23	15.07		**0.16***	
	15.23		14.87	**0.36***	
		15.07	14.87	**0.20***	

* Significant at 0.05 level

Table 9 reveals the dribbling mean differences between the paired adjusted post test means of all groups. The mean difference between control group and grass field, control group and gravel field, control group and synthetic field, grass field and gravel field, grass field and synthetic field, gravel field and synthetic field were 0.25, 0.41, 0.61, 0.16, 0.36 and 0.20 respectively. Since, the values of mean difference were higher than the confidential interval value of 0.09, it was found to be statistically significant at 0.05 level of confidence. From these results, it was inferred that synthetic field produced better improvement on than the other training groups of gravel, grass and control group.

4. DISCUSSION

Hockey is very powerful, intermittent sport. The typical player performs for to twenty min to sixty minutes game. This high-intensity bursts with quick changes in velocity and duration a wide variety of motor skills and a high level of fitness to complete successfully at an elite level. As any coach or physical educator knows, one of the primary objectives of a training program is to obtain the greatest possible work load with the smallest physiological strain.

4.1 Speed

Speed of movement is a praised quality in hockey. Speed differs from individual to individual and also between the different playfields like that grass, gravel and synthetics. **Yadav (2017**) supported that the effects of circuit training and fartlek training on selected physical fitness variables (speed and endurance) of the male school children's the physical fitness

variables signifince improvement of circuit training, The speed no significant proved of between experimental groups. **Ucan (2015)** investigates the effects of national-level field hockey on physical fitness and body-composition parameters in Turkish females. Results suggest that regular participation to hockey training programs improves the speed. **Meethal and Najeeb (2013)** suggested three groups namely mud circuit training group, concrete circuit training group and control group. The result of the study clearly indicated that the mud circuit training group had improved the speed to a greater than concrete circuit training group. In this study among the circuit training on grass is better than circuit training on gravel. Circuit training on gravel is better than compared with circuit training on synthetic field. However no significant improvement was observed in speed between control groups. Circuits training on synthetic field have shown statistically better speed.

4.2 Cardiovascular Endurance

Hockey is a game in which endurance is of prime importance. Hence endurance occupies an important place in the game of hockey. Taking into consideration of the above facts endurance was selected as motor variable for this study. **Deepender and Pal (2017)** the purpose of the current study was to determine the effect of circuit training on the cardiovascular endurance (**Sonchan, Moungmee, Sootmongkol, 2017).** This study aimed to examine the effects of a circuit training program on cardiovascular endurance. The circuit training program improved cardiovascular endurance of the study subjects. **Mayorga-Vega (2013)** investigated that the effects of a circuit training program was effective to increase and maintain cardiovascular endurance among school children. In this study among the circuit training on grass is better than circuit training on gravel. Circuit training on gravel is better than compared with circuit training on synthetic field. However no significant improvement was observed in speed between control groups. Circuits training on synthetic field have shown statistically better on cardio vascular endurance.

4.3 Dribbling

Dribbling in hockey is an important aspect of individual tactics. The results are in conformity with the following findings of **Bose (1999)** had conducted An Analytical Study of Physical and Performance Variables of University and State men Hockey players, playing at different playing surfaces. The dribbling variables of university men hockey players were found better in the artificial surface and gravel surface. In this study among the circuit training on grass is better than circuit training on gravel. Circuit training on gravel is better than compared with circuit training on synthetic field. However no significant improvement was observed in speed between control groups. Circuits training on synthetic field have shown statistically better on dribbling.

5. CONCLUSIONS

It is concluded that three experimental groups namely Circuit training on grass fields, Circuit training on gravel fields and Circuit training on synthetic fields group have achieved significant improvement as compared to control group towards improving motor fitness variables such as speed and cardio vascular endurance. Circuit training on grass fields, gravel fields and synthetic fields there was significant difference on speed and cardio vascular endurance. The motor fitness variables of speed and cardio vascular endurance were better in the synthetic field with compare of grass and gravel fields.

It is concluded that three experimental groups namely Circuit training on grass fields, gravel fields and synthetic fields group have achieved significant improvement as compared to control group towards improving performance variable such as dribbling for hockey. Circuit

training on grass fields, gravel fields and synthetic fields group there was significant difference of dribbling for hockey. The performance variable of dribbling shows performed in the synthetic field was better than the grass and gravel fields.

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