STAR
Research Journal

Available online at www.starresearchjournal.com (Star International Journal)
PHYSICAL EDUCATION
UGC Journal No: 63023

INFLUENCE OF STAIR CLIMBING AND SAND DUNE RUNNING ON STRENGTH ENDURANCE AND CARDIO RESPIRATORY ENDURANCE AMONG FOOTBALL PLAYERS

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Abstract

Stair climbing and sand dune running trainings are suitable exercises to burn fat and improves the condition of heart and lungs. They are creative, fun and very challenging patterns of movement, that is, on and off stair case can challenge the legs, footsteps and arms also. The aim of this research is to find out the effect of stair climbing and sand dune running on strength endurance and cardio respiratory endurance among football players. For this purpose, randomly selected thirty football players from different departments of Annamalai University were divided into three groups, stair climbing, sand dune running and control group. Stair climbing exercise group after a warm up for 5 minutes underwent climbing stairs having 18 steps with vertical height of 3 meters with variation of slow, medium, high, medium and slow speed walk and sprints alternatively and finished each session with cool down exercises. Sand Dune running group, after a warm up for 5 minutes underwent climbing sand dune with vertical height of 4 meters and elevation at 45^{o} with variation of slow, medium, high, medium and slow speed running alternatively and finished each session with cool down exercises and the sessions lasted for 40 minutes in each day, on alternate days, forming three days a week. Statistical analysis of pre and post test means through ANCOVA and Scheffe's post hoc test proved that there was significant improvement in selected endurance variables, strength endurance and cardiorepiratory endurance due to stair climbing training and sand dune running. Sand dune running made significant improvements in cardio respiratory endurance and failed to significantly influence strength endurance. It was concluded that stair climbing can be better utilized for improving endurance variables than sand dune running, especially among football players.

Keywords: Stair Climbing, Sand Dune Running, Strength Endurance, Cardio respiratory Endurance.

INTRODUCTION

Stair climbing training is a suitable exercise to burn fat and improves the condition of heart and lungs. Lejeune TM, et.al. (1996) reported that walking or running on sand, has a profound effect on the mechanics and energetics of locomotion. Walking on sand requires 2.1-2.7 times more energy expenditure than does walking on a hard surface at the same speed; while running on sand requires 1.6 times more energy expenditure than does running on a hard surface.

"Physical Fitness provides capacity for doing all types of activities" Willgoose(1961). Currently there is wide interest to identify the most effective methods of training for strength and endurance development and this is of special significance for physical education programmes in schools and colleges. Training is usually defined as systematic process of repetitive, progressive exercise or work involving the learning process and acclimatization. (Lawrence Gray Kumar, 2002). Evidences show the difference between the trained and untrained individuals that the former is able to increase the cardiac output and transport oxygen to the working muscles at a higher rate than the latter.(Clark and Albert, 1952). Muramatsu S, et.al. (2006) investigated the energy expenditure of jumping on sand and on a firm surface and found the energy expenditure of jumping in the sand condition was equivalent to 119.4 +/- 10.1% of the one in the firm surface condition, which ratio was less than in walking and close to in running.

Moritz CT, and Farley CT. (2006) found that humans simultaneously adjust leg compression magnitude and timing, as well as mechanical work output, to conserve center of mass dynamics on damped surfaces, hence runners may use similar strategies on natural energy-dissipating surfaces such as sand, mud and snow for improved strength endurance. The purpose of this research is to find out the effect of stair climbing and sand dune running on strength endurance and cardio respiratory endurance among football players.

MATERIALS & METHODS

To achieve the purpose pre and post test random group research design was adapted and thirty football players from various departments of Annamalai University, were randomly selected and their age group was between 18 to 23 years. They were divided into three groups (n = 10) as Group I, Group II and Group III, in which Group I underwent stair climbing and

Group II underwent sand dune running for a period of eight weeks and Group III acted as control group. Stair climbing exercise group after a warm up for 5 minutes underwent climbing stairs having 18 steps with vertical height of 3 meters with variation of slow, medium, high, medium and slow speed walk and sprints alternatively and finished each session with cool down exercises. Sand Dune running group, after a warm up for 5 minutes underwent climbing sand dune with vertical height of 4 meters and elevation at 45^{o} with variation of slow, medium, high, medium and slow speed running alternatively and finished each session with cool down exercises and the sessions lasted for 40 minutes in each day, on alternate days, forming three days a week.

The investigator selected criterion variables Strength endurance, assessed by Bent knee sit ups, and Cooper's 12 minutes run / walk test for measuring cardio respiratory endurance of the subjects were selected as endurance variables. The collected data prior to and after completion of the experimental period on selected variables were statistically examined by applying Analysis of Covariance (ANCOVA). In all the cases to test the significance, 0.05 level of confidence was fixed. Since three groups were involved, whenever significant results were found, Scheffe's post-hoc test was used to find out the significant difference between the paired means of groups.

RESULTS

TABLE 1
RESULTS ON CALCULATION OF ANALYSIS OF COVARIANCE ON ENDURANCE VARIABLES

Calculation of Analysis of Covariance on Strength Endurance								
	Stair Climbing Group	Sand Dune Running Group	Control Group	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	39.10	40.80	40.70	Between	18.2	2	9.10	0.60
				Within	412.6	27	15.28	
Post Test Mean	44.40	43.10	41.50	Between	42.2	2	21.10	1.34
				Within	423.8	27	15.70	
Adjusted Post Test Mean	45.40	42.55	41.04	Between	94.5	2	47.25	15.24*
				Within	80.6	26	3.10	
Mean Diff	5.30	2.30	0.80					
Calculation of Analysis of Covariance on Cardiorespiratory Endurance								
Pre Test Mean	1994	2059	2086	Between	44727	2	22363	1.28
				Within	473370	27	17532	
Post Test Mean	2245	2185	2109	Between	92907	2	46453	2.75
				Within	455390	27	16866	
Adjusted Post Test Mean	2285	2175	2078	Between	196986	2	98493	14.85*
				Within	172391	26	6630	
Mean Diff	251	126	23					

Required $F_{(0.05)\,(2,27)} = 3.354$, $F_{(0.05),\,(2,26)} = 3.369$ *Significant

TABLE 2
SCHEFFE'S POST HOC ANALYSIS RESULTS

Post Hoc Analysis for Strength Endurance				
Stair Climbing Group	Sand Dune Running Group	Control Group	Mean Difference	Reqd. C.I
45.40	42.55		2.85*	2.04
45.40		41.04	4.36*	2.04
	42.55	41.04	1.51	2.04
Post Hoc Analysis for Cardiorespiratory Endurance				
2285.46	2175.21		110.26*	94.53
2285.46		2078.33	207.13*	94.53
	2175.21	2078.33	96.88*	94.53

*Significant

DISCUSSION

The results presented in Table 1 and 2 proved that stair climbing has significantly improved strength endurance, as measured by bent knee sit ups than sand dune running and control groups. It was also found that stair climbing and sand dune running trainings were significantly improved cardio respiratory endurance comparing to control group. While comparing between the treatment groups, it was found that stair climbing is better than sand dune running.

Lejeune TM, et.al. (1996) reported sand running requires 1.6 times more energy expenditure than does running on a hard surface. Muramatsu S, et.al. (2006) investigated and found the energy expenditure of jumping on sand was less than in walking and close to in running. Moritz CT, and Farley CT. (2006) suggested runners may use surfaces such as sand, mud and snow for improved strength endurance.

Gottschall JS et.al. (2010) recommend for double step stair climbing for improved metabolic and muscular strength. Koegelenberg CF, et.al. (2008) was of view that stair climbing may replace formal exercise testing at much lower costs. The findings of this study are in agreement with the theoretical knowledge cited in respect of stair climbing and sand dune running.

CONCLUSION

1. It was concluded that the Stair Climbing and Sand dune running programs has resulted in significant improvement on selected criterion variables as compared to control group.
2. It was concluded that stair climbing can be better utilized for improving endurance variables than sand dune running, especially among football players.

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