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INFLUENCE OF SAND PLYOMETRIC AND SAND AEROBIC TRAINING ON RESTING HEART RATE AND VITAL CAPACITY OF HOCKEY PLAYERS

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Abstract

The aim of this study was to find out the effect of sand plyometric training and sand aerobic training on resting heart rate and vital capacity of hockey players. 60 hockey players (N=60) were randomly selected and divided into 3 groups. Group I underwent sand plyometric training (SPTG), Group II underwent sand aerobic training (SATG) and Group III as control group. The subjects underwent 12 weeks experimental treatment. Prior to and after the experimental period speed and muscular endurance of the subjects were measured. The pre and post test score were subjected to statistical analysis using ANCOVA. The results showed that the obtained F value 13.37 and 10.41 on resting heart rate and vital capacity respectively were significant at 0.05 level. The post hoc analysis results proved that paired mean comparison between sand plyometric training and control group and sand aerobic training and control group were significant for both resting heart rate and vital capacity and there was no significant difference between treatment groups. It was concluded that sand plyometric training and sand aerobic training has significantly increased the relative exercise intensity and training load, subsequently leading to superior improvements in aerobic fitness, resting heart rate and vital capacity of hockey players.

Introduction

Sand plyometric training is a simple, low-impact form of resistance training. Running on dry sand requires 1.6 times more energy than running on stable surfaces, and walking in sand requires 2.1 to 2.7 times more energy. This increased resistance helps improve quickness and builds explosive strength because your muscles experience a greater workload during training exercises. Sand plyometric training is easier on your joints than working out on stable ground. Sand workouts help alleviate compression forces on the joints during running, jumping, and walking. Sand plyometric workouts are great for improving an athlete's cutting ability because the resistance of the sand makes it easier to achieve the ideal 45-degree body angle when accelerating out of a cut. Sand plyometric training will help athletes increase their speed, vertical jump, balance and core stability The reason sand is such a great surface to train on is a matter of simple physics: for every action there is an equal and opposite reaction. If you jump on a solid surface, energy is transferred into your jump to propel you upward. If you jump on sand, your energy still propels you up, but it also moves the sand, which limits the amount of force propelling your jump. It's almost like adding more weight to an exercise. Sand is also forgiving, reducing the impact on your joints during exercise, helping to preserve joint health and lowering the chance of injury. (William and Sperryn, 1976).The major benefits of aerobic exercises are stronger and more efficiently operating heart and lungs, more energy physical flexibility, conditioned muscles, proper use of fats and effective burning of calories. The increased oxygen flow gained through aerobics re-energies by giving any one more energy and a "re-awakening" of his senses. In other words, as the heart pumps more blood with fewer beats the body systems are in sync, allowing the subject to take in more oxygen. When everything is operating smoothly, your body can efficiently transport and utilize oxygen with no obstructions the nucleus of this whole system is the heart. Each heart beat is responsible for propelling the oxygenated blood through the proper blood vessels. Aerobic training will produce an increased capacity for pumping larger volumes of blood to accommodate the need for extra energy and extra oxygen. (Hardayal Singh. 1991).Slimani M et.al. (2016) critically review the available literature related to plyometric training (PT) and its effects on physical fitness in team sport athletes and reported that available evidence suggests that short-term PT on non-rigid surfaces (i.e. aquatic, grass or sand-based PT) could elicit similar increases in jumping, sprinting and agility performances as traditional PT. Arazi H et.al. (2014) compared the effects of plyometric training on sand vs. land surface on muscular performance adaptations in men and recommended that athletes can use sand for improving agility and strength. Binnie MJ et.al. (2014) compared the use of sand and grass training surfaces throughout an 8-week conditioning programme in well-trained female team sport athletes (n = 24). Performance testing was conducted pre- and post-training and included measures of leg strength and balance, vertical jump, agility, 20 m speed, repeat speed (8 × 20 m every 20 s), as well as running economy and maximal oxygen consumption (VO2max). Heart rate (HR), training load (rating of perceived exertion (RPE) × duration), movement patterns and perceptual measures were monitored throughout each training session. Results showed a significantly higher ($P < 0.05$) HR and training load in the SAND versus GRASS group throughout each week of training, plus some moderate effect sizes to suggest lower perceptual ratings of soreness and fatigue on SAND. Significantly greater ($P < 0.05$) improvements in VO2max were measured for SAND compared to GRASS. These results suggest that substituting sand for grass training surfaces throughout an 8-week conditioning programme can significantly increase the relative exercise intensity and training load, subsequently leading to superior improvements in aerobic fitness. These review of related literature proved that there was further scope for research to find out the influence of sand plyometric and sand aerobic training on resting heart rate and vital capacity of hockey players.

Methodology

Subjects

60 intercollegiate level men hockey players were selected randomly from different colleges in Chennai. They were in the age group of 19 to 25 years. They were divided into three groups, namely, sand plyometric training group (SPTG), sand

aerobic training group (SATG) and control group (CG) consisting of 20 in each.

Variables

The dependent variable resting heart rate was measured through palpation methods and scores recorded in number of beats per minute and vital capacity through spirometer and scores recorded in milliliters (Donald K. Mathews, (1978). The independent variables were 12 weeks SPTG and 12 weeks SATG.

Research design and statistical applications

Randomly selected 60 intercollegiate level men hockey players were divided into 3 groups, namely sand plyometric training group (SPTG), sand aerobic training group (SATG) and control group (CG) consisting of 20 in each group. Prior to the experimental treatment, all the subjects were measured of their resting heart rate and vital capacity using standard tests which formed the initial scores of the subjects. SPTG group were asked to perform Jump and Tuck, Standing long jump and hops with adequate repetitions on beach sand for 12 weeks. SATG group was asked to perform walking, jogging, fast walking and fast run in alternatively with adequate repetitions on beach sand for 12 weeks. In order to draw up a proper schedule of work outs, a pilot study was conducted in which phase training schedules for the experimental designs were well laid out and practiced and tested. After the experimental treatment on the respective training methods, the subjects were again tested of their speed and muscular endurance which formed the final scores of the subjects. The differences between the initial and final scores were considered as the effect of respective treatments. To test statistically ANCOVA was used and in all cases 0.05 level was fixed.

Results

Tab 1: ANCOVA Results Due to 12 weeks Sand Plyometric and Sand Aerobic Training among Hockey players

TESTS	SPTG	SATG	CG	SOV	Sum of Squares	Df	Mean Squares	Obtained F
ON RESTING HEART RATE								
Pre Test Mean	71.60	71.60	70.00	Between	34.13	2	17.07	0.45
				Within	2171.60	57	38.10	
Post Test Mean	67.75	67.05	69.85	Between	84.93	2	42.47	2.44
				Within	993.25	57	17.43	
Adjusted Post Test Mean	67.45	66.75	70.45	Between	151.56	2	75.78	13.37*
				Within	317.49	56	5.67	
Mean Diff	-3.85	-4.55	-0.15					
ON VITAL CAPACITY								
Pre Test Mean	3215.25	3264.00	3217.00	Between	30590.83	2	15295.42	0.34
				Within	2602173.75	57	45652.17	
Post Test Mean	3410.00	3411.50	3211.50	Between	529363.33	2	264681.67	

				Within	2324110.00	57	40773.86	6.49*
Adjusted Post Test Mean	3420.84	3390.95	3221.21	Between	463064.45	2	231532.22	
				Within	1245577.26	56	22242.45	10.41*
Mean Diff	194.75	147.50	-5.50					

SPTG: Sand Plyometric Training Group SATG : Sand Aerobic Training Group
CG : Control Group SOV : Source of Variance
*Significant at 0,05 level.

Tab 2: Scheffe's Post Hoc Analysis – Multiple Paired Mean Comparisons of Adjusted Means of Hockey Players

SPTG	SATG	CG	MEAN DIFF	Reqd. C.I
On Resting Heart Rate				
67.45	66.75		0.70	1.89
67.45		70.45	2.99*	1.89
	66.75	70.45	3.69*	1.89
On Vital Capacity				
3420.84	3390.95		29.89	118.56
3420.84		3221.21	199.63*	118.56
	3390.95	3221.21	169.74*	118.56

***Significant at 0.05 level**

Conclusion

The results presented in Table I showed that the obtained F value 13.37 on adjusted means was greater than table F value of 3.16 to be significant at 0.05 level. This was due to the fact that the sand plyometric training and sand aerobic training significantly influenced resting heart rate of the hockey players comparing to control group. Similarly the obtained F value of 10.41 was significant at 0.05 level on vital capacity of hockey players. The post hoc analysis results presented in Table 2 proved that paired mean comparison between sand plyometric training and control group and sand aerobic training and control group were significant for both resting heart rate and vital capacity and there was no significant difference between treatment groups. This may be because of the fact that substituting sand for grass training surfaces throughout the experimental treatment has significantly increased the relative exercise intensity and training load, subsequently leading to superior improvements in aerobic fitness, resting heart rate and vital capacity.

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