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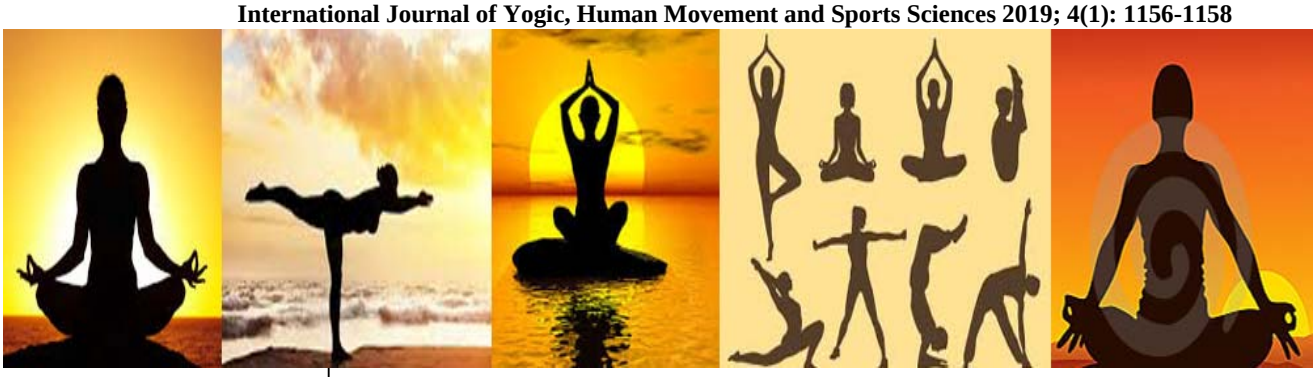

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Effect of varied combinations of aerobic and anaerobic training with game specific drills on selected motor fitness variables of field hockey players

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Abstract
Field hockey is a team sports which has a long history. The gradual modification of the game from time to time further increased the speed of play and accordingly modified physiological need of the game. The recent studies clearly showed that field hockey is high intensity intermittent game. The present study was focused effect of varied combinations of aerobic and anaerobic training with game specific training on selected motor fitness variables of field hockey players. To achieve the purpose of the study, 48 intercollegiate male (21±2 years) field hockey players were randomly selected and they were divided into three groups consisting of sixteen each (N = 16). Experimental group-1 underwent Combination-1 HALAN and experimental group-2 Combination-2 LAHAN programme for 3 days per week of 12 weeks. Third group acted as control group was not exposed to any treatment. Test was administered before and after the training programme on speed and cardio-respiratory endurance. Statistical results of the study showed that significant difference among groups after the training programmes. The Combination-2 LAHAN programme produced better improvement than the Combination-1 HALAN programme over selected variables. Since, Combination-2 LAHAN is time concern and one of the best protocols for field hockey players to improve motor fitness variables field hockey players.

Keywords: Anaerobic, aerobic, field hockey, speed, cardio-respiratory endurance

Introduction
Field hockey is a team sports which has a long history over the era. The game field hockey officially evaluated in British. Field hockey played with equal number of opponent on the field both of them trying to put the ball an opponent's goal in order to score a goal. Each player carries a stick, only the players permitted to play the ball with the flat side of the stick (FIH, 2017) [6]. In beginning, the game was played mud and grass surface, the innovation of synthetic surface revolutionized the game (Spencer *et al.*, 2004) [13]. The introduction of synthetic surface and construction of modern sticks produced greater impact on speed of the game, duration of ball in play and players kill (Shepard and Astrand, 2000 and Spencer *et al.*, 2004) [12, 13]. The gradual modification of the game from time to time further increased the speed of play and accordingly modified physiological need of the game (Pearson and Naylor, 2003) [11]. To compare the game field hockey with other team events like soccer, rugby, etc., the results provide some useful information on physical demands of the game or to prepare appropriate training programme for the hockey (Stango, 2005) [14]. At the end of 20th century most of studies provide information for hockey depends aerobic energy system, so that training programme also aims aerobic power players (Shepard and Astrand, 2000) [12]. The global positioning system (GPS) analysis showed that the field hockey players involve walking, jogging, sprinting, change of direction in speed manner during the attack and defense with or without ball. This innovation showed that hockey demands both aerobic and anaerobic energy pathway (Hinrichs *et al.*, 2010 and Bloomfield *et al.*, 2007) [5, 2]. To assess the athletes in a regular interval during the field hockey training indicates load of the programme. The high intensity intermittent activities during the competition require more aerobic and anaerobic energy (Manna *et al.*, 2010). The recent studies clearly showed that field hockey need high amount of physical, physiological and skill performance. Thus, focusing suitable training programme for fulfill the need of athletes can achieve their specific goal only through

structured training programme (Muniraj, 2014 and Bompa and Haff, 2009) [10, 3]. The present study was focused effect of varied combinations of aerobic and anaerobic training with game specific training on selected motor fitness variables of field hockey players.

Methods

Selection of subjects

To achieve the purpose of the study, 48 intercollegiate male field hockey players were randomly selected from SRMV Maruthi College of Physical Education, RKMV Vivekananda Educational and Research Institute and SRKV Arts College, Coimbatore, Tamil Nadu. Their age ranged from 18 to 23 years. They were divided into three groups consisting of sixteen each (N = 16). There were two experimental groups and one control group. The experimental groups under gone their respective training for 3 days per week for a period of 12 weeks and no treatment for control group.

Selection of variables and criterion measures

After reviewing available scientific studies and within the limitation of availability the following motor fitness variables were selected for this study.

1. Speed- 30m sprint test (Gevat *et al.*, 2012) [4].
2. Cardio-respiratory endurance- Yo-Yo intermittent test level 1 (Bangsbo *et al.*, 2008) [1].

Training programme

The selected subjects divided into three groups consist of 16 each. Experimental group-1 underwent high aerobic and low anaerobic with game specific drills [Combination-1 HALAN (high frequency aerobic training (2days) and low frequency anaerobic training (1day))] and experimental group-2 underwent low aerobic and high anaerobic with game specific drills [Combination-2 LAHAN (low frequency aerobic training(1day) high frequency anaerobic training (2days))] for 3 days per week of 12 weeks. Third group acted as control group was not exposed to any treatment.

Statistical techniques

The data were collected from the subjects before and after the training were analysed by ANCOVA. Whenever 'F' shows significant difference among group post hoc test (Bonferroni) was adopted to find the significant between the groups. The collected data were analysed by using SPSS software for window at 0.05 level of confidence.

Results

The numerical form of collected data would not provide any information unless it is critically analysed and interpreted. The data of subjects selected motor fitness variables were analysed and the results were given below tables.

Table 1: Computation of analysis of covariance on speed (scores in seconds)

Test	HALAN	LAHAN	CG	Source of variance	Sum of Square	df	Mean Square	F-ratio
Pre-test Mean	5.43	5.42	5.42	B / S	0.001	2	0.0005	0.05 (p=0.95)
				W / S	0.23	45	0.005	
Post-test Mean	5.36	5.32	5.40	B / S	0.05	2	0.025	4.33* (p=0.01)
				W / S	0.26	45	0.006	
Adjusted Post-test Mean	5.35	5.32	5.40	B / S	0.057	2	0.029	32.52* (p=0.01)
				W / S	0.039	44	0.001	

*Significant at 0.05 level

Table 1 reveals the computation of 'F' ratios on pre test, post test and adjusted post test means of HALAN, LAHAN and CG on speed. The obtained 'F' ratio for the pre test on speed was 0.05. Since, the 'p' value was lesser than the confidence interval and it was found to be statistically not significant at 0.05 level of confidence. Further, the 'F' ratio for post test and adjusted post test means of HALAN, LAHAN and CG on speed were 4.33 and 32.52 respectively. Since, the 'p' value was higher than the confidence level and it was found to be statistically significant at 0.05 level of confidence.

Table 2: Computation of analysis of covariance on cardio-respiratory endurance (Scores in Meters)

Test	HALAN	LAHAN	CG	Source of variance	Sum of Square	df	Mean Square	F-ratio
Pre-test Mean	1680.00	1675.00	1677.50	B / S	200.00	2	100.00	0.04 (p=0.96)
				W / S	106700.00	45	2371.11	
Post-test Mean	1750.00	1810.00	1692.50	B / S	110466.66	2	55233.33	26.14* (p=0.01)
				W / S	95100.00	45	2113.33	
Adjusted Post-test Mean	1748.39	1811.61	1692.5	B / S	113570.83	2	56785.42	48.87* (p=0.01)
				W / S	51123.89	44	1161.91	

*Significant at 0.05 level

Table 2 reveals the computation of 'F' ratios on pre test, post test and adjusted post test means of HALAN, LAHAN and CG on cardio-respiratory endurance. The obtained 'F' ratio for the pre test on cardio-respiratory endurance was 0.04. Since, the 'p' value was lesser than the confidence interval and it was found to be statistically not significant at 0.05 level of confidence. Further, the 'F' ratio for post test and adjusted post test means of HALAN, LAHAN and CG on cardio-respiratory endurance were 26.14 and 48.87 respectively. Since, the 'p' value was higher than the confidence level and it was found to be statistically significant at 0.05 level of confidence.

Table 3: Post hoc test (Bonferroni) on adjusted post test means of motor fitness variables of HALAN, LAHAN and control groups

Variables	HALAN	LAHAN	CG	MD	P
Speed	5.36		5.41	0.050*	0.01
		5.32	5.41	0.084*	0.01
	5.36	5.32		0.034*	0.01
CRE	1748.39		1692.50	55.89*	0.01
		1811.60	1692.50	119.10*	0.01
	1748.39	1811.60		63.21*	0.01

*Significant at 0.05 level

Table 3 revealed that the mean differences between the paired adjusted post test means of all groups on speed and cardio-respiratory endurance. The mean difference on speed between HALAN and CG, LAHAN and CG and HALAN and LAHAN were 0.05 seconds, 0.084 seconds and 0.034 seconds respectively. The 'p' values of mean difference were lesser than fixed confidence interval, it is found to be statistically significant at 0.05 level of confidence. The mean difference on cardio-respiratory endurance between HALAN and CG, LAHAN and CG and HALAN and LAHAN were 55.89 meters, 119.10 meters and 63.21 meters respectively. The 'p' values of mean difference were lesser than fixed confidence interval, it is found to be statistically significant at 0.05 level of confidence. The result of post hoc showed that LAHAN programme produced better effects over HALAN programme on selected motor fitness variables.

Discussion

Speed was positively improved by high intensity interval training (Tabata *et al.*, 1996) [15]. Concurrent aerobic training produced better improvement in cardio-respiratory endurance (Kong & Ratamess, 2014) [8]. High intensity interval training combined with game specific small was games enhanced performance of soccer players (Katis and Kellis, 2009) [7]. From the statistical result of this study both Combination-1 HALAN and Combination-2 LAHAN programmes produced better improvement on selected motor fitness variables.

Conclusion

The present study proved that both Combination-1 HALAN and Combination-2 LAHAN programmes were best protocols to bring out desired changes over selected motor fitness variables of field hockey players. Next, the Combination-2 LAHAN programme produced better improvement than the Combination-1 HALAN programme over selected variables. Since, Combination-2 LAHAN is time concern and one of the best protocols for field hockey players to improve motor fitness variables field hockey players.

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