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Alteration in Playing Ability among Female Hockey Players after Strength and Endurance Training Programme Followed by Yoga Practice

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Abstract

The purpose of the study was to find out the effect of strength and endurance training programme followed by yoga practice, on playing ability among female intercollegiate hockey players. For this purpose, 45 female hockey players who were played in various intercollegiate tournaments in the age category between 19 and 25 years were selected for the study. They were divided into three equal groups, each group consisting of fifteen subjects in which two experimental groups and one control group, in which the group I (n=15) underwent strength training followed by yoga practice, group – II (n = 15) underwent endurance training followed by yoga practice for three days (alternative days) per week for twelve weeks and group III (n = 15) acted as control, which did not participate in any training apart from their regular hockey game practice. The subjects were tested on selected criterion variable as hockey playing ability at prior to and immediately after the training period. For testing the hockey playing ability was assessed by administering Stewart Pitchers' Hockey skill test, consists of dribbling, passing and goal shooting. Paired sample 't' test was used to find out any difference between pre- and post-test mean values. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the experimental groups and control group on selected criterion variable separately. Since there were three groups involved in the present study, the Scheffé *S* test was used as post-hoc test. The selected criterion variables such as Stewart Pitchers' Hockey skill test, consists of dribbling, passing and goal shooting were improved significantly for all the training groups when compared with the control group. But there was no significant difference found between the training groups on selected criterion variables.

Keywords: strength training, endurance training, yoga practice, Stewart Pitchers' Hockey skill test.

INTRODUCTION

Hockey is a multidimensional Olympic sport played by both men and women, both informally and professionally, with global appeal, claiming over a million participants annually from 138 countries (Nassif and Raspaud, 2023). One of the most trendy and gainful sports, hockey is trained by both gender at all levels, from amateur to professional (Andres and Myers, 2008).

Hockey is known for its fast-paced nature, which requires intense physical preparation for matches. Strength, speed, ability, and other psychological and physical fitness are all essential for top achievement in this international sport (Kahn, 1999; Burr *et al.,* 2008; and International Hockey Federation, 2019).

Players must combine technical proficiency and physical fitness in the face of fierce competition in hockey, a competitive sport played on uniform fields. During the competition, the hockey players do a variety of actions, including walking, jogging, slow running, repeated sprints, acceleration, and deceleration. These actions are performed by the players during attack or defence, with or without the ball.

Players in this game engage in an intensive, high-energy activity run the chance of acquiring a range of musculoskeletal ailments as it involves atypical movement patterns (Sherker and Cassel, 2002; Dick, *et al.,* 2007). Hockey player's physical fitness levels greatly determine the athletic prowess required (Wang, *et al.,* 2024; Deng, *et al.,* 2024). Like in other team sports, skills like coordination, strength, speed, and quick power are crucial (Şahin and Coskun, 2020). Elite performance in this sport needs different physical traits such as strength, speed, and ability (Burr *et al.,* 2008; Noblett *et al.,* 2023;

Azam *et al.,* 2021). Characterised by the execution of high-intensity activities such as sprints, jumps, agility, and shoots (McGuinness, Malone, and Petrakos, 2019), these manoeuvres are crucial in determining athletic performance (McGuinness, *et al.,* 2020). For that, hockey players require both aerobic as well as anaerobic capability (Bloomfield, *et al.,* 2007; Elferink-Gemser, *et al.,* 2006; Hinrichs, *et al.,* 2006)

The best method for maintaining and building muscle strength is weight exercise, which also directly enhances blood flow. Furthermore, according to David *et al.,* (1999) weight training has been found to diminish vascular stiffness. Several studies (Sander, *et al.,* 2013; and Ingle, Sleap and Tolfrey, 2006) have shown how resistance training effects a young athlete's capacity to account for their maximum strength. Recognise that engaging in hockey-specific resistance-based training may make up a significant amount of ground, particularly for women's hockey. In men's hockey, this is the same. Athletes that play hockey must be quick and aggressive. The shot's speed aims to be amazing. Hockey players, especially those who wish to participate at the top levels of competition, also require strength endurance. Young female hockey players, who regularly participate in hockey training programs had better lower and upper extremity strength, speed, and body composition (Ucan, 2015).

For hockey players to perform well, strength training is essential. It enhances power, speed, performance, and other aspects. To create the ideal training regimen, hockey players should collaborate with certified strength and conditioning experts. A proper program addresses individual requirements, technique and form, and gradual overload. Combining strength training with endurance training leads to a more effective performance (Retrieved from https://www.issaonline.com/blog/post/strength-and-conditioning-hockey-building-endurance-strength-and on 03-12-2025).

Effective hockey coaching can increase motor skills, speed, body balance, stamina, and strength (Elferink-Gemser, *et al.,* 2007; Macutkiewicz and Sunderland, 2011; Podgorski and Pawl, 2011). It is crucial for strength- and resistance-based training regimens to realize that hockey players require strength to complete the necessary motions. It is necessary to utilize isometrics, unilateral work, heavy drop-sets, long-duration sets (walking lunges for more than a minute), or on-the-clock motions (snatch, clean, and jerk).

Cardiovascular training, weight training, and flexibility exercises are typically included in regular exercise regimens. Although regular exercise regimens can enhance the general fitness of hockey players, they may not necessarily be adequate to fulfill the specialised demands necessary for playing hockey (Krishnan and Rajawadha, 2020).

A high level of aerobic fitness is thought to improve recovery time in the high-intensity sport of hockey (Lippi, *et al.,* 2006). Field hockey players engage in frequent, intense workouts, particularly during games, and this is favourably correlated with a number of metabolic markers of aerobic fitness (Aziz, Chia and The, 2000).

In order to develop the stamina needed for hard game play, hockey players require endurance training. They will be more dominant on the rink if they recover more quickly and maintain their energy for longer. A solid endurance regimen involves cardio, strength, and flexibility, focusing on exercises especially tailored for hockey. A good aerobic capacity provides sustainability during sprint efforts (Akbar *et al.,* 2022).

One of the nicest things one can do after working out is yoga. After the weight training or endurance training session, taking ten to fifteen minutes will improve rest, speed up recuperation, and soothe tense or sore muscles. Including yoga in the workout regimen can improve the strength, flexibility, and mobility as well as the attention and mental toughness while enhancing the mind-body connection.

METHODS

The goal of this study was to determine how strength and endurance training followed by yoga practice affected Stewart Pitchers' Hockey skill test, consists of dribbling, passing and goal shooting. 45 female inter-collegiate hockey players were chosen as subjects to accomplish the goal, and further they were divided into three equal groups of fifteen each and further divided as two experimental groups and one control group, in which the group I (n=15) underwent strength training followed by yoga practice, group II (n = 15) underwent endurance training followed by yoga practice for three days (alternative days) per week for twelve weeks, and group III (n=15) acted as control which did not participate in any special training apart from the regular hockey practice sessions. There will be changes to the playing ability and systems with every training regimen. After consulting with the specialists, the researchers decided to use the following variables as criteria: 1. Dribbling, 2. Passing and 3. Goal Shooting from Stewart Pitchers' hockey skill test.

Statistics

The mean and standard deviations (mean ± SD) were calculated as descriptive statistics. The difference between the groups was analysed by using independence sample t-test. The homogeneity of variances was assessed by Levene's tests. The differences, if any, between the corrected post test means on three criteria variables were examined independently using Analysis of Covariance. The Scheffé *S* test was used as a post-hoc test if the adjusted post-test mean's 'F' ratio was shown to be significant. To evaluate the 'F' ratio discovered

using analysis of covariance, the level of significance was set at 0.05 level of confidence.

Descriptive characteristics of the subjects were presented in Table-1. There were no significant differences in all descriptive variables between groups ($p > 0.05$).

Table – 1: Descriptive characteristic of the subjects

Age (Years)	**22.63 ± 0.5**
Height (Centimetre)	159.8 ± 6.4
Weight (Kilogram)	55.6 ± 1.08

The influence of independent variables on each criterion variable was analyzed separately and presented below: To scrutinize if there is any statistically considerable enhancement of strength training followed by yoga practices and endurance training followed by yoga practices on preferred dependent variables were discussed discreetly. Table – 2, 3 & 4 present pre and post-test means and the results of the paired sample 't'-test of strength training followed by yoga practices and endurance training followed by yoga practices, and control group on selected dependent variables such as, Stewart Pitchers' Hockey skill test, consists of dribbling, passing and goal shooting.

Table – 2: Paired sample 't'-test of strength training followed by yoga practice group on selected dependent variables

Name of the Group	**Name of the Dependent Variable**	**Pre-test mean**	**Post-test mean**	**'t'**
Strength Training followed by yoga practice Group	Dribbling	11.53	13.60	8.898*
	Passing	10.53	12.40	8.035*
	Goal Shooting	11.80	13.87	8.60*

* Significant at 0.05 level of confidence. Table value for the level of significance df 14 was 2.145.

Strength training followed by yoga practice group

The paired sample 't' was computed on chosen subordinate factors were introduced in the above table. The 't' value for the percentage of dribbling, passing and shooting were 8.898, 8.035, and 8.60 respectively. All the 't' values are considerably higher than the requisite table value of df 14 at 0.05 level of confidence was 2.145. The after effect of the examination shows that the strength training followed by yoga practices group and endurance training followed by yoga practices group altogether improved the presentation of the relative multitude of chosen dependent variables.

Table – 3: Paired sample 't'-test of endurance training followed by yoga practice group on selected dependent variables

Name of the Group	**Name of the Dependent Variable**	**Pre-test mean**	**Post-test mean**	**'t'**
Endurance Training followed by yoga practice Group	Dribbling	11.13	13.40	9.76*
	Passing	10.40	12.53	9.18*
	Goal Shooting	12.07	13.86	5.48*

* Significant at 0.05 level of confidence. Table value for the level of significance df 14 was 2.145.

Endurance training followed by yoga practice group

The paired sample 't' was computed on chosen subordinate factors were introduced in the above table. The 't' value for the percentage of dribbling, passing and goal shooting were 9.76, 9.18, and 5.48 respectively. All the 't' values are considerably higher than the requisite table value of df 14 at 0.05 level of confidence was 2.145. The after effect of the examination shows that the endurance training followed by yoga practices group altogether improved the presentation of the relative multitude of chosen dependent variables.

Table – 4: Paired sample 't'-test of control group on selected dependent variables

Name of the Group	**Name of the Dependent Variable**	**Pre-test mean**	**Post-test mean**	**'t'**
Control Group	Dribbling	11.33	11.53	0.54
	Passing	10.33	10.40	0.15
	Goal Shooting	12.27	12.00	0.77

Table value for the level of significance df 14 was 2.145.

Control group

The paired sample 't' was computed on chosen subordinate factors were introduced in the above table. The 't' value for the percentage of dribbling, passing and goal shooting were 0.54, 0.15, and 0.77 respectively. All the 't' values are considerably lesser than the requisite table value of df 14 at 0.05 level of confidence was 2.145. The after effect of the examination shows that the control

group altogether did not improve the presentation of the relative multitude of chosen dependent variables.

Justification for using One-Way ANCOVA

One-way univariate analysis of covariance (ANCOVA) was utilized to decide how much dependent variable was affected by independent factors while controlling for a covariate pre-test Analysis of Covariance, changes the mean of each depending variable to what they would be if all groups began similarly on the covariate. In this examination, pretest scores of chosen factors have been appeared to relate with the post-test scores consequently, they were considered as a proper covariate.

Assumption for ANCOVA

A primer investigation was directed to decide if the essential suppositions of ANCOVA were met prior to continuing the nivariate examination. In this way, the assumption of the equality of variance (Levene's test-homogeneity) the linear regression relationship between the covariates and the dependent variables, and homogeneity of regression slopes were examined.

Levene's Test

Levene's test of equality of error variances on selected variables was calculated and presented in table-5.

Table – 5: Levene's test of equality of error variances on selected variables among groups

Variables	F – Ratio	df -1	df -2	Sig.
Dribbling	0.221	2	42	0.803
Passing	1.264	2	42	0.293
Goal Shooting	1.085	2	42	0.347

*The Table value required for 0.05 level of significance with df 2 & 42 is 3.18.

The tests mentioned above demonstrate that the alternative that at least two group variances differ is opposed to the null hypothesis that all group variances are the same (homogeneity of variance).

Table – 6: Analysis of Covariance and 'F' ratio for dribbling, passing and goal shooting of strength training followed by yoga practice group, endurance training followed by yoga practice group, and control group

Variable Name	Group Name	Exp. Group - I	Exp. Group - I	Control Group	'F' Ratio
Dribbling (in Points)	Pre-test Mean ± S.D.	11.52 ± 0.51	1.13 ± 0.64	11.33 ± 0.62	1.70
	Post-test Mean ± S.D.	13.60 ± 0.74	13.40 ± 63	11.53 ± 1.30	22.16*
	Adj. Post-test Mean	13.429	13.572	11.533	30.64*
Passing (in Points)	Pre-test Mean ± S.D.	11.80 ± 0.0.68	12.07 ± 0.80	12.27 ± 0.88	1.32
	Post-test Mean ± S.D.	13.87 ± 0.64	13.89 ± 0.99	12.00 ± 1.00	21.87*
	Adj. Post-test Mean	14.041	13.851	11.842	43.43*
Goal Shooting (in Points)	Pre-test Mean ± S.D.	10.53 ± 0.64	10.40 ± 0.74	10.33 ± 0.82	0.289
	Post-test Mean ± S.D.	12.40 ± 0.63	12.53 ± 0.52	10.40 ± 1.55	20.96*
	Adj. Post-test Mean	12.324	12.549	10.461	24.91*

* Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with df 2 and 42 and 2 and 41 were 3.18 and 3.20 respectively).

Table – 6 shows that the dribbling pre-test "F" ratio value of 1.70 was less than the necessary table value of 3.18 for significant with df 2 and 42 at 0.05 level of confidence. For the post- and adjusted post-test mean 'F' ratio value of 22.16 and 30.64 for the adjusted post-test scores was greater than the necessary table value of 3.20 for significant. According to Table - 6, the pre-test averages of passing test 'F' ratio value of 1.32 was less than the necessary table value of 3.18 for significant with df 2 and 42 at 0.05 level of confidence. For post- and adjusted post-test mean 'F' ratio values of passing were 21.87 and 43.43 was greater than the necessary table value of 3.20 for significant. The goal shooting pre-test values 'F' ratio of goal shooting value was 0.289 which was insignificant. For post- and adjusted post-test mean 'F' ratio values of goal shooting were 20.96 and 24.91 was greater than the necessary table value of 3.20 for significant. Further, to find out which training group has significant improvement on selected criterion variables, Scheffé S post-hoc test was applied and presented in table – 7.

Table – 7: Scheffĕ S test for the difference between the adjusted post-test mean of dribbling, passing and goal shooting abilities

Exp. Group - I	Exp. Group - II	Control Group	Mean Difference	Confidence Interval at 0.05 level
Adjusted Post-test Mean for Dribbling				
13.429	13.572	…	0.143	0.74
13.429	…	11.533	1.896*	0.74
…	13.572	11.533	2.039*	0.74

Exp. Group - I	Exp. Group - II	Control Group	Mean Difference	Confidence Interval at 0.05 level
Adjusted Post-test Mean for Passing				
14.041	13.851	…	0.19	0.65
14.041	…	11.842	2.199*	0.65
…	13.851	11.842	2.009*	0.65
Adjusted Post-test Mean for Goal Shooting				
12.324	12.649	…	0.325	0.82
12.324	…	10.461	1.863*	0.82
…	12.649	10.461	2.188*	0.82

* Significant at 0.05 level of confidence.

RESULTS

The adjusted post-test mean difference in dribbling ability between strength training followed by yoga practice and control group and endurance training followed by yoga practice and control group was 1.896 and 2.039, respectively, and these differences were significant at the 0.05 level of confidence, according to Table-7. The adjusted post-test mean difference in passing skill between strength training followed by yoga practice and control group, endurance training followed by yoga practice group and control group was 2.199 and 2.009, respectively, and these differences were significant at the 0.05 level of confidence, according to Table - 7. Based on the study's findings, it can be said that strength training followed by yoga practice group and endurance training followed by yoga practice group considerably enhance passing ability. The post- and adjusted post-test mean difference in goal shooting skill between strength training followed by yoga practice group and control group, endurance training followed by yoga practice group and control group was 1.863 and 2.188, respectively, and these differences were significant at the 0.05 level of confidence, according to Table - 7. Based on the study's findings, it can be said that strength training followed by yoga practice group and endurance training followed by yoga practice group significantly improved the goal shooting ability.

CONCLUSIONS

After completing strength training followed by yoga practice and endurance training followed by yoga practice, the study's results shown a notable increase in Stewart Pitchers' hockey skills (dribbling, passing, and goal shooting). According to Mohan and Rajeswaran's (2019) research, school-level hockey players' goal shooting skill significantly improved after receiving strength and coordination training as well as combination training. Female university hockey players who received sports-specific instruction showed a notable increase in their goal shooting and dribbling, according to studies by Kumar (2019) and Shelvam and Sekhon (2016). Ansari (2020) and Churi (2020) discovered that following weight training, passing ability significantly improved. After endurance training, Rathi (2020) discovered that the ability to shoot, balance with the ball, and move with the ball had all increased.

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