

Comparison of Swiss Ball Exercises and Plyometric Training for Improving Speed and Agility in Inter-University Level Male Field Hockey Players

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ABSTRACT

Objectives: The purpose of the study was to compare the effects of six weeks Swiss ball exercises & plyometric training techniques on speed & agility in inter-university level male field hockey players.

Study Design: Randomized controlled trial.

Study Setting: Guru Nanak Dev University.

Interventions: Fifty-six male hockey players of inter-university level were randomly allocated into 3 groups: Swiss ball exercise (group A), plyometric training (group B) & control (group C) with subjects 18, 18 & 20 respectively. After the baseline measurements of speed and agility the participants in the group (A) & group (B) performed exercises program according to the protocols and group (C) did the routine training protocols. Post-reading of speed and agility were taken after the 6 weeks training programme.

Results: ANOVA revealed significant improvement in speed composite score of group(A) (post training, 6.375 ± 0.123), group (B) (post training, 6.348 ± 0.111) & group(C) (post training, 6.608 ± 0.08) ($p < 0.05$). There is also improvement in the agility composite score of group (A) (post training, 16.29 ± 0.09), group(B) (post training, 16.07 ± 0.11) & group (C) (post training, 17.46 ± 0.20) ($p < 0.05$).

Conclusion: The study concluded that both Swiss ball & plyometric training activities enhanced speed and agility in hockey players, but plyometric training is more effective as compared to swiss ball training in improving agility.

Keywords: Speed, Agility, Swiss ball Exercises, Plyometric training, Male Hockey Players.

INTRODUCTION

Hockey is a team sports which requires two physiological components anaerobic and aerobic capacity & one of the most popular games in the world. [1] As we all know key feature of the field hockey is changing of direction during sprinting as well as intermittent running, e.g. the alternation of decelerating and accelerating, quickly moving in a semi-crouch posture and dribbling the ball by the demand of the game. [2,3,4] Refined, efficient & effective

movement patterns emerge through sensorimotor co-ordination. [5] Low-level activity such as back-to-back sprints, walking and light jogging are the main requirement of the game demand, maintain speed of the player and tolerance to lactic acid. [3]

In recent years, plyometric play an important role in improving the performance of hockey players. All types of games demand strength as well as explosiveness of muscles which is achieved

by plyometric training techniques. The eccentric loading followed immediately by a concentric contraction during plyometric. [6] Some of the researchers reported that agility is the ability to maintain or control body position while quickly changing directions during a series of movements which improved by plyometric training techniques. [7,8] One of the researchers assumed that plyometric training program re-enforces the motor programming through neuromuscular conditioning, neural adaptation of muscle spindles and joint proprioception. Plyometric training also improves proprioception, kinesthetic sense as well as provides functional stability to joint. [6,9] Agility is the ability to control body position while quickly changing direction during a series of movements. [10]

In previous literature it has been stated that Swiss ball exercise is the training used in many sports for enhancement of performance as like plyometric. The rationale behind the unstable surface training is to procure a mixed and effective training stimulus. The aim is to decrease the risk of injury, increase incoordination, balance, stability, proprioception and improve neuromuscular adaptations rather than to gain explicit strength. [11] The unstable surface training which will in term improve dynamic posture control, balance and will produce more coordinated and consistent movement patterns. [12] The spinal stability is enhanced by the more muscle recruitment during movement and exercise and the Swiss ball are more effective to improve strength as compare to other resistance exercises. [13] Furthermore, balance board and stability disc exercises, performed in conjunction with plyometric exercises, are recommended to improve proprioceptive and reactive capabilities, which may reduce the chances of lower extremity injuries. [14] Swiss-ball exercises are widely used for improving strength, endurance, flexibility, coordination, and balance. [15] Thus purpose of present study was to investigate effect of Swiss ball exercise with respect to plyometric training

activities on performance of male hockey players. The study therefore aimed to evaluate the effects of Swiss ball exercises & plyometric training on speed, agility and analyse the effects of training protocol after 6 weeks on the performance among inter university level male hockey players.

METHODOLOGY

SUBJECTS:-

The sample consisted of 56 healthy university-level male hockey players with mean age (18.95 ± 1.017) years, mean weight (59.02 ± 5.629) k.g., mean height (165.830 ± 6.190) c.m., mean BMI (21.45 ± 1.72) k.g./m². Subjects gave their informed consent and volunteered to participate in the study. All subjects were randomly allocated into 3 groups: Swiss ball (group A), plyometric (group B) and control (group C) with 18, 18 & 20 subjects respectively.

PROCEDURE:-

Pre-readings were taken before the initiation of Swiss ball exercises & plyometric training. After the baseline measurements were conducted in three groups. The players were training according to the protocols. The post readings were taken after 6 weeks of the end of the training. The pre and post readings of the following parameters were recorded.

Group A

The subjects in this group performed a warm up of 15 mins. which consisted of light jogging, hamstring stretch, quadriceps stretch, chest stretch, shoulder stretch & back-roll by using the Swiss ball. [16] This group was given Swiss ball training like Supine bridge, Prone bridge, Supine bridge exercise with alternate leg extension, Abdominal crunch, Russian twist, Cobra extension, Physio ball v pass, Superman and Wall squat for 6 weeks 3 days/ week with the help of physio ball (Swiss Ball), medicine ball & yoga mat.

Group B

The subject warmed up for 15 minutes consisting of jogging and stretching. Then plyometric exercises were performed for 20 minutes and they performed soft jogging

and stretching to cool down and recover for 15 minutes. [17] This group was given plyometric training like Squat Jump, Tuck Jump, Butt Kick, Power Step Up, Box Jump Up, Box Jump Down, Proprioceptive Training (leftleg) and Proprioceptive Training(right leg)with the help of box, watch & stepper for 6 weeks 3 days/ week.

Group C

This group served as a control group which did routine training only.

TESTS

RESULTS

Table 1 shows comparison of speed between Swiss ball, plyometric & control group by using one way ANOVA & Post hoc ANOVA.

ANOVA	30 METER DASH TEST (SPEED TEST)					
	Pre			Post		
	Group A	Group B	Group C	Group A	Group B	Group C
Mean ± S.D.	6.57 ± 0.12	6.60 ± 0.10	6.60 ± 0.09	6.37 ± 0.12	6.34 ± 0.111	6.60 ± 0.08
F test	.488			31.807		
P value	.616			.000		
Result	Not Significant			Significant		
Tukey’s method for pairwise comparison		A			A	
Result with a mean difference of pair>	B	-0.03NSig	B	B	0.03NSig	B
	C	-0.03NSig	00NSig	C	-0.23 Sig	- 0.26Sig

Intergroup comparison by using one way ANOVA showed significant improvement on the speed with 30-meter dash test of Swiss ball group, plyometric training group & control group after 6 weeks of the training program.

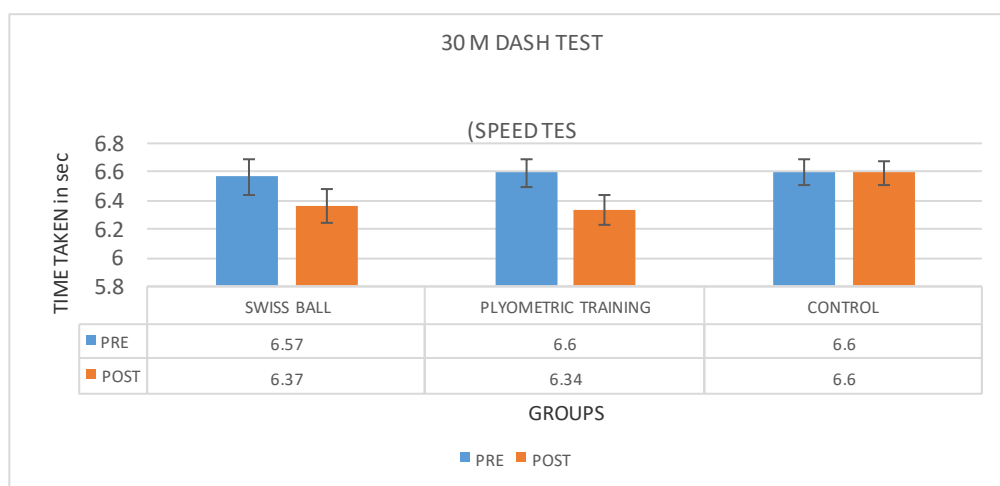
Intergroup comparison by using post hoc ANOVA showed significant

Speed was tested by using 30-meter dash test, agility by Illinois agility test. [6,40]

STATISTICAL ANALYSIS

Descriptive statistics (mean ± standard deviation) were determined for the directly measured and derived variables. ANOVA and Post hoc ANOVA were applied to compare the pre as well as post data. The data were analysed for statistical significance by using the Statistical Package for Social Sciences (SPSS 21.0) software.

improvement on speed between Swiss ball & control group (p<0.005) & plyometric training group & control group (p<0.005), but there were no significant differences between Swiss ball & plyometric training group (p>0.05) after 6 weeks of the training program.



Graph 1: Comparison between mean values of pre and post-test scores of Swiss ball training, plyometric training & control group.

Graph 1 shows the comparison between mean values of pre-test and post-test scores of Swiss ball training, plyometric training &

control group which indicates improvement in speed by using 30-meter DASH test in

both training group when compared with the control group.

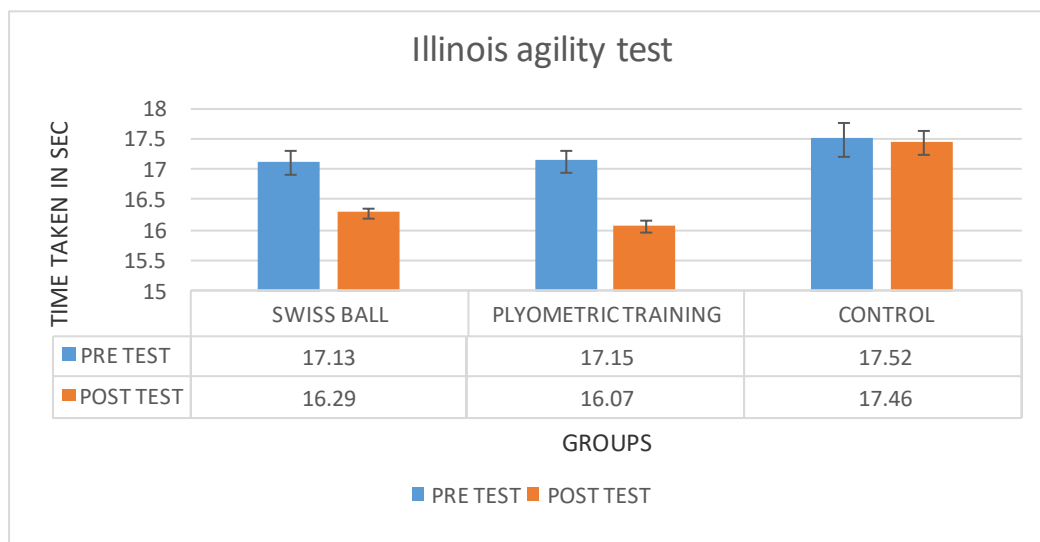
Table 2 shows comparison of agility between Swiss ball, plyometric & control group by using one way ANOVA & Post hoc ANOVA.

ANOVA	ILLINOIS AGILITY TEST					
	Pre			Post		
	Group A	Group B	Group C	Group A	Group B	Group C
Mean ± S.D.	17.13 ± 0.21	17.15 ± 0.18	17.52 ± 0.28	16.29 ± 0.09	16.07 ± 0.11	17.46 ± 0.20
F test	16.243			474.107		
P value	.000			.000		
Result	Significant			Significant		
Tukey's method for pairwise comparison		A			A	
Result with a mean difference of pair>	B	-0.02NSig	B	B	0.22Sig	B
	C	-0.39Sig	-0.37Sig	C	-1.16 Sig	-1.38Sig

Intergroup comparison by using one way ANOVA showed significant improvement on agility with Illinois agility test among all the group.

Intergroup comparison by using post hoc ANOVA showed significant improvement

on agility between Swiss ball & control group ($p < 0.005$) & plyometric training group & control group ($p < 0.005$) & in between Swiss ball & plyometric training group ($p < 0.005$).



Graph 2: Comparison between mean values of pre and post-test scores of Swiss ball training, plyometric training & control group.

Graph 2 shows the comparison between mean values of pre-test and post-test scores of Swiss ball training, plyometric training & control group which indicates improvement in agility by using Illinois agility test in both training group when compared with the control group.

DISCUSSION

Hockey is the high intensity and non-continuous game. Low-level activity such as back-to-back sprints, walking and light jogging is a key requirement of the game. The lower limb activities used excessively to produce the game demand. The purpose of this study was to investigate

the effects of Swiss ball training & plyometric training on speed and agility. To enhance performance & avoid injury or re-injuries, these factors should be improved in hockey players along with various other training.

As it was stated earlier, the main goal of the unstable surface training is not to gain explicit strength (especially power and maximum strength), but to improve balance, stability and proprioceptive capabilities. [11] Plyometric had verified by research to improve strength, balance and agility. [18]

SPEED

The findings of present study demonstrated significant improvement in speed with 30-meter dash test, in Swiss ball group & plyometric group when compared with the control group, but between Swiss ball & plyometric group there were no significant differences. The results were consistent with a study which examined the effects of plyometric training on stable surfaces compared with combined plyometric training on stable and unstable surfaces on components of physical fitness in prepubertal male soccer athletes. [33] The results were consistent with a study which evaluated the effects of the in-season plyometric training program on balance and sprint performance in basketball players. [34] The findings of another study also concluded that plyometric training improves the overall sprinting performance of the basketball players and plyometric training also contributed to improvements in vertical jump performance, acceleration, leg strength, muscular power, increased joint awareness, and overall proprioception. [19-21,34] The findings of a study signified that plyometric training improves the overall sprinting performance as the use of SSC seemed a particularly appropriate regimen for soccer, where players must frequently jump, run, and sprint. [35] Similar gains of maximal strength had reported with traditional strength and plyometric training, but the latter approach appears to induce greater gains in muscle power. [22] The results were consistent with another study who investigated the effect of a short term Swiss ball training on core stability and running economy. The findings of this study showed that Swiss ball exercise training improves the sprinting performance as well as maintain core stability was commonly used in both athletic therapy and conditioning settings. [23,36]

AGILITY

The present study demonstrated significant improvement in agility with Illinois agility test, in Swiss ball group & plyometric group when compared to control

group. Between Swiss ball group & plyometric group, the plyometric group showed better improvement. Because lower limb plyometric improve lower body strength, decreases contact time of the foot during agility tasks & increase the change of direction speed. The findings were consistent with a study where they found out the effects of Swiss ball training on agility among Annamalai University netball players where there were significantly increase in agility by the use of Swiss ball. [37] The findings of the studies were also consistent with another study who found that six weeks of plyometric training significantly improve an athlete's agility. [6] Plyometric drills consisted of stopping, starting, and changing directions in an explosive manner. These movements were the key components that assisted in developing agility. [24-27] The results were consistent with the study who evaluated the effects of two plyometric training techniques significantly develop agility in youth soccer players. [38] The agility requires rapid force development and high power output, as well as the ability to efficiently utilize the stretch-shortening cycle in ballistic movements. [28] Plyometric training had been shown to improve these requirements [29-31] & Besier recommended the inclusion of plyometric in soccer training to familiarize players with unanticipated changes in direction. [32] The findings were consistent with the study who investigated the effect of plyometric and resistance training on agility, speed and explosive power in soccer players and found that plyometric training is responsible for improvement of agility. [39]

CONCLUSION

It can be concluded that the Swiss ball & plyometric training both enhanced speed, agility. Both training groups showed good results & significant improvement in skill related performance parameter in inter-university level hockey players. Hence this study opens up a new horizon for the

hockey players to result in better performance & more injury prevention.

Clinical Significance of the Study

- Incorporating these exercises into lower extremities training & overall performance enhancement.
- These training should lower the chance of injury or re-injury & could bring the athlete back to an optimal level of performance.

Future Suggestions

1. The study needs to be replicated on a large sample size.
2. Other protocols of Swiss ball exercise can be used to study the effects on agility.
3. Effects of the combination of both training protocols can be studied.
4. Rehabilitation specific studies can be done.

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