Influence of Strength and Plyometric Training on Leg Strength and Hockey Dribbling Ability among Male Hockey Players

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Abstract: **The purpose of the study was to find out the effect of strength and plyometric training, on leg strength and dribbling ability. Forty five male hockey players aged 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 three experimental groups and one control group, in which the group I (n=15) underwent strength training, group II (n = 15) underwent plyometric training for three days (alternative days) per week for twelve weeks and group III, 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 leg strength, the leg lift dynamometer was used and hockey dribbling ability was assessed by administering Stewart Pitchers' Hockey dribble test. 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 leg strength and Stewart Pitchers' Hockey dribble test were improved significantly for all the training groups when compared with the control group.**

Key Words: strength training, plyometric training, Stewart Pitchers' Hockey dribbling test.

INTRODUCTION

A common contributing component in the tough world of sports is intense motivation, which drives athletes to put in long and exhausting workdays. Furthermore, sports scientists and athletic experts might be of aid to coaches, as coaching is a difficult job. Today's athletes are more knowledgeable than ever before, which affects coaching and training methods. The field of sports sciences has progressed from descriptive to scientific methods and their implementation (Bompa, 1999).

One of the most popular and profitable sports, hockey is played by men and women at all levels, from amateur to professional (Andres and Myers, 2008). Hockey is an Olympic sport that is played by both men and women for both leisure and competitive reasons. Strength, speed, skill, and other psychological and physical qualities are all necessary for top performance in this worldwide sport (Kahn, 1999; Burr et al. 2008; and International Hockey Federation, 2019). Players who engage in this intense, high-energy sport run the danger of developing a variety of musculoskeletal issues since it requires unusual movement patterns. (Sherker and Cassel, 2002; and Dick, et al. 2007).

Dynamic balance and endurance are strained by the players' frequent need to stride, leap, sprint, and walk (Hrysomallis, McLaughlin, and Goodman, 2006). Because they generally have a much higher risk of overuse difficulties, junior athletes are often more vulnerable to injury than adult athletes. The physical attributes required for much of the game include muscular strength, endurance, and dynamic balance. A player's chance of several injuries and their output will both rise and decrease if these motions are disrupted during play (Loose, et al. 2019). Recent research has revealed that poor neuromuscular control, muscular imbalance in different movement patterns, and instability in the core muscles are risk factors for sports injuries (Chorba, Chorba and Helgerud, 2004; and Peate, et al. (2007).

Based on scientific principles, sports training is a strategy designed to increase athletic ability via the methodical development of mental and physical capacity, efficiency, and motivation. Athletes can accomplish amazing and unheard-of sports exploits thanks to this procedure (Harre, 1982). Physical activity is one of the finest techniques to achieve peak performance throughout training. Athletes' physiological attitudes will be improved, and their biomotor skills will be improved to the highest levels.

At different levels, different training techniques are applied to improve every facet of physical and motor fitness. Training plans with basic components and little tweaks will function better and be more suitable for both individual and team players. According to Boucher and Malina (1993), the optimal training program is one that accelerates the desired quality without having undesirable side effects.

The improvement of motor skills, speed, body balance, stamina, and strength can result from receiving effective hockey coaching (Elferink-Gemser, et al. 2007; Macutkiewicz and Sunderland, 2011; and Podgorski and Pawl, 2011). It is important for strength- and resistance-based training programs to recognise that hockey players need strength to perform the necessary motions. It is imperative to use isometrics, unilateral work, heavy drop-sets, long-duration sets (walking lunges for more than a minute), or on-the-clock movements (snatch, clean, and jerk).

Weight training is the most effective strategy to maintain and increase muscle strength, and it also directly improves blood circulation. Furthermore, according to David et al., (1999) weight training has been demonstrated to reduce vascular stiffness. Several studies (Sander, et al. 2013; and Ingle, Sleap and Tolfrey, 2006) have shown how resistance training impacts a young athlete's capacity to account for their maximal strength.

Plyometric exercise improves muscular strength and power (Markovic, 2007), speed (Diallo et al., 2001; Impellizzeri et al., 2008; and Michailidis et al., 2013), and agility (Arazi, Coetzee and Asadi, 2012; Ramirez-Campillo, et al., 2014; and Ramirez-Campillo, et al., 2015). This has been demonstrated in numerous scientific studies. The need for a precise plyometric training session to develop motor and physical fitness—which requires both single and multiple abilities—does exist, even though it is not the newest trend in competitive team sports (Chaouachi et al. 2009; Duncan, Woodfield, and al-Nakeeb, 2006; Gabbett, 2000; Ostojic, Mazic, and Dikic, 2006; and Stolen, et al. 2005). Spasmodic team games that combine cyclic and acyclic development in relation to victory in competitive sports include handball, basketball, soccer, hockey, and other team sports (Arazi, Coetzee, and Asadi, 2012; and Chelly, et al. 2014). Regular plyometric training, consisting of three sessions spaced over a 12-week period, improves the maximum kicking velocity, countermovement leap, and drop jump of amateur female football players (Ccampo, et al. 2009).

METHODS

The goal of this study was to determine how strength and plyometric exercise, affected Stewart Pitchers' Hockey skill test, consists of dribbling, passing and goal shooting. 45 male hockey players who were enrolled at various colleges, those who were represented in inter-collegiate tournaments, around Kovilpatti Town, Tamil Nadu, India for the academic year 2023–2024 were chosen as subjects to fulfil the goal. 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, group II (n = 15) underwent plyometric training 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 curricular activities.

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. Leg strength and 2. Dribbling.

ANALYSIS OF THE DATA

The differences, if any, between the corrected post test means on several 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.05 level of confidence.

Table – I: Analysis of Covariance and 'F' ratio for Leg Strength and Dribbling of Strength Training Group, Plyometric Training Group, and Control Group

Variable Name	Group Name	Strength Training Group	Plyometric Training Group	Control Group	'F' Ratio
Leg Strength (in Kg)	Pre-test Mean ± S.D.	63.33 ± 5.54	62.87 ± 4.24	64.80 ± 4.55	0.66
	Post-test Mean ± S.D.	66.13 ± 5.67	67.33 ± 5.43	64.47 ± 4.60	1.127
	Adj. Post-test Mean	66.471	68.143	63.319	21.91*
Dribbling (in Points)	Pre-test Mean ± S.D.	12.93 ± 0.80	12.87 ± 0.83	12.13 ± 0.83	0.43
	Post-test Mean ± S.D.	14.07 ± 0.88	13.73 ± 1.03	12.27 ± 1.03	14.16*
	Adj. Post-test Mean	13.958	13.690	12.419	19.22*

* 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 3.21 and 3.23 respectively).

Table – I shows that the leg strength pre- and post-test "F" ratio value of 0.66 and 1.127 was less than the necessary table value of 3.21 for significant with df 2 and 42 at 0.05 level of confidence. The 'F' ratio value of 21.91 for the adjusted post-test scores was greater than the necessary table value of 3.24 for significant.

In Table _ I shows the dribbling pre-test "F" ratio value of 0.59 was less than the necessary table value of 3.21 for significant with df 2 and 42 at 0.05 level of confidence. For the post-test mean and adjusted post-test mean 'F' ratio value of 14.16 and 19.22 for the adjusted post-test scores was greater than the necessary table value of 3.24 for significant. Further, to find out which training group has significant improvement on selected criterion variables, Scheffe *S* post-hoc test was applied and presented in table – II.

Table – II: Scheffẽ S Test for the Difference Between the Adjusted Post-Test Mean of Leg Strength, Dribbling, Passing and Shooting Abilities

Strength Training Group	Plyometric Training Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
Adjusted Post-test Mean for Leg Strength				
66.471	68.143	…	1.672	1.846
66.471	…	63.139	3.332*	1.846
…	68.143	63.139	5.004*	1.846
Adjusted Post-test Mean for Dribbling				
13.956	13.690	…	0.268	0.66
13.956	…	12.419	1.539*	0.66
…	13.690	12.419	1.271*	0.66

* Significant at 0.05 level of confidence.

RESULTS

The adjusted post-test mean difference in leg strength between the strength training group and control group, plyometric training group and control group was3.332 and 5.004 respectively, and these differences were significant at 0.05 level of confidence. The table – II also indicated that there was no significant difference was found between the experimental group (1.672).

The adjusted post-test mean difference in dribbling ability between strength training group and control group and plyometric training group and control group was 1.539 and 1.271, respectively, and these differences were significant at the 0.05 level of confidence, according to Table II. The table II also indicate that there was no significant difference was occurred between the training groups (0.268). Based on the study's findings, it can be said that strength training group and plyometric training group considerably boost the dribbling ability.

CONCLUSIONS

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

REFERENCE

[1] Anders, E., and Myers, S. (2008). Field Hockey: Steps to success, 2nd ed., Leeds: Human Kinetics.

[2] Ansari, Azhar Hussain. (2020). Effect of weight training on playing ability of hockey players. International Journal of Physical Education, Sports and Health. 7(6): 306-308.

[3] Arazi, H., Coetzee, B. and Asadi, A. (2012). Comparative effect of land and aquatic based plyometric training on the jumping ability and agility of young basketball players. South African Journal of Research in Sports, Physical Education and Recreation.34: 1 – 14.

[4] Bompa, Tudor O. (1999). Periodization: Theory and Methodology of Training. (4th ed.,), Champaign, Illinois: Human Kinetics Publishers. 3.

[5] Boucher, C. and Malina, R.M. (1993). Genetic of physical fitness and motor performance, Exercise and Sports Sciences Reviews. 11: 3206.

[6] Burr, J.F., Jamnik, R.K., Baker, J., Macpherson, A., Gledhill, N., McGuire, E.J. (2008). Relationship of physical fitness test results and hockey playing potential in elite-level ice hockey players. J Strength Cond Res. 22(5): 1535-43.

[7] Ccampo, S. Sedano., Vaeyens, R., Philippaerts, R.M., Redondo, J.C., Benito, A.M. De., and Cuadrado, G. (2009). "Effects of lower limb plyometric training on body composition, explosive strength, and kicking speed in female soccer players. Journal of Strength Conditioning Research. 23: 1714 – 1722.

[8] Chaouachi, A., Brughelli, M., Levin, G., Boudhina, N.B., Cronin, J. and Chamari, K. (2009). Anthropometric, physiological and performance characteristics of elite team-handball players, Journal of Sports Science. 15: 151 – 7.

[9] Chelly, Mohamed Souhaiel., Hermassi, Suhail., Aouadi, Ridha., and Shephard, Roy J. (May 2014). Effects of 8 week in-season plyometric training on upper and lower limb performance of elite adolescent handball players. Journal of Strength and Conditioning Research, 28(5): 1401-10.

[10] Chorba, R.S., Chorba, H.J., and Helgerud, J. (2004). Endurance and strength training for soccer players: physiological considerations. Sports Med. 34(3):165-180.

[11] Churi, Jayesh. (May 2020). A comparative study on the effect of weight training on playing ability of inter-collegiate level hockey players. International Journal of Creative Research Thoughts. 8(5): 4182-4186.

[12] David, A.B., Tamara, K.W., Christoph, D.G., James, D.C., Anthony, M.D. and Bronwyn, A.K. (1999). Muscular strength training is associated with low arterial compliance and high pulse pressure. Hypertension. 33(6): 1385-1391.

[13] Diallo, O., Dore, E., Duche, P., and Praagh, E. Van. (2001). Effects of plyometric training followed by a reduced training program me on physical performance in prepubescent soccer players. Journal of Sports Medicine and Physical Fitness. 41: 342 – 348.

[14] Dick, R., Hootman, J.M., Agel, J., Vela, L., Marshall, S.W., and Messina, R. (2007). Descriptive epidemiology of collegiate women's field hockey injuries: National Collegiate Athletic Association Injury Surveillance System, 1988-1989 through 2002-2003. J Athl Train. 42(2): 211-220.

[15] Duncan, M.J., Woodfield, L. and al-Nakeeb, Y. (2006). Anthropometric and physiological characteristics of junior elite volleyball players. British Journal of Sports Medicine. 40: 649-651.

[16] Elferink-Gemser, M.T., Visscher, C., Lemmink, K.A.P.M., and Mulder, T. (2007). Multidimensional performance characteristics and standard of performance in talented youth field hockey players: A longitudinal study. Journal of Sports Sciences. 25: 481-489.

[17] Gabbett, T.J. (2000). Physiological and anthropometric characteristics of amateur rugby league players. British Journal of Sports Medicine. 34: 303-307.

[18] Harre, Dietrich. (1982). Principles of Sports Training. Berlin: Sportverlag. 10.

[19] Hrysomallis, C., McLaughlin, P., and Goodman, C. (2006). Relationship between

static and dynamic balance tests among elite Australian footballers. J Sci Med Sport. 9(4):288-291.

[20] Impellizzeri, F.M., Rampinini, E., Castagna, C., Martino, F., Fiorini, S., and Wisloff, U. (2008). Effects of plyometric training on sand versus grass on muscle soreness and jumping and sprinting ability in soccer players. British Journal of Sports Medicine. 42: 42 – 46.

[21] Ingle, L., Sleap, M. and Tolfrey, K. (2006). The effect of a complex training and detraining program me on selected strength and power variables in early pubertal boys". Journal of Sports Science. 24, 987-997.

[22] International Hockey Federation. Accessed 19 Oct 2019. http://www.fih.ch/hockeybasics/history/.

[23] Kahn, J. (1999). Hockey. Phys Med Rehabil Clin N Am, 10 (1): 1-17.

[24] Kumar, T. Senthil. (2019). Impact of specific training on motor fitness and skill performance variables among hockey players. International Journal of Physiology, Nutrition and Physical Education. 4(2): 61-62.

[25] Macutkiewicz, D., and Sunderland, C. (2011). The use of GPS to evaluate activity profiles of elite women hockey players during match-play. Journal of Sports Sciences, 29: 967-973.

[26] Markovic, G. (2007). Does plyometric training improve vertical jump height? A meta-analytical review. British Journal of Sports Medicine. 41: 349 - 355.

[27] Michailidis, Y., Fatouros, I.G., Primpa, E., Michailidis, C., Avloniti, A., and Chatzinikolaou, A. (2013). Plyometrics' trainability in preadolescent soccer athletes. Journal of Strength and Conditioning Research. 27: 38-49.

[28] Mohan, S Chandra and Rajeswaran, S.T.N. (2019). Effects of strength and coordination training on selected skills in school level boys field hockey players. International Journal of Physiology, Nutrition and Physical Education. 4(1): 169-171.

[29] Ostojic, S., Mazic, S. and Dikic, N. (2006). Profiling in basketball: physical and physiological characteristics of elite players. Journal of Strength and Conditioning Research. 20: 740-744.

[30] Peate, W.F., Bates, G., Lunda, K., Francis, S., and Bellamy, K. (2007). Core strength: a new model for injury prediction and prevention. J Occup Med Toxicol. 2(3): 1-9.

[31] Podgorski, T., and Pawl, M. (2011). A half century of scientific research in field hockey. Human Movement, 12: 108-123.

[32] Ramirez-Campillo, R., Burgos, C., Henríquez-Olguín, C., Andrade, D.C., Martínez, C., Alvarez, C., Castro Sepúlveda, M., Marques, M.C. and Izquierdo, M. (2015). Effect of unilateral, bilateral and combined plyometric training on explosive and endurance performance of young soccer players. Journal of Strength and Conditioning Research. 29(5): 1317-28.

[33] Ramirez-Campillo, R., Meylan, C., Alvarez, C., Henriquez-Olguin, C., Martinez, C., Canas-Jamett, R., Andrade, D.C., and Izquierdo, M. (2014). Effects of in-season low-volume high-intensity plyometric training on explosive actions and endurance of young soccer players. Journal of Strength and Conditioning Research. 28: 1335-42.

[34] Rathi, Umesh. (September 2020). Effect of the plyometric exercises on the hockey skill of hockey players. Aayushi International Interdisciplinary Research Journal. 8(9): 69-71.

[35] Sander, A., Keiner, M., Wirth, K., and Schmidtbleicher, D. (2013). Influence of a 2-year strength training programme on power performance in elite youth soccer players. European Journal of Sport Science. 13: 445–451.

[36] Shelvam, P.V., and Sekhon, Baljit Singh. (2016). Effect of specific training programme on dribbling performance among university hockey players. International Journal of Scientific Research and Modern Education. 1(1): 128-132.

[37] Sherker, S., and Cassell, E.A. (2002). Review of Field Hockey Injuries and Countermeasures for Prevention. Melbourne, Australia: Monash University Accident Research Centre.

[38] Stolen, T., Chamari, K., Castagna, C. and Wisløff, U. (2005). Physiology of soccer: An update. Sports Medicine. 35: 501-536.