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Effect of plyometric training on selected physical and physiological variables of adolescent male tennis players

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Abstract
The objective of this study was to explore the effect of plyometric training on selected physical fitness and physiological variables of adolescent male tennis players, totally 30 males to participate in this study were selected randomly from various college at Coimbatore district. The subjects aged from 18 to 21 years. Treatment group I underwent plyometric training, group II acted as control group. All thirty subjects were inducted for pre and post-test on physical fitness and physiological variables. The plyometric training was given to the experimental group for 5 days per week (Monday to Friday) for the period of eight weeks. The control group was not given any sort of training except their routine work. The breath holding time, resting pulse rate, flexibility and leg explosive power were selected as dependent variable and it was measured by nose clip, cardio radial pulse, sit and reach, and standing broad jump. All the subjects were tested two days before and immediately after the experimental period on the selected dependent variables. The obtained data from the experimental group and control group before and after the experimental period were statistically analysed with dependent't'-test to find out significant improvements. The level of significance was fixed at 0.05 level confidence for all the cases. Significant improvement was found on breath holding time, resting pulse rate, flexibility and Leg Explosive power of experimental group due to the effect of plyometric training when compared to the control group.

Keywords: Plyometric training, breathe holding time, resting pulse rate, flexibility and leg explosive power

Introduction
Tennis is a racket sport. It can be played by individually against a single opponent or between two teams (doubles). Players use a racket that strung with cord to strike the ball around a net and into opponent's court. It is characterized by quick start and stops, changes of direction, multi-directional movements and stamina. It requires short explosive burst of energy with repeatedly during the match. Unlike many other sports, it does not have time limits on matches. It lasts one hour to five hours. In this context, it requires tennis athletes to be highly trained on physiological aspects. Hence, it requires solid understanding of the physiological variables in terms of the design and implementation of the training to enhance successful performance without any injury risk (Kovacs 2006) [14]. In addition to special skills, many sports teams must also have sports-specific physical fitness (Barbieri *et al*., 2017, Franchini *et al*., 2019) [15, 16]. These so-called special skills refer to sports-specific physical fitness, which means that athletes have the appropriate muscle strength and physical fitness for spe- cific sports (Beattie *et al*., 2014 & Suchomel *et al*., 2016) [17, 18], also called "special physical fitness to improve technical performance". Through special physical training, strength and explosive strength can be improved. This is one benefit of special physical training. The term "plyometric" means fast and powerful sports performance (Oxfeldt *et al*., 2019) [20]. It is a form of explosive training that can improve the force rate and neural response as well as agility and speed (Asadi *et al*., 2016) [21]. The principle of PT is based on the stretch–shorting cycle, or SSC for short (Bedoya *et al*., 2015) [19]. Plyometric training uses the mutual coordination of muscle concentric contraction and eccentric contraction so that the muscles and connective tissues can fully store elastic potential energy and then use the stretch reflex principle too

instantly and rapidly concentrically contract, release stored elastic potential energy, and generate powerful explosive strength (Slimani *et al*., 2016) [22]. Explosive strength is the momentary muscle strength that directly affects sports performance; the quality of explosive strength is key to sports performance (Ramírez *et al*., 2022) [23].

Materials and Methods

To achieve the purpose of the study 30 male at the age group between 18-21 years were selected from various college at Coimbatore district. The selected subject was randomly assigned into two equal groups, consist of fifteen each, namely Plyometric training group (n=15) and Control group (n=15). The respective training was given to the experimental group the 5 days per weeks (Monday, Tuesday, Wednesday, Thursday and Friday) for the training period of eight weeks. The control group was not given any sort of training except their routine. The evaluated breath holding time, resting pulse rate, flexibility and leg explosive power were selected as dependent variable and it was measured by nose clip, cardio radial pulse, sit and reach, and standing broad jump. The parameters were measured at baseline and after 8 weeks of plyometric training were examined. The intensity was increased once in two weeks based on the variation of the exercises. The training programme was lasted for 45 minutes for session in a day, 5 days in a week for a period of 8 weeks duration. These 45 minutes included warm up for 10 minutes, 25 minutes plyometric training and warm down for 10 minutes. The equivalent in specific skill training is the length of the time each action in total 5 day per weeks. (Monday, Tuesday, Wednesday, Thursday and Friday).

Statistical Analysis

The collected data on breath holding time, resting pulse rate, flexibility and leg explosive power due to the effect of plyometric training was statically analysed with "t" test to find out the significant improvement between pre& post-test if any. In all case the criterion for spastically significance was set at 0.05 level of confidence (p<0.05).

Table I: Mean and dependent 't' – test for the pre and post tests on Breath Holding Time, Resting Pulse Rate, Flexibility and Leg Explosive Power of experimental and control group

S. No	Variable	Group/Test	Mean	SD	t-ratio
1.	Breath Holding Time (Scores in seconds)	Experimental Pre – test	35.97	1.99	10.81*
		Experimental Post - test	42.50	2.57	
		Control Pre - test	35.67	1.88	1.21
		Control Post - test	35.98	0.98	
2.	Pulse Rate (Scores in seconds)	Experimental Pre - test	72.22	0.85	9.96*
		Experimental Post - test	71.60	0.89	
		Control Pre - test	72.14	0.82	0.93
		Control Post - test	72.10	0.91	
3.	Flexibility (Scores in numbers)	Experimental Pre - test	27.79	1.38	8.99*
		Experimental Post - test	29.09	1.29	
		Control Pre - test	27.56	1.01	0.38
		Control Post - test	28.58	1.06	
4.	Leg explosive power (Scores in meters)	Experimental Pre - test	1.19	0.19	15.06*
		Experimental Post - test	1.32	1.21	
		Control Pre - test	1.19	0.080	0.36
		Control Post – test	1.20	0.30	

*Significant level 0.05 level (degree of freedom 2.14, 1 and 14)

The table I, shows that, the obtained 't'–ratio between the pre and post-test means of experimental group were 9.96, 8.99, 15.06 and 10.81 and control group were 21.21, 0.93, 0.38 and 0.36 respectively. The table values required for significant difference with df 14 at 0.05 level of confidence. Since the obtained 't' – ratio value of experimental and control group on resting pulse rate, breath holding time, flexibility and leg explosive power were greater than the table value 2.14, it was concluded that the plyometric training had significantly improved resting pulse rate, breath holding time, flexibility and leg explosive power of experimental group. The pre and post-test mean value of experimental and control group on breath holding time, resting pulse rate, flexibility and leg explosive power were graphically represented in the figure I.

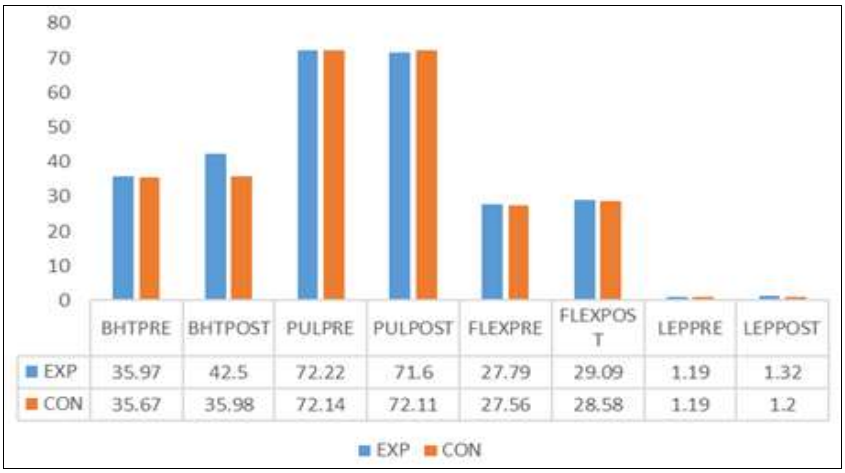

Fig 1: Bar Diagram showing the mean value on Breath Holding Time, Resting Pulse Rate, Flexibility and Leg Explosive Power of adolescent Male tennis players on Experimental and Control group

Discussions on findings

The present study investigated the effect of plyometric training on the selected variables are breath holding time, resting pulse rate, flexibility and leg explosive power of adolescent male tennis players. The results of this study indicated that plyometric training is more efficient to bring out needed changes over the breath holding time, resting pulse rate, flexibility and leg explosive power of adolescent male tennis players.

It has also been confirmed that the sports performance of muscle strength or explosive strength (Suchomel *et al*., 2016). [18]. Some studies have identified that PT affects muscle length, strength, and flexibility to increase speed (Manouras *et al*., 2016) [24].

The results of this study highlight the importance of selecting plyometric forms of exercise that correspond to the level of motivation to practice with volleyball players. It was found that the plyometric form of the Depth Jump exercise was more effective in the group of players who had high training motivation, while the Jump to Box form of exercise was more effective in the group of players with low training motivation. This suggests that training motivation may influence players' response to plyometric exercise and their ability to achieve increased limb muscle explosive power (Anggara, 2018; Gustiawan *et al*., 2021) [7, 9].

The significant interaction between plyometric forms of exercise and training motivation also highlights the importance of an individualized approach in sports training. Every player has a different level of motivation, and there is no one-size-fits-all approach when it comes to designing a training program. By considering each player's training motivation level, the coach can identify the most appropriate form of plyometric training to help the player achieve optimal explosive power enhancement (Alamsyah *et al*., 2018; Salahuddin *et al*., 2022) [8, 26].

The interaction between plyometric forms of exercise and training motivation may also indicate individual differences in players' responses to physical exercise (Fajri, 2017; Miftahudin *et al*., 2022) [10, 13]. Players with high training motivation tend to be more committed and eager to follow a training program and actively try to improve their abilities. As a result, they are more respons ive to the plyometric form of Depth Jump exercise which can provide a more intense stimulus and focus on developing the explosive power of leg muscles (Febrianto *et al*., 2022; Fernanda & Yunus, 2020) [12, 25]. (Mohammad, 2017) [4] plyometric was significant effect on flexibility and leg strength of Badminton players Heart rate is increased due to the Plyometric exercise after six week training period (Shunmuganathan, 2018) [1]. Resting heart rate and breath holding time had significant improvement by the influence of the Plyometric training in the volley ball players (Anitha, 2017) [2]. Plyometric training had observed changes in resting heart rate and breath holding time among the volley ball players with the limitation of player's diet, life style, climate (Vishnu Raj R 2017) [3]. (P. Senthil 2015) [5] revealed that the resting pulse rate reduced by the Plyometric training after the 12 weeks period.

Conclusions

1. Based on the result of the study it was concluded that the plyometric training have been significantly changes in breath holding time, pulse rate, flexibility and leg explosive power of adolescent male tennis players.

References

1. Shunmuganathan D. Effect of Plyometric training programme on physiological variables among adolescent school boys. International Journal of Physiology, Nutrition and Physical Education. 2018;3(2):26-28.
2. Anitha J. Effect of Plyometric training on selected physiological variables among college level volleyball players. International Journal of Physiology, Nutrition and Physical Education. 2017;2(2):1094-1095.
3. Vishnu Raj R. Effect of Plyometric training on selected physical and physiological variables among college level volleyball players. International Journal of Yoga, Physiotherapy and Physical Education. 2017;2(5):181-184.
4. Bhat MR. Effect of Plyometric Exercises on Flexibility And Leg Strength of Badminton Players. International Journal of Creative Research Thoughts (IJCRT). 2017, 5(1).
5. Senthil P. Effects of Plyometric Training on Physical and Physiological Parameters. Asian Journal of Science and Technology. 2015;06(12):2113-2116.
6. Kare RS. Effect of plyometric training on vital capacity and resting plus rate in state level rowing sculling players. International Journal of Physiology, Nutrition and Physical Education. 2019;4(1):1345-1347.
7. Anggara H. Part Whole Part and Whole Part Whole Affect Volley Normal Smash Ability. ACTIVE: Journal of Physical Education, Sport, Health and Recreation. 2018;7(3):124–127.
8. Alamsyah A, Supriatna E, Samodra Y. Peningkatan Kemampuan Smash Open melalui Alat Drill Smash. Jurnal Pendidikan Dan Pembelajaran Khatulistiwa (JPPK). 2018, 9(7).
9. Gustiawan H, Putra MR, Suhdy M. Hubungan Daya Ledak Otot Tungkai Dengan Kemampuan Smash Pada Ektrakurikuler Bolavoli Di SMP Negeri 6 Kota Lubuklinggau. Journal Perspektif Pendidikan. 2021;15(2):99–108.
10. Fajri M. Kemampuan Dasar Smash Dalam Permainan Bola Voli Menggunakan Metode Permainan pada Siswa Ekstrakulikuler SMAN 1 Kedung Waringin. Lentera STKIP-PGRI Bandar Lampung. 2020;2:223–227.
11. Fauzi F. Validitas Penilaian Kinerja Teknik Bendungan Atau Blok Pada Atlet Junior Bola Voli Daerah Istimewa Yogyakarta. Jorpres (Journal Olahraga Prestasi). 2017;16(2):78–84.
12. Febrianto A, Sulaiman S, Hidayah T. The Contribution of Leg Length, Leg Flexibility and Leg Speed to the Results of Kedeng Sepaktakraw's Smash Ability. JUARA: Journal Olahraga. 2022;7(2):390–397.
13. Miftahudin I, Nurhidayat SP, Or M. Analysis Keterampilan Smash Pada Mahasiswa Ukm Bola Voli Universitas Muhammadiyah Surakarta. Universitas Muhammadiyah Surakarta.
14. Kovacs MS. Applied physiology of tennis performance, British Journal of Sports Medicine. 2006;40:381-386.
15. Barbieri D, Zaccagni L, Babic´ V, Rakovac M, Mišigoj-Durakovic´ M, Gualdi E. Body composition and size in sprint athletes. Journal of Sport Medicine and Physical Fitness. 2017;57:1142–1146.
16. Franchini E, Cormack S, Takito MY. Effects of High-Intensity Interval Training on Olympic Combat Sports Athletes' Performance and Physiological Adaptation: A Systematic Review. Journal of Strength and Conditioning Research. 2019;33:242–252.
17. Beattie K, Kenny IC, Lyons M, Carson BP. The effect of strength training on performance in endurance athletes.

Sports Medicine. 2014;44:845–865.
18. Suchomel T, Nimphius S, Stone M. The Importance of Muscular Strength in Athletic Performance. Sports Medicine. 2016;46:1419–1449.
19. Bedoya AA, Miltenberger MR, Lopez RM. Plyometric Training Effects on Athletic Performance in Youth Soccer Athletes: A Systematic Review. Journal of Strength and Conditioning Research. 2015;29:2351–2360.
20. Oxfeldt M, Overgaard K, Hvid LG, Dalgas U. Effects of plyometric training on jumping, sprint performance, and lower body muscle strength in healthy adults: A systematic review and meta-analyses. Scandinavian Journal of Medicine & Science in Sports. 2019;29:1453–1465.
21. Asadi A, Arazi H, Young W, Sáez de Villarreal E. The Effects of Plyometric Training on Change of Direction Ability: A Meta-Analysis. International Journal of Sport Physiology and Performance. 2016;11:563–573.
22. Slimani M, Chamari K, Miarka B, Del Vecchio FB, Chéour F. Effects of Plyometric Training on Physical Fitness in Team Sport Athletes: A Systematic Review. Journal of Human Kinetics. 2016;53:231–247.
23. Ramírez-delaCruz M, Bravo-Sánchez A, Esteban-García P, Jiménez F, Abián-Vicén J. Effects of Plyometric Training on Lower Body Muscle Architecture, Tendon Structure, Stiffness and Physical Performance: A Systematic Review and Meta-analysis. Sports Medicine Open. 2022;8:40.
24. Manouras N, Papanikolaou Z, Karatrantou K, Kouvarakis P, Gerodimos V. The efficacy of vertical vs. horizontal plyometric training on speed, jumping performance, and agility in soccer players. International Journal of Sport Science. 2016;11:702–709.
25. Fernanda AM, Yunus M. The Effect of Plyometric Standing Jump Exercise Towards High Jump of Volleyball Players UABV Universitas Negeri Malang. InThe 1st International Scientific Meeting on Public Health and Sports (ISMOPHS 2019) 2020 Dec 4 (pp. 157-162). Atlantis Press.
26. Salahuddin Z, Woodruff HC, Chatterjee A, Lambin P. Transparency of deep neural networks for medical image analysis: A review of interpretability methods. Computers in biology and medicine. 2022 Jan 1;140:105111.