Journal of Exercise Science & Physiotherapy Vol.17 No.2 (July to December) 2021
ISSN: 0973-2020 (Print) I2OR Impact Factor = 7.005 ISSN: 2454-6089 (Online)

Effectiveness of Contract-Relax PNF Technique versus Dynamic Oscillatory Stretching on Active Range of Motion and Balance in Collegiate Basketball Players

Ambuja Bhardwaj and LokendraBahadur Kathayat

Abstract

Aims: The purpose of this study was to compare the effect of PNF contract-relax technique and dynamic oscillatory technique. **Materials and Methods:** Thirty male (N=30) collegiate basketball players (from stadiums and colleges of Ludhiana District of Punjab) between the age group of 18 to 24 years voluntarily participated in the study. The subjects were assigned to two groups on the basis of random sampling with 15 participants in each group. Group A was given contract relax PNF stretch and Group B was given Dynamics Oscillatory Stretching (DOS) of dorsiflexors and plantar flexors. **Results:** The Mean Difference of ankle dorsiflexion of Group A was 24.67 and for Group B was 14.33.The Mean Difference of ankle plantarflexion of Group A was 21.33 and for Group B was 13.33. No significant differences in effect on dynamic balance of players were observed. **Conclusion:** In conclusion, effect of PNF Contract-Relax Technique and Dynamic Oscillatory Stretching of ankle plantar flexors and dorsiflexors in collegiate basketball players both were efficient in increasing active range of motion of dorsiflexion and plantarflexion but PNF Contract-Relax is more effective than dynamic oscillatory stretching. There was no significant difference in effect of both the approaches on dynamic balance in the athletes.

Ambuja Bhardwaj
Assistant Professor
Department of Physiotherapy
RIMT University MandiGobindgargh, Punjab, India
Email: ambujabharadwaj@gmail.com

Lokendra Bahadur Kathayat
Assistant Professor
Department of Physical Education
RIMT University MandiGobindgargh, Punjab, India
Email: lukskathayat@gmail.com

Key words: PNF Contract-Relax, Dynamic Oscillatory Technique, Active Range of Motion, Star Excursion Balance Test(SEBT)

DOI: 10.18376/jesp/2021/v17/i2/167263

Introduction

Basketball is a sport which includes both aerobic and anaerobic activity which includes explosive activities like jumps, dribbles, turns and low potency activities such as walking, stopping and jogging (Utku 2012). Among all the joints ankle joint is more prone to get injured specifically because of activities like running and jumping are involved in the game of basketball (Kristen et al., 1997). As the season passes the tendency to get tighter muscles increase specifically the muscles in the back, hip, ankle and groin gets tightened. This tightness is the result of exhaustion caused by the regular training and practices by the athletes (Angela et al., 2017). To maintain an optimum level of performance in sports many factors are required which include flexibility and balance. In regulating physiological capacity, physical fitness plays a principal role. Basketball is a sport which is played as a unit by the members of the team and it requires high level of mastery and proficiency in the skills and strategic ability in which composite motoric features such as changing positions, coordination, good reaction time, strength and endurance are required (Omer 2006). Favorable outcome in all composite movements with rapidly changing direction might have a powerful link to balance and proficient range of motion (Ozhan 2016). Muscle Pliability is reviewed as a beneficial

and rewarding element of athletic skill and injury cutback. PNF stretching has been outlined as better technique at improving range of motion as compared to static or ballistic techniques. There are numerous variants of PNF stretching. The contract-relax (CR) approach of PNF includes use of maximum voluntary isometric muscle contraction and following that the subject goes for relaxation. The previous researches has shown that the most beneficial PNF contraction duration is 3–10 seconds, with six seconds being preferred (Feland and Marin 2003). Proprioceptive neuromuscular facilitation (PNF) stretching, impedes tonic reflex activity and it results in increment in range of motion it can be hypothesized that these effects are because of changes at both mechanical and neurological level in the muscle. Previous studies have reported that the autogenic and reciprocal inhibition mechanisms which take place during the application of this approach results in reducing the muscle tension and resistance to stretch thus increasing the range of motion of the muscle (Bekir and Fetih 2009). Dynamic Oscillatory stretching along with isometric contraction is an efficient method for increasing the flexibility of muscle, it includes combination of pre-contraction stretching along with dynamic high amplitude stretching isometric contraction of the elongated pointed muscle group triggers the physiological process of autogenic inhibition mechanism which results in reduction of muscle tension. This technique has direct effect on reducing the pain in the muscle as proved by pervious researches (Glover 2012). In a study by Masood et al., (2020) it has been shown that dynamic Oscillatory stretching technique has shown better results as compared to static stretching on the flexibility and pain tolerance in the hamstrings muscle group. It was stated that this approach includes oscillatory physiological mobilization technique and has shown to reduce edema and soreness after performing intense exercise.

Materials and Methods

Thirty male (N=30) collegiate basketball players (from stadiums and colleges of Ludhiana District of Punjab) between the age group of 18 to 24 years voluntarily participated in the study. The subjects were assigned to two groups on the basis of random sampling with 15 participants in each group. Group A was given contract relax PNF stretch and Group B was given Dynamics Oscillatory Stretching (DOS) of dorsiflexors and plantar flexors. The conservative treatment given to both the groups is hot pack for 10 minutes. The treatment was given for 5 days a week for 3 weeks. The subjects were tested for active range of motion and Dynamic Balance using goniometer and Star Excursion Balance Test both before and after the completion of treatment protocol. Data was meaningfully assorted through calculation of Mean and Standard Deviation (SD). Later on Paired "t" test was applied for comparison within the Pre and Post-test values of Group A and Group B Active Range of Motion and 8 directions of Star Excursion Balance test.

Results

The mean age of basketball players' was19.9±1.97 year for group A and 22±1.54 for group B (Table 1).

Table 1. Mean ±SD of Age of Basketball Players

GROUPS	N	**Mean ±SD**
A	15	19.9±1.97
B	15	22±1.54
Total	30	20.95±1.75

Table 2 shows Paired "t" test result of dorsiflexion within the Group A and Group B. The Mean±SD value for Pre (ROM) of Group A was 54.00±6.866 and for Post (ROM) of Group A was

78.67±9.722. The value for Pre (ROM) of Group B was 55.67±5.936 and for Post (ROM) of Group B was 70.00±9.449. The "t" value for Comparison within Group A was 23.919 which was significant, p<0.05 Significant. The "t" value for Comparison within Group B was 8.527 which was significant, p<0.05 Significant.

Table 2.Comparison of Ankle Dorsiflexion within the Group A and Group B

Paired T test	**Dorsiflexion**			
	Group A		**Group B**	
	Pre (ROM)	Post (ROM)	Pre (ROM)	Post (ROM)
Mean	54.00	78.67	55.67	70.00
S.D.	6.866	9.722	5.936	9.449
Number	15	15	15	15
Mean Difference	24.67		14.33	
Paired T Test	23.919		8.527	
P value	<0.001		<0.001	
Table Value at 0.05	2.14		2.14	
Result	Significant		Significant	

Table 3 shows Paired "t" test result of Plantarflexion within the Group A and Group B. The Mean±SD value for Pre (ROM) of Group A was 35.67±8.423 and for Post (ROM) of Group A was 57.00±10.488. The value for Pre (ROM) of Group B was 36.33±6.114 and for Post (ROM) of Group B was 49.67±7.188. The "t" value for Comparison within Group A was 23.482 which was significant, p<0.05 Significant. The "t" value for Comparison within Group B was 10.583 which was significant, p<0.05 Significant.

Table 4 shows result of Mean Difference of Dorsiflexion between Group A and Group B. The mean difference of Group A was 24.67 and for Group B were 14.33.

Table 5 shows result of Mean Difference of plantarflexion between Group A and Group B. The mean difference of Group A was 21.33 and for Group B was 13.33.

Table 6 shows the Pre and Post values of the eight directions of the star excursion balance test of group A." t" value for the eight directions are A8.78, AL12.88, L7.28, PL7.26, P 4.79, PM4.83, M6.70 and AM11.55 respectively. Significant effect of the approach was seen on dynamic balance.

Table 3.Comparison of Ankle Plantarflexion within the Group A and Group B

Paired T test	Plantarflexion			
	Group A		Group B	
	Pre (ROM)	Post (ROM)	Pre (ROM)	Post (ROM)
Mean	35.67	57.00	36.33	49.67
S.D.	8.423	10.488	6.114	7.188
Number	15	15	15	15
Mean Difference	21.33		13.33	
Paired T Test	23.482		10.583	
P value	<0.001		<0.001	
Table Value at 0.05	2.14		2.14	
Result	Significant		Significant	

Table 4. Comparison of Mean Difference of Dorsiflexion between Group A and Group B

Variables	**Dorsiflexion**	
Group	**Group A**	**Group B**
Mean Difference (Pre-Post)	24.67	14.33

Table 5. Comparison of Mean Difference of Plantarflexion between Group A and Group B

Variables	**Plantarflexion**	
Group	**Group A**	**Group B**
Mean Difference (Pre-Post)	21.33	13.33

Table 6. The Pre V/S Post Values of The 8 Directions of SEBT

GROUPS A	A	AL	L	PL	P	PM	M	AM
PRE VALUE	65.73 ±8.93	66.57 ±7.55	64.95 ±7.014	64.23 ±7.21	60.86 ±5.34	57.08 ±5.36	53.45 ±7.35	59.41 ±5.28
POST VALUE	84.66 ±7.11	89.02 ±7.41	87.03 ±9.45	84.12 ±8.63	79.02 ±11.32	76.36 ±11.88	74.27 ±9.34	80.90 ±8.60
T VALUE	8.78	12.88	7.28	7.26	4.79	4.83	6.70	11.55
SIGNIFICANCE	S	S	S	S	S	S	S	S

Table 7 shows the Pre and Post values of the eight directions of the star excursion balance test of group B. "t" value for the eight directions are A6.304, AL6.53, L6.53, PL5.76, P 7.19, PM5.13, M6.34 and AM6.63 respectively. Significant effect of the approach was seen on dynamic balance.

Table 7.The Pre V/S Post Values Of The 8 Directions of SEBT

GROUPS B	A	AL	L	PL	P	PM	M	AM
PRE VALUE	70.76 ±4.95	72.25 ±7.94	70.99 ±7.62	68.20 ±5.99	61.44 ±5.72	57.62 ±4.63	53.67 ±5.90	61.07 ±9.34
POST VALUE	88.13 ±6.94	93.93 ±7.60	95.70 ±8.86	92.71 ±10.84	85.37 ±10.46	81.43 ±14.57	76.23 ±13.65	81.82 ±12.70
T VALUE	-6.304	-6.53	-6.53	-5.76	-7.19	-5.13	-6.34	-6.63
SIGNIFICANCE	S	S	S	S	S	S	S	S

Discussion

The purpose of this study was to assess the effect of PNF contract relax technique and Dynamic Oscillatory technique on dynamic balance and active range of motion, this study also compared the effect of both on the same outcomes. After the statistical analysis, it was found that improvement in dynamic stability and static stability was not much differed between the two groups but the result of group A who performed PNF Contract – Relax Technique came out to be significant. In 2009 Ulrike et al. reported that that an isometric contraction increases the firing rate of its own muscle spindles. They in turn send stimuli to Ia-inhibitory interneurons, presumably inhibiting alpha motor neurons of the antagonistic muscles. This leads to relaxation of the antagonistic muscles and/or a depression of the amplitude of the muscle stretch-reflex response. The CR technique is said to take advantage of this occurrence. Imbalance can build up in all distinct movements of basketball, most commonly spotted in the twisting movements of feet, jump shots alongwith offensive and defensive recoils. Therefore, uncovering more specific regime for balance training is an area of research for better sports performance (Bale 2019). Absence of balance can lead to knee and ankle injuries in basketball players (Gabriele et al., 2013). Kayla et al., (2012) and Nicolas et al., (2010) reported that PNF Technique used i.e. contract- relax, is aimed at relaxing tense muscles and restricted joints to make quick gains in range of motion with the ultimate goal being to optimize motor performance and rehabilitation. Previous studies using goniometry have confirmed that the joint ROM can be increased significantly by PNF Contract – Relax technique. So the Group A receiving PNF Contract – Relax improved better. The result of Group B who performed Dynamic Oscillatory technique came out to be significant possibly may be due to the fact that this approach reduces the pain threshold. PNF stretching exercises has also shown to increase the strength of the joint. In the previous studies it was shown that four weeks of PNF stretching increases the range of motion, increases the isokinetic peak torque and maximize the isometric ankle strength. The beneficial

effects of the approach used in this study are in accordance with previous researches which stated that the physiological effects of PNF CR technique are responsible for the improved flexibility. It was reported that the initial sessions of the approach use to give a maximum increase in flexibility and practice of CR stretches twice a week are sufficient to get the permanent changes in the muscle (Taner and Ani 2015).

Conclusion

This study concluded that effect of PNF Contract-Relax Technique and Dynamic Oscillatory Stretching of ankle plantar flexors and dorsiflexors in collegiate basketball players both were efficient in increasing active range of motion of dorsiflexion and plantarflexion but PNF Contract-Relax is more effective than dynamic oscillatory stretching. There was no significant effect of both the approaches on dynamic balance in the athletes. The study will help in designing the warm –up protocol of the athlete and suggests the best suitable flexibility regime.

References

Angela N, Fabrizio P, Alessio C. 2017. Flexibility responses to different stretching methods in young elite basketball players. Muscles, Ligaments and Tendons Journal; 7 (4):582-589

Bale P. 2019. Investigation of Strength, Flexibility and Balance Parameters with Performance Dimension in Basketball Players. Journal of Education and Learning; Vol. 8(5):225-231.

Bekir Y, and Fatih K. 2009. Investigation into the long-term effects of static and PNF stretching exercises on range of motion and jump performanceJournal of Bodywork and Movement Therapies; 13:11–21.

Feland J B, and Marin H N. 2004. Effect of submaximal contraction intensity in contract-relax proprioceptive neuromuscular facilitation stretching.Br J Sports Med, 38(4):E18. doi: 10.1136/bjsm.2003.010967.

Gabriele B, Alessandro B, Luca B, Giampietro A.2013.Using balance training to improve the performance of youth basketball players.Sport Sci Health 9:37–42.

Glover K, 2012. Dynamic oscillatory stretching with isometric contraction versus sacroiliac joint manipulation versus a combination on hamstring flexibility. Johannesburg: University of Johannesburg.

Kayla BH, Tyler JW, Wyatt OB, Junggi H. 2012. PNF: Its Mechanisms and Effects on Range of Motion and Muscular Function. J Hum Kinet; 31:105 – 113.

Kristen A. Payne, Kris B, Richard W. Latin. 1997. Ankle Injuries and Ankle Strength, Flexibility, and Proprioception in College Basketball Players.Journal of Athletic Training; 32 (3):221-225.

Masood K, Riaz H, Ghous M. 2020. Comparison between dynamic oscillatory stretch technique and static stretching in reduced hamstring flexibility in healthy population: A single blind randomized control trial. JPak Med Assoc; 70 (11):1908-1912.

Nicolas B, Kouassi B, Kevin D. 2010. Acute effects of 15 min static or contract-relax stretching modalities on plantar flexors neuromuscular properties. Journal of Science and Medicine in Sport; 247–252.

Ömer Ö. 2006. Anthropometric, body composition and somatotype differences of Greek elite female basketball, volleyball and handball players. J Sports Med Phys Fitness; 46(2): 271- 280.

Özhan Bavlı. 2016. Investigation into the Effects of Eight Weeks of Step Aerobic Dance Practice on Static Balance, Flexibility and Selected Basketball Skills in Young Basketball Players. Journal of Education and Training Studies. 4(5):233-238.

Taner A and Ani A. 2015. Effects of an eight-week proprioceptive neuromuscular facilitation stretching program on kicking speed and range of motion in young male soccer players. Journal of Strength and Conditioning Research.; 29(12)/3412–3423

Ulrike HM, William JM, Hopkins JT, Hunter L, Feland JB, Hilton SC. 2009. Neurophysiological Reflex Mechanisms Lack of Contribution to the Success of PNF Stretches, Journal of Sports Rehabilitation; 18:343 – 357.

Utku A. 2012.The Relationship between Muscle Strength, Anaerobic Performance, Agility, Sprint Ability and Vertical Jump Performance in Professional Basketball Players. Journal of Human Kinetics volume; 13: 99 – 106

Conflict of Interest: None declared