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Effect of proprioceptive neuromuscular facilitation stretching on physical fitness: A Critical Analysis

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Abstract

Background: PNF stretching is a reputed exercise for the development of physical exercise and sports performance. However, there was no review study on PNF stretching and physical fitness.

Aim: The aim of the study was to identify the effect of PNF stretching on physical fitness in the perspective of positive effect, negative effect and no effect.

Method: 28 articles fulfilling the criteria for made this review study after inclusion and exclusion were done. All articles were collected through online scientific data sources.

Discussion: Interpretation was made on the following three areas: PNF and positive effect on physical fitness; PNF and negative effect on physical fitness; PNF and no effect on physical fitness.

Conclusion: It may be conclude that PNF stretching has some positive effect for the development of physical fitness, i.e flexibility, strength, balance, endurance, sprinting performance. Researchers reported some adverse effect on muscle activation and strength. Some researchers also reported that there was no effect on isometric maximal voluntary contraction and muscle activity.

Keywords: PNF and Strength; Flexibility; Speed; Agility: Coordination; Balance

1. Introduction

Physical fitness is very important for daily living activities and for the development of skills in various sports. It is a kind of characteristics which a person should bear or acquire. The components of physical fitness are categorized into two sections: i) Health-related components of physical fitness that are, a) cardiorespiratory endurance, b) muscular endurance, c) muscular strength, d) body composition and e) flexibility these components are necessary for non-sportsperson; ii) Skill-related components of physical fitness that are: a) agility, b) balance, c) body composition, d) endurance, e) coordination, f) flexibility, g) power and h) speed all these components are essential for sportsperson. From both the health-related and skill-related physical fitness components flexibility is a common factor. The flexibility may increase by the practice of Proprioceptive Neuromuscular Facilitation (PNF) stretching. It is an advanced form of flexibility training that involves muscle contraction and stretching. This stretching technique helps to improve muscle elasticity and for the development of active and passive range of motion.

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1.1. Objective of the study:

The objective of the study was to indentify the effect of proprioceptive neuromuscular facilitation stretching on physical fitness in perspective of positive effect, negative effect and no effect

2. Methods

2.1. Acquisition of Evidence:

Acquisition of evidence was done by the procedure of online searching. Reviewing literatures were searched through electronic databases. The scientific studies were identified up to September 2020. All the relevant studies of PNF and physical fitness identified from: International PNF Association; Pubmed; Springer; Somatosensory and Motor research; Biomed Central and Web of Science. The following keywords were given to search articles: PNF and cardiorespiratory system; PNF and musculoskeletal; PNF and sports training; PNF and coordination; PNF and functional activities; PNF and Physical activity; PNF and exercise etc. The experimental studies have been considered for this review literature only.

2.2. Inclusion and Exclusion Criteria

Inclusion criteria: i) Only PNF studies on experimental aspects, ii) Physical fitness and PNF, iii) PNF and sport training, iv) PNF and physical activity and v) PNF and exercise were included in this review study.

Exclusion criteria: i) Historical studies, ii) Review studies and iii) Survey studies were excluded from this review study.

2.3. Selection Procedure of Review Literature

In the beginning there were 42 articles identified from search databases. The researcher has gone through 34 scientific studies after duplicate articles removed. All full text articles were examined and 06 articles were excluded and at last 28 articles were included for the study of narrative review. Figure no.1 is presented for detail article selection procedure.

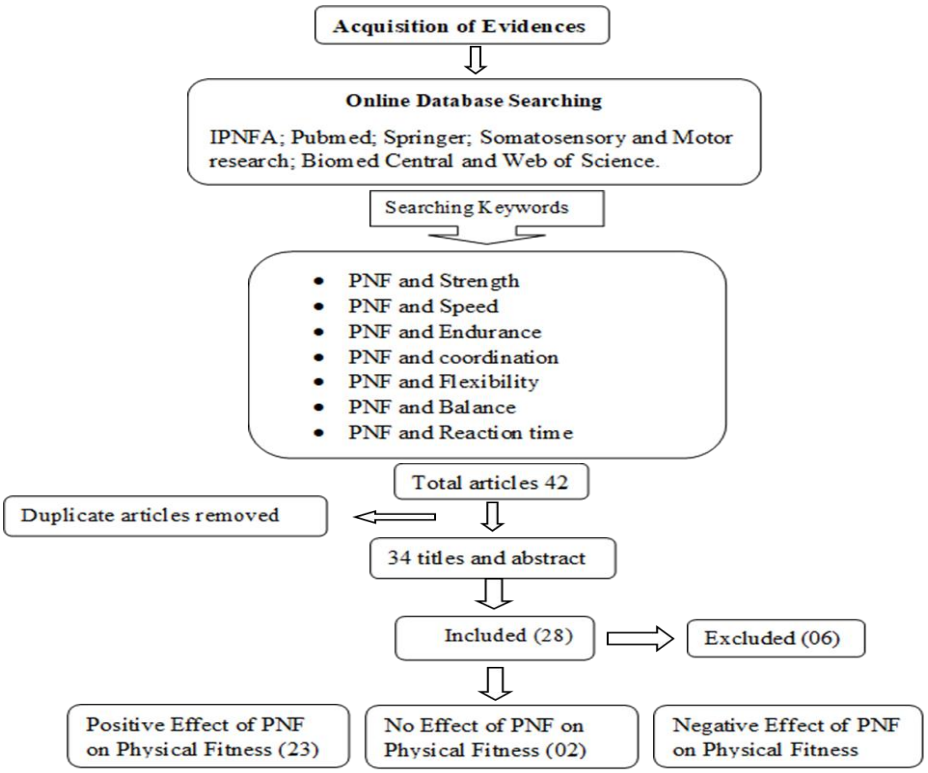

Figure 1 Detail Selection Procedure of Articles

3. Results and discussion

PNF technique may improve general flexibility, specific range of motion, local muscular strength, coordination and functional activities of daily living. PNF stretching is very popular for the development of various sports skills. All the papers of PNF stretching and its effects on physical fitness have been studied properly then we categorized in three areas i.e i) Positive Effect of PNF on Physical Fitness, ii) Negative Effect of PNF on Physical Fitness and iii) No Effect of PNF on Physical Fitness.

3.1. Positive Effect of PNF on Physical Fitness

Range of motion (ROM) in the joint age related declines might counter act by PNF stretch and life time training (Ferber, 2002). Almost equal clinical effectiveness for improving hamstring flexibility of PNF hold relax and PNF contract relax-antagonist contract (Nagarwal, 2010). Individually PNF stretching techniques can practice with a partner or alone with a strap to improve ROM. For an athlete it should not practice before important competitions or training because impairment of limb velocity and movement time (Maddigan, 2012). Upper extremity PNF pattern did significantly affect the mean upper trapezius, middle trapezius and lower trapezius activity (Witt, 2011). PNF stretching with resistance training group had slightly more improvement in strength, muscle volume and flexibility when compared to the resistance training group (Arazi, 2012). Flexibility, strength and endurance of hamstring muscle can increase in non-athlete men by the PNF training (Sanavi, 2013). Muscle energy technique, PNF stretching and static stretching produce a significant improvement in hamstring flexibility (Kumar, 2015). PNF stretching may change the length –tension association (Cengiz, 2015). PNF stretching, it is not necessary to apply the maximum intensity of muscle contraction (Kwak, 2015). Eight weeks PNF stretching improved ROM of lower extremity joints and the kicking speed in the young male soccer players (Akbulut, 2015). Both PNF stretching and static stretching can be performed before sprinting activity to improve the sprinting performance (Maharjan, 2015). PNF stretching of hamstring with valsalva maneuver shows significant increase in heart rate and blood pressure compared to PNF stretching of pectorals (Krima, 2016). Contract-relax PNF stretching might be effective to improve dynamic balance control (Ghram, 2016). Static stretching and PNF stretching significantly effective in improving hamstring muscle range of motion when compared from pretest with posttest (Karthikeyan, 2016). A single session of soft tissue mobilization with proprioceptive neuromuscular facilitation immediate improvement in glenohumeral external rotation and overhead reach (Gadpal, 2017). PNF stretching group, the pennation angle in the stretched position and plantar flexor maximum voluntary contraction decreased significantly (Konrad, 2017). Kinesiotherapeutic technique may be effectively used in the prevention, treatment and rehabilitation of shoulder disorders (Comel, 2018). PNF stretching of the hamstrings may not adversely affect the H:Q ratios, and consequently not negatively affect injury risk associated with muscular strength imbalances (Ruas,2018). PNF contract relax antagonist stretching technique was better than PNF hold-relax stretching technique in improving the hamstring muscle flexibility (Ramachandran, 2018). A single dose of contract relaxes PNF stretching of hip abductors and adductors muscle improves mideolateral dynamic balance (Szafraniec, 2018).Repetitive high-intensity stretching may cause heavy burden on muscle tissues, and pain caused by high-intensity stretching can hinder muscle performance. Moderate stretching intensity is recommended and considered conducive to maintaining the effects of stretching while ensuring its safety (Lim, 2018). Neck proprioception may be improved with training program and neck PNF training can reduced sports injuries and enhance athletic performance (Naderifar, 2018). Static, ballistic and PNF stretching exercise are effective for promoting flexibility performance among male football players (Derbachew, 2019).

3.2. No Effect on Physical Fitness after PNF stretching

No significant differences observed between the difference scores of the static and PNF stretching conditions on 14 elite, premier league young soccer players (Jordan et al. 2012). Short-duration PNF or static stretching has no effect on isometric maximal voluntary contraction and muscle activity in indoor soccer players (Reis et al. 2013).

3.3. Negative Effect of PNF Stretching on Physical Fitness

Static and PNF stretching caused similar deficits in strength, power output and muscle activation at both slow and fast velocities (Marek et al. 2005). PNF method negatively affects the vertical jump performance and, thus ought not to be used as part of warm-ups (Nogueira et al. 2010). PNF method should be avoided because of subsequently negative effects on vertical jump performance (Oliveira et al. 2018).

4. Conclusion

Conclusion was drawn after thoroughly reviewing 28 articles which was reported that PNF stretching and its effect on Physical fitness.

- Positive effect of PNF stretching has been identified for the development of flexibility, strength, balance, endurance, sprinting performance.
- Some negative effects have been identified by the scientists on muscle activation and strength by the practice of PNF stretching.
- Two studies reported that there was no effect of PNF stretching on isometric maximal voluntary contraction and muscle activity.
- However, PNF may increase heart rate and blood pressure also.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interests regarding the publication of this paper.

References

[1] Akbulut T, Agopyan A. 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 Association. 2015; 29(12): 3412-3423.

[2] Arazi H, Nia FR, Hakimi M, Mohamadi MA. The effect of PNF stretching combined with a resistance training on strength, muscle volume and flexibility in non-athlete male students. Sports Science. 2012;5(1):85-90.

[3] Cengiz A, Demirhan B, Yaman C,Yaman M. Acute effects of PNF stretching on maximum voluntary contraction in men. Anthropologist. 2015;21(30): 500-504.

[4] Comel JC, Nery RM, Garcia EL, Bueno CDS, Silveira, Zarantonello MM, Stefani MA. A comparative study on the recruitment of shoulder stabilizing muscles and types of exercises. Journal of Exercise Rehabilitation. 2018;14(2): 219-225.

[5] Derbachew A. Static, ballistic and PNF stretching exercise effects on flexibility among arba minch football players. Journal of humanities and social science. 2019; 24(3): 87-92.

[6] Ferber R, Gravelle DC, Osternig LR. Effect of proprioceptive neuromuscular facilitation stretch techniques on trained and untrained older adults. Journal of Aging and Physical Activity. 2002; (10): 132-142.

[7] Gadpal P, Bhava S, Deshpande NK. Immediate effect on external rotation and overhead reach in patients with shoulder pathology using proprioceptive neuromuscular facilitation and soft tissue mobilization. International Journal of Physiotherapy and Research. 2017;5(4): 2259-64.

[8] Ghram A, Damak M, Rhibi F, Marchetti PH. The contract-relax proprioceptive neuromuscular facilitation (PNF) stretching can affect the dynamic balance in healthy men. Medical express.2016; 3(4): M160404.

[9] Gomes TM, Simao R, Marques MC, Costa PB, Novaes JDS. Acute effects of two different stretching methods on local muscular endurance performance. Journal of strength and conditioning research. 2010; 0(0): 1-8.

[10] Gontijo LB, Pereira PD, Neves CDC, Santos AP, Machado DDCD, Bastos VHDV. Evaluation of strength and irradiated movement pattern resulting from trunk motions of the proprioceptive neuromuscular facilitation. Rehabilitation Research and Practice. 2012; 1-6.

[11] Haskell WL, Montoye HJ, Orenstein D. Physical activity and exercise to achieve health-related physical fitness components. Public Health Reports. 1985; 202-211.

[12] Jordan JB, Korgaokar AD, Farley RS and Caputo JL. Acute effects of static and proprioceptive neuromuscular facilitation stretching on agility performance in elite youth soccer players. International journal of exercise science. 2012; 5(2): 97-105.

[13] Karthikeyan R, Thiruvevenkadam IA, Nedunchezhiyan A. Static stretching vs hold relax (PNF) on sustainability of hamstring flexibility in sedentary living college students. International Journal of Physiotherapy and Research. 2016; 4(2): 1436-43.

[14] Kaya F, Bicer B, Yuktasir B, Willems MET, Yildiz N. The effects of two different stretching programs on balance control and motor neuron excitability. Journal of Education and Training Studies. 2018;6(5): 85-91.

[15] Konrad A, Stafilidis S, Tilp M. Effects of acute static, ballistic, and PNF stretching exercise on the muscle and tendon tissue properties. Scandinavian Journal of Medicine & Science in Sports. 2017; (27):1070-1080.

[16] Krima T, Falak O. Comparison of cardiovascular responses with proprioceptive neuromuscular facilitation stretching on pectorals and hamstrings with valsalva maneuver in young adults. International Archives of Integrated Medicine. 2016; 3(6): 42-48.

[17] Kwak DH, Ryu YU. Applying proprioceptive neuromuscular facilitation stretching: optimal contraction intensity to attain the maximum increase in range of motion in young males. Journal of Physical Therapy Science. 2015;27(7): 2129-2132.

[18] Lempke L, Wilkinson R, Murray C, and Stanek J. The effectiveness of PNF versus static stretching on increasing hip-flexion range of motion. Journal of sport rehabilitation. 2018; 27: 289-294.

[19] Lim W. Optimal intensity of PNF stretching: maintaining the efficacy of stretching while ensuring its safety. The Journal of Physical Therapy Science. 2018;(30): 1108-1111.

[20] Maddigan ME, Peach AA, Behm DG. A comparison of assisted and unassisted proprioceptive neuromuscular facilitation techniques and static stretching. Journal of Strength and Conditioning Research. 2012;26(5):238-1244.

[21] Maharjan J, Mallikarjunaiah HS. Proprioceptive neuromuscular facilitation stretching versus static stretching on sprinting performance among collegiate sprinters. International Journal of Physiotherapy. 2015; 2(4): 619-626.

[22] Marek SM, Cramer JT, Fincher AL, Massey LL, Dangelmaier SM, Purkayastha S, Fitz KA, Culbertson JY. Acute effects of static and proprioceptive neuromuscular facilitation stretching on muscle strength and power output. Journal of athletic training. 2005; 40(2): 94-103.

[23] Monga P, Sahni R, Saini H. Evaluation of irradiation by scapular PNF patterns on forearm muscles using surface electromyography in healthy females. International Journal of Innovative Research and Review. 2017; 5(2): 28-47.

[24] Naderifar H, Minoonejad H, Barati AH, Lashay A. Effect of a neck proprioceptive neuromuscular facilitation training program on the body postural stability in elite female basketball players. Journal of rehabilitation sciences and research.2018;5: 41-45.

[25] Nagarwal AK, Zutshi K, Ram CS, Zafar R. Improvement of hamstring flexibility: a comparison between two PNF stretching techniques. International Journal of Sports Science and Engineering. 2010; 4(1): 025-033.

[26] Nogueira CJ, Galdino LADS, Vale RGDS, Mello DBD, Dantas EHM. Acute effect of the proprioceptive neuromuscular facilitation method on vertical jump performance. Biomedical human kinetics. 2010; 2: 1-4.

[27] Oliveira LP, Vieira LHP, Aquino R, Maneehini JPV, Santiago PRP, Puggina EF. Acute effects of active, ballistic, passive, and proprioceptive neuromuscular facilitation stretching on sprint and vertical jump performance in trained young soccer players. Journal of strength and conditioning research. 2018; 32(8): 2199-2208.

[28] Ramachandran S, Paul J, Senthilkumar N, Sudhakhar S, Tamilselvi. Comparative effect of PNF stretching techniques on hamstring flexibility. International Journal of Medical and Exercise Science. 2018; 4(1): 443-447.

[29] Reis EFS, Pereira GB, Sousa NMF, Tibana RA, Silva MF, Araujo M, Gomes I, Prestes J. Acute effects of proprioceptive neuromuscular facilitation and static stretching on maximal voluntary contraction and muscle electromyographical activity in indoor soccer players. Clinical Physiology and Functional Imaging. 2013.

[30] Ruas CV, McManus RT, Bentes CM,Costa PB. Acute effects of proprioceptive neuromuscular facilitation on peak torque and muscle imbalance. Journal of Functional Morphology and Kinesiology. 2018;3:63.

[31] Sanavi HM, Zafarin A, Firouzi M. The effects of MVIC durations in PNF training on stretching, endurance and flexibility of hamstring muscle. World Applied Sciences Journal. 2013;21(1):109-112.

[32] Szafraniec R, Chromik K, Poborska A, Kawcyski A. Acute effects of contract-relax proprioceptive neuromuscular facilitation stretching of hip abductors and adductors on dynamic balance, Peerj. 2018.