

The Immediate Effect of Pelvic PNF on Y balance Test in Healthy Young Individuals

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ABSTRACT

Background: Balance is ability to maintain equilibrium. In order to maintain optimal trunk stability, co-ordination and co-activation of neural control of trunk muscle are needed. PNF is a therapeutic exercise based on diagonal patterns of motion and enhance neural control. Y balance test is dynamic test that requires strength, flexibility and proprioception.

Need of the study: PNF practices are often preceded by verbal / visual / tactile input to promote and achieve muscle contraction and motor control. So pelvic PNF can help to promote neuromuscular control of trunk. Adequate neuromuscular control of trunk can improve dynamic balance. Purpose of study is to identify the immediate effect of pelvic PNF on Y balance test in healthy young individuals

Methodology: 50 participants selected and divided into 2 groups. Control group receives trunk flexibility exercise and experimental group receives pelvic PNF in all four patterns: anterior elevation, anterior depression, posterior elevation, posterior depression and two PNF methods used: rhythmic stabilization, slow reversal. Total duration of treatment is 40 minutes.

Result: The present study indicate improvement in dynamic balance ($p < 0.05$)

Keywords: Pelvic PNF, Dynamic stability, Balance

INTRODUCTION

Balance is ability to maintain equilibrium. Dynamic balance is a key component of injury prevention and rehabilitation. Training the core muscles has been hypothesized as an intervention for improving balance. Dynamic balance is the ability to maintain stability while in motion or in movement of the body or part of the body from one point to another and in maintaining stability.⁽¹⁾

The stabilization of the pelvis and trunk is necessary for all movements of the extremities

The core is important because it is defined as the lumbo-pelvic-hip complex where a person's center of gravity is located and all movement begins.⁽¹⁾

Dynamic balance is the ability to transfer the vertical projection of the centre of gravity around the supporting base of support. Dynamic balance is the ability to maintain postural stability and orientation with centre of mass over the base of support while the body parts are in motion.

Trunk stability is important for the connection of movements between the lower and upper body, as well as the control of body balance and movements.⁽³⁾

Balance refers to an individual's ability to maintain their line of gravity within their Base of support (BOS).

Proprioceptive senses play an important role in maintaining joint stability. Balance control requires well-controlled voluntary

movement and reflective muscle reaction. Generally, the body core is stabilized by actively controlling physical stability and tension against gravity, bearing surface, vision, and exterior environment through interaction between various sensory nerves.⁽⁶⁾

Pelvic proprioceptive neuromuscular facilitation (PNF) helps to improve control of pelvis which is a key point for maintaining trunk control, gait and balance by stimulation of muscle and joint proprioception. PNF is a strategy of therapeutic exercise in which the functionally based diagonal patterns of motion are blended with the strategies of Neuromuscular abetment to endorse the motor feedback and enhance the Neuromuscular control and function.⁽⁷⁾

The YBT is a functional test that requires strength, flexibility, neuromuscular control, stability, range of movement, balance, and proprioception. This test is a good solution for functional testing because of its speed, efficiency, portability, consistency, and objectivity.⁽³⁾ The Y Balance Test requires the subject to be able to control his or her body while maintaining a single-leg stance. Potentially, this requires adequate hip girdle

strength to maintain stability of the pelvis and trunk throughout the test.⁽⁸⁾

A previous study recommended proprioceptive neuromuscular facilitation (PNF), which may stimulate the proprioceptive senses of the lumbar region muscles, and is useful for training sensory-motor regulation and balance. Therefore, this study examined the effects of PNF intervention.⁽⁵⁾

MATERIALS & METHODS

- STUDY DESIGN: Experimental Study design.
- TYPE OF SAMPLING: Convenient sampling.
- SAMPLE SIZE: 50 subjects

Group A: Pelvic PNF Group – 25 subjects

Group B: Trunk flexibility exercise Group – 25 subjects.

INCLUSION CRITERIA:

- Age between 18 to 25 years
- Male and female both

EXCLUSION CRITERIA

- Any other musculoskeletal disorder of lower extremity.
- Any other cardiopulmonary deficits
- Any other neurological deficits involving sensory function



Figure 1 : Y BALANCE TEST

The Y Balance Test is a dynamic test that requires strength, flexibility, and

proprioception. It is a measure of dynamic balance. The test can be used to assess

physical performance but can also be used to screen deficits in dynamic postural control due to musculoskeletal injuries.

The Y Balance Test requires the subject to be able to control his or her body while maintaining a single-leg stance. Potentially, this requires adequate hip girdle strength to maintain stability of the pelvis and trunk throughout the test.

After screening the subjects for the above inclusion and exclusion criteria, subjects were included in the study. A consent was taken by the subjects. The procedure was explained to the subjects

Subjects were conveniently divided into either of the two groups

Experimental Group A

- Pelvic PNF

Two methods: rhythmic stabilization (10 minutes), slow reversal (10 minutes)

Rhythmic stabilization - In this technique alternating isometric contractions against resistance is given, no motion intended

Slow Reversal- It utilizes an isotonic contraction of the agonist group instantly followed by an isometric contraction, with a hold instruction which is given at the end of every active movement.

Four patterns of Pelvic PNF

- anterior elevation
- anterior depression
- posterior elevation
- posterior depression



Figure 2: ANTERIOR ELEVATION AND POSTERIOR DEPRESSION OF PELVIC PNF PATTERNS



Figure 3: POSTERIOR ELEVATION AND ANTERIOR DEPRESSION OF PELVIC PNF PATTERNS

Control group B

Trunk flexibility exercise

- Bridging : 15 repetition 3 sets
- Crunch : 15 repetition 3 sets
- Trunk rotation : 15 repetition 3 sets
- Marching on place 10 minute

STATISTICAL ANALYSIS

- Level of significance was fixed at $p=0.05$ and any value less than or equal to 0.05 was considered to be statistically

significant. The Statistical software IBM SPSS statistics 20.0 was used for the analyses of the data. Collected data was analyzed using paired t test, to find out the significance of difference within the variables of two Groups i.e. Group A and Group B separately. Unpaired t test was employed to find out the significance of difference between the variables of Group A and Group B.

RESULT

Paired t test

Table 1: INTER GROUP COMPARISON OF DYNAMIC BALANCE

	Mean	Standard deviation	t value	P value
Pre –post experimental	9.054	3.032	21.116	<0.05
Pre –post control	2.8486	1.6146	12.47	<0.05

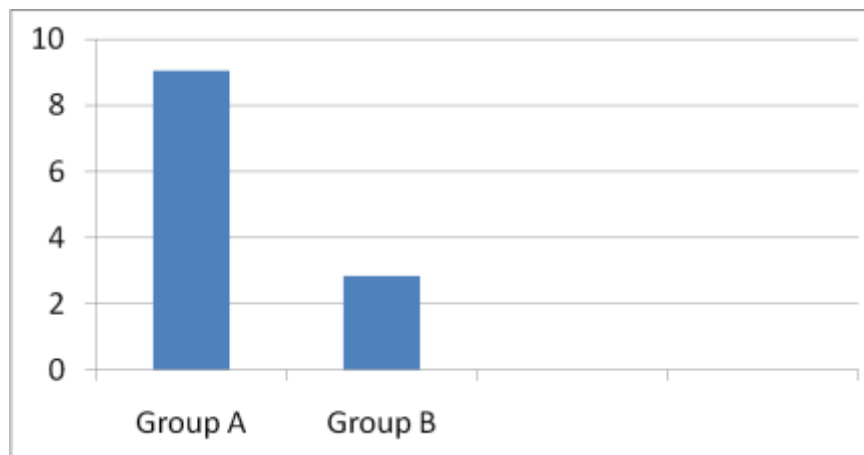


Figure 4 : MEAN DIFFERENCE BETWEEN TWO GROUPS

In present study the intervention given in both the groups was shown to be effective, but the intervention given in Group A (pelvic PNF) was found to be more effective when compared to Group B.

DISCUSSION

The present study was done to compare the effects of Pelvic PNF exercises on dynamic balance, where Group A was given Pelvic PNF exercises and Group B was given trunk flexibility exercises.

The results of this study demonstrated that the PNF techniques and trunk flexibility exercise both have significant effect on dynamic balance in healthy young individuals but pelvic PNF is more effective to improve dynamic balance.

The probable mechanism by which PNF could have worked is by facilitating the neuromuscular mechanism thus a greater motor response can be attained when employing facilitating techniques in addition to resistance. Facilitation resulted from a number of factors such as use of particular movement patterns and use of resistance in order to induce movement. Exercise program performed with PNF techniques stimulated both the myoreceptors and the exteroceptors, promoted motor-skill memory, and triggered neurophysiological changes. In addition, the neurophysiological changes must have increased functional activities by more accurate control of muscle activities and surrounding structures.⁽⁹⁾

In PNF position, sensory inputs from the periphery leads to stronger excitation of the cortical areas, leading to variations in the thresholds of a number of motor neurons⁽¹⁰⁾ The lumbo pelvic hip complex and its musculature which work synergistically to produce force, reduce force, and provide dynamic stabilization throughout the movement. Lack of stability lead to lower extremity injuries. The stability of the pelvis and trunk is essential for all movements of the extremities. Pelvic stability also helps equilibrium during performance.⁽¹⁾

Pelvis provides base of support for core musculature. Core musculature includes the muscles of trunk and pelvis that are responsible for the maintenance of stability of spine and pelvis and help in generation and transfer of energy from large to small body parts during many activities like walking, running. Core strength is an integral component of the complex phenomena that comprise balance, which requires a multidimensional interplay between central, peripheral, sensory, and motor systems. Balance is important for functional movements. Core acts as an anatomical basis for motion of distal segment. Core stability involves the ability to control motion of trunk over pelvis and legs in order to maintain stability of spine (Kibler et al., 2006). It was assumed that addition of core stability would provide more stability to improve to allow optimum force production and control of movement of lower legs.⁽¹¹⁾

The PNF approach to treatment uses the principle that control of motion proceeds from proximal to distal body regions. Facilitation of trunk control, therefore, is used to influence the extremities. Gaining control and strengthening “normal” pelvic motions improve lower extremity function . PNF utilizes a typical helical or diagonal pattern to stimulate proprioceptive sensation promote a nerve root response, enhancing functional movement. It improves muscle strength, flexibility, and balance. PNF techniques are facilitation of pelvic motion to improve control of the pelvis. Because

the pelvis has been described as a “key point of control” for maintaining a gait pattern.⁽¹⁰⁾ Previous studies reported that lumbo-pelvic instability caused by insufficient action of the deep core muscles may result in muscle imbalance between the global and local muscles. Global muscles produce movement and phasically respond to loads; local muscles, however, work tonically and are able to generate only a moderate stabilizing force.⁽¹²⁾

A previous study recommended proprioceptive neuromuscular facilitation (PNF), which may stimulate the proprioceptive senses of the lumbar region muscles, and is useful for training sensory-motor regulation and balance.⁽²⁾

In the study of Hu et al. the stability of the lumbosacral spine is secured by the internal force caused by contraction of the transverse abdominal and oblique muscles during the lower limb movement. In this study, it is also thought that the internal force and the stability of the lumbar spine were increased by the activation of the abdominal muscles according to the provision of pressure biofeedback.⁽¹³⁾

Thus present study shows Pelvic PNF exercises are more effective in improving dynamic balance in healthy young individuals.

Limitations of the study are sample size was small, only adult age group was selected, The effect of only few trunk exercises were studied, This study could not explain how long the immediate effect on YBT lasts.

CONCLUSION

In present study, neuromuscular training that focused on core stability significantly improved the composite YBT scores in healthy young individuals. Pelvic PNF exercises are more effective in improving dynamic balance in healthy young individuals.

Conflict of Interest: None

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