



“EFFECT OF FUNCTIONAL STRETCHING ALONG WITH DYNAMIC BALANCE TRAINING ON AGILITY AND BALANCE IN STATE LEVEL BASKETBALL PLAYERS - A COMPARATIVE STUDY”.

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ABSTRACT

Purpose of the study was to investigate the to find the effects functional stretching along with dynamic balance training on agility and balance in state level basketball players. The importance of agility in basketball is well known, but there are less studies examining basketball-specific effects functional stretching along with dynamic balance training on agility and balance.

Method: In this study total 30 samples who plays State level Basketball were screened according to the inclusion and exclusion criteria and were divided into two groups of 15 sample in each group respectively. Group A was treated with Functional Stretching along with Dynamic Balance training and Group B was treated with Conventional Stretching along with Dynamic Balance training. Outcome measures were taken pre and post treatment. Subjects from both the groups received 12 sessions in 4 weeks duration.

Results: The data was presented using descriptive statistics (mean, median, standard deviation). The amount of change noted in all the outcome measures was evaluated by the paired T-test, Unpaired T-test, Mann Whitney Rank Sum test, Wilcoxon test. The analysis of the study showed that the above study was effective in both functional stretching along with dynamic balance training and conventional stretching along with dynamic balance training proved to be effective in improving agility and balance in State level Basketball players. **Conclusion:** It can be concluded from the above study that both functional stretching along

with dynamic balance training and conventional stretching along with dynamic balance training proved to be effective in improving agility and balance in State level

Basketball players. But it was seen that functional stretching along with dynamic balance training showed more improvement compared to conventional stretching along with dynamic balance training in improving agility and balance in State level Basketball players.

Keywords: Functional Stretching, Dynamic Balance Training, Agility.

INTRODUCTION

Basketball is a sport in which there are two teams, in each team the number of players is five, these five players have a primary objective of opposing other team from shooting the basketball on the rectangular court which is approximately 9.4 inches in diameter from the defender's hoop, a basket is of 18 inches in diameter which is 10 feet high to a backboard at each end of the court while preventing the opposite team from shooting through their own hoop. The physiological demands that are required for basketball include aerobic and anaerobic energy utilization, and integrates physical characteristics including muscular strength, power, endurance, flexibility, speed, agility and skill (1).

Long and short-term training regimens should be used to prepare for basketball-related tasks such as jumping, acceleration, speed, agility, and others. A well-developed fitness program is required for long-term preparation, whereas a warm-up is required for short-term preparation. There are various sorts of warm-ups, with stretching being one of the most significant and frequently performed.

Agility is defined recently by Oliver and Meyers (2) which defines specifically that it is an athlete's ability to change direction efficiently to the stimulus, which is referred to as 'planned agility' (2). Agility is a factor which plays a major role and contributes directly to achieve best results in sports in which athletes have to rapidly change direction and speed while playing and has respond to the stimulus.

This ability of changing directions rapidly is considered to be the important aspect in basketball. Agility component generally comprises of the following abilities. (i) To change the direction rapidly and immediately with proper and advanced knowledge of the directional change which is known as pre-planned agility (ii) the potential to change the direction rapidly while responding to an unpredictable visual and/or audio stimulus this is considered as non-planned agility

Basketball is a game that requires the movement like sideways, forward, and backward movement, with the centre of gravity (COG) which is frequently present near the edge of the base of support (BOS). It is important to have a functional awareness of the BOS in order to better adjust the shifting COG in order to maintain balance. The body is in a constant state of mobility, adapting to keep the centre of gravity above the base of support in order to maintain postural control. Balance training aims to improve balance by perturbing the musculoskeletal system in order to improve neuromuscular capability, readiness, and responsiveness. Single-limb stance activities on stable and unstable surfaces have traditionally been used in balance training.

A progressive balancing training program was used to examine a subject's ability to maintain a single limb stance while completing various balance activities such as predicted and unanticipated changes in direction, landing from a hop, and dynamic reaching tasks.

the study's balance training regimen included numerous reaction-time activities that were completed simultaneously while the balance was challenged by altering the base of support.

The integration of afferent impulses, their perception and integration in the central nervous system, and an effective motor efferent control created by the CNS and carried out by the motor system are all important factors in maintaining balance. The ocular, vestibular, and somatosensory systems make up the afferent system. The somatosensory system is made up of 'Proprioceptors,' which are peripheral receptors that detect changes in body posture and position. The efferent system, which is mostly comprised of the musculoskeletal system, necessitates proper range of motion (ROM), muscular strength, muscle torque, and power generation capability, as well as endurance (6).

Warm-up exercises and stretching performed before training and/or competition are common and well-accepted practices and there are many scientific evidences supporting their effectiveness. Conventional warm-up procedures generally consist in aerobic exercises, upper- and lower-extremity stretching followed by a rehearsal the specific sport skill that will be performed during a match. Most of the studies assessing the effects of stretching exercises on muscle performance conducted so far focused on performance assessment done immediately after the end of stretching routines. In many team sports, like basketball, it is customary that the stretching period is followed by a phase of sport-specific drills, of almost 15 minutes duration.

In Italy, the rules established by the Basketball Federation, foresee a warm-up phase, whose duration is exactly 30 min before beginning the match. Within this time framework, the warm-up phase usually consists in 7-8 minutes of slow jogging, running, various sprinting and bouncing drills, followed by ~8 minutes of stretching routines and by ~15 minutes of a specific shooting phase (7).

"Stretching is an important aspect of every game preparation since it overcomes muscle size with technique." (Brainy quotes, Edwin, 1955) It's crucial to understand that stretching and warming up are two separate actions. Warming up is done to raise core body temperature, while stretching is done to enhance range of motion (ROM) at a joint or a set of joints. The importance of generalized warm-up motions in maximizing sport performance and lowering injury risk in physical activity is widely acknowledged (Knudson, 2014). The use of stretching exercises to maintain flexibility and prevent injury is based on personal experience. Stretching is clearly a priority in physically demanding employment and athletics in order to avoid tissue damage.

A certain level of joint and connective tissue mobility is required for movement. To obtain good success in various sports, remarkable flexibility will be required. Flexibility is especially important in sports that require a wide range of motion. (Ylinen and colleagues, 2008). Long and short-term training regimens should be used to prepare for performances such as flexibility, speed, and agility. A well-developed fitness training program may be included in long-term preparation, whereas a warm-up should be included in short-term preparation (Amiri-Khorasani et al., 2010). Stretching, which is commonly done before physical workouts, is one aspect of a warm-up (4).

Throughout the game, players constantly change directions, contributing to much of the imposed intensity. According to research (8), elite basketball players do 50-60 changes in direction and speed transitions every game on average, in addition to 40-60 maximal jump efforts. In basketball compared to aerobic energy, anaerobic energy utilization is more dominant. Therefore, basketball players appear to be more dependent on anaerobic power (1).

Therefore, there is need for maintaining and improving speed and agility in basketball players. So, the current study will help us to find out the effectiveness of functional stretching, conventional stretching along with dynamic balance training.

Methods

Approval will be taken from college ethical committee. Participants fulfilling inclusion criteria will be put randomly in the two groups. Group A: Functional Stretching along with Dynamic balance training, Group B: Conventional Stretching along with Dynamic balance training. Explanation of the technique will be given to the players and 3 sessions per week for 4 weeks will be given. Consent form will be given and filled from participants. Pre-test values will be statistically analysed and stretches and dynamic balance training will be given according to the groups. Post-test values will be analysed. Data analysis will be done.

INTERVENTION:

FUNCTIONAL STRETCHING: Each stretching will be done for 3 rounds of basketball court and 5 mins of break will be given followed by dynamic balance training.

1. Walking knees to chest
2. Walking Pull heels back
3. Opposite elbow to knee
4. Walking hips up and out
5. Straight leg kick with clap

CONVENTIONAL STRETCHING: Each stretching will be done for 3 repetitions and 5 mins of break will be given followed by dynamic balance training.

1. Hamstring Stretch: Athlete has to sit on ground with both the legs straight and extended and bend the left leg and position the sole of the left foot alongside the right leg's knee. Bend forward while maintaining the back straight and allowing the left leg to lie comfortable on the ground. The stretch will be felt in the right leg's hamstring.

2. Gastrocnemius Stretch: Stand tall against a wall with one leg in front of the other and your hands flat and at shoulder height. Bring your back leg closer to the wall while maintaining it straight and pressing your heel hard into the floor. Maintain a straight line with your back leg and spine while facing the wall. The stretch will be felt in the back leg's calf.

3. Hip Extensors: Stand tall and spread your feet two shoulder widths apart. Turn your feet to the right and face the right. The right thigh should be parallel to the ground, and the right lower leg should be vertical. Lower your body gradually while keeping your back straight and balancing with your arms. The stretch will be felt in the front of the left thigh and the hamstrings of the right leg.

4. Adductor Stretch: Athlete has to stand with his feet about two shoulder width and has to bend his right leg, and slowly lower your body while keeping your back straight and balancing with your arms. The stretch will be felt in the left leg adductor.

5. Knee Extensor Stretch: Maintain your balance by standing erect and gripping or leaning against an item. Pull your ankle or forefoot toward your buttocks by grabbing the top of your ankle or forefoot behind you. Repeat with the opposite leg.

DYNAMIC BALANCE TRAINING:

1. Single-Limb Hops to Stabilization
2. Hop to Stabilization and Reach
3. Unanticipated Hop to Stabilization

OUTCOME MEASURE: Illinois agility test, Y- Balance Test, Balance Master.

RESULTS

Graph 1 and Table 1 explains the mean pre treatment of Illinois Agility Test for Group A participants was 20.8667. The post treatment value of the same test was 18.33333. It shows that there was difference between pre and post values of mean after the intervention of 4 weeks was completed and the intervention helped to improve the Agility in Group A.

Graph 2 and Table 2 explains the mean pre treatment of Illinois Agility Test for Group B participants was 21.8667. The post treatment value of the same test was 20.0000. It shows that there was difference between pre and post values of mean after the intervention of 4 weeks was completed and the intervention helped to improve the Agility in Group B.

Graph 3 and Table 3 explains the mean difference pre and post of Illinois Agility Test between both the groups. The mean difference in group A was 18.33333 and group B was 20.0000. It shows that there was improvement in group A compared to group B.

Graph 4 and Table 4 explains the mean pre treatment of Y Balance Test for Group A participants was 93.7333. The post treatment value of the same test was 95.0667. It shows that there was difference between pre and post values of mean after the intervention of 4 weeks was completed and the intervention helped to improve the Balance in Group A.

Graph 5 and Table 5 explains the mean pre treatment of Y Balance Test for Group B participants was 98.0000. The post treatment value of the same test was 99.0000. It shows that there was difference between pre and post values of mean after the intervention of 4 weeks was completed and the intervention helped to improve the Balance in Group B.

Graph 6 and Table 6 explains the mean difference pre and post of Y Balance Test between both the groups. The mean difference in group A was 1.3333 and group B was 0.1333. It shows that there was improvement in group A compared to group B.

Graph 7 and Table 7 explains the mean pre treatment of Reaction Time for Group A participants was 0.7507. The post treatment value of the same test was 0.6553. It shows that there was difference between pre and post values of mean after the intervention of 4 weeks was completed and the intervention helped to improve the Reaction Time in Group A.

Graph 8 and Table 8 explains the mean pre treatment of Reaction Time for Group B participants was 0.6753. The post treatment value of the same test was 0.6893. It shows that there was difference between pre and post values of mean after the intervention of 4 weeks was completed and the intervention didn't improve the Reaction Time in Group B.

Graph 9 and Table 9 explains the mean difference pre and post of Reaction Time between both the groups. The mean difference in group A was 0.2800 and group B was 0.3200. It shows that there was improvement in group A compared to group B.

GRAPHS AND TABLES

GRAPH 1: Mean pre treatment of Illinois Agility Test for Group



TABLE 1: Mean pre treatment of Illinois Agility Test for Group

GROUP	MEAN	SD	STATISTICAL ANALYSIS
GROUP A PRE	20.8667	2.2636	t = -9.906 Df = 14 P = < 0.0001
GROUP A POST	18.3333	1.9881	

GRAPH 2: Mean pre treatment of Illinois Agility Test for Group B participants was 21.8667



TABLE 2: Mean pre treatment of Illinois Agility Test for Group B participants was 21.8667

GROUP	MEAN	SD	STATISTICAL ANALYSIS
GROUP B PRE	21.8667	2.1336	t = -7.299 Df = 14 P = < 0.0001
GROUP B POST	20.0000	2.1381	

GRAPH 3: Comparison Between Group A and B: IAT



TABLE 3: Mean difference pre and post of Illinois Agility Test between both the groups

GROUPS	MEAN	SD	STATISTICAL ANALYSIS
GROUP A	2.5333	0.9904	t = -1.843 Df = 28.0
GROUP B	1.8667	0.9904	P = 0.0759

GRAPH 4: Comparison Within Group A: Y-Balance test

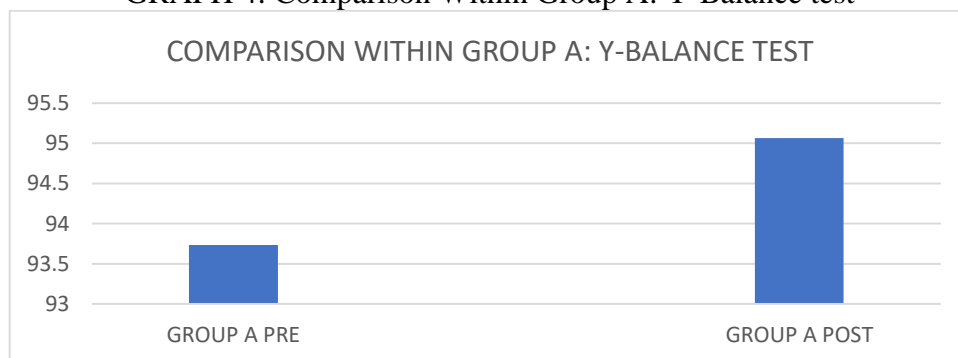


TABLE 4: Mean pre treatment of Y Balance Test for Group A participants was 93.7333

GROUP	MEAN	SD	STATISTICAL ANALYSIS
GROUP A PRE	93.7333	3.1502	t = 5.292 Df = 14
GROUP A POST	95.0667	3.5950	P = 0.0001

GRAPH 5: Comparison Within Group B: Y- Balance test

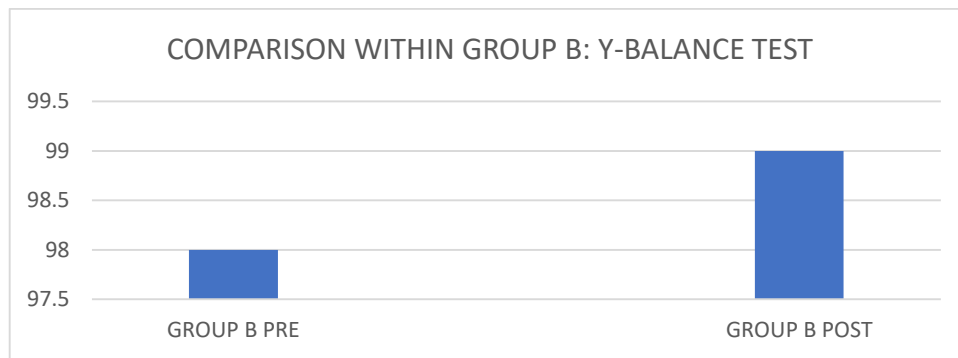


TABLE 5: Mean pre treatment of Y Balance Test for Group B participants was 98.0000.

GROUP	MEAN	STATISTICAL ANALYSIS
GROUP B PRE	<u>98.0000</u>	P = 0.8203
GROUP B POST	<u>99.0000</u>	

GRAPH 6: Comparison Between Group A and B: Y Balance Test

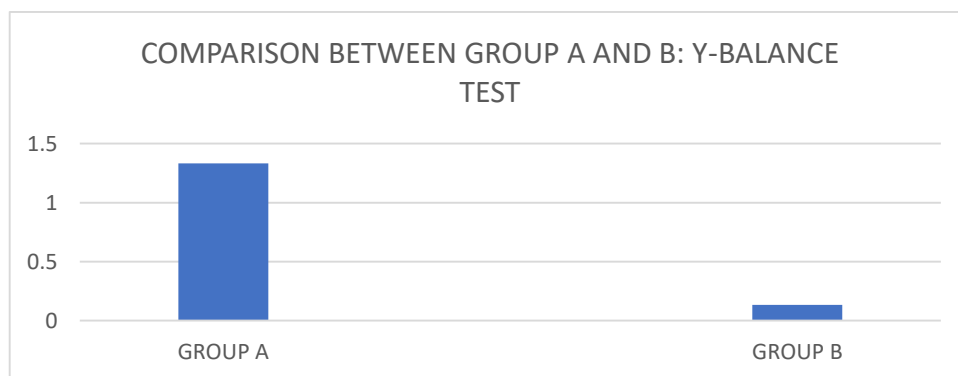


TABLE 6: Mean difference pre and post of Y Balance Test between both the groups

GROUPS	MEAN	SD	STATISTICAL ANALYSIS
GROUP A	1.3333	0.9759	t = 3.696 Df = 27.0 P = 0.0010
GROUP B	0.1333	1.1872	

GRAPH 7: Comparison Within Group A: reaction Time

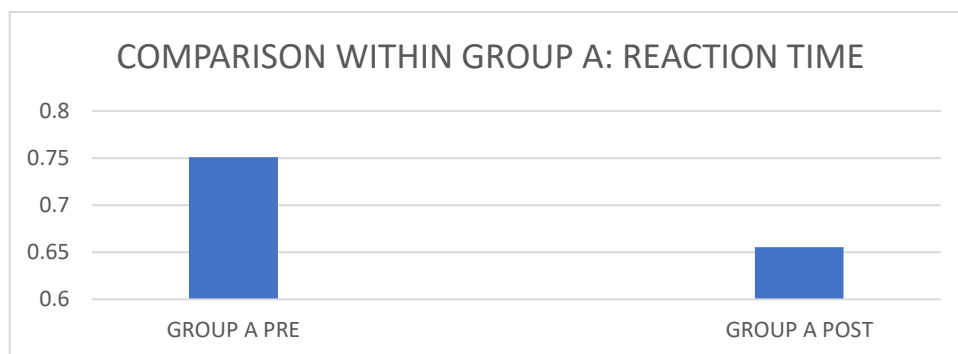


TABLE 7: mean pre treatment of Reaction Time for Group A participants was 0.7507

GROUP	MEAN	SD	STATISTICAL ANALYSIS
GROUP A PRE	0.7507	0.2758	t = -1.919 Df = 14 P = 0.0756
GROUP A POST	0.6553	0.1417	

GRAPH 8: Comparison within Group B: Reaction Time

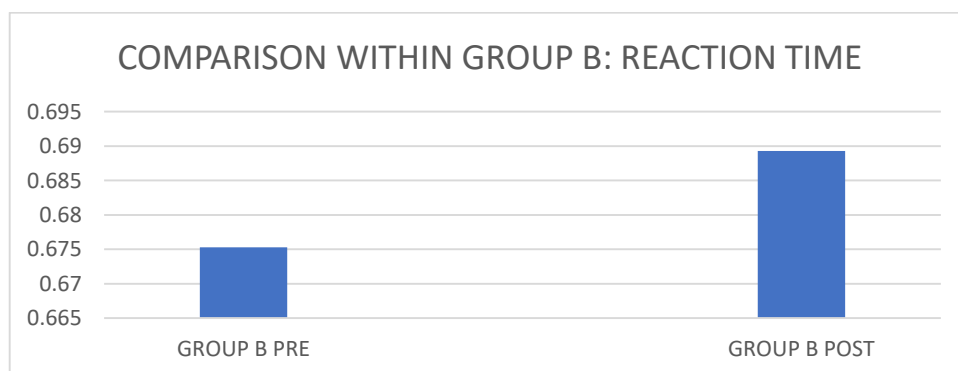


TABLE 8: Mean pre treatment of Reaction Time for Group B participants was 0.6753

GROUP	MEAN	SD	STATISTICAL ANALYSIS
GROUP B PRE	0.6753	0.3515	t = 0.206 Df = 14 P = 0.8400
GROUP B POST	0.6893	0.1948	

GRAPH 9: Comparison Between group A and B : Reaction Time

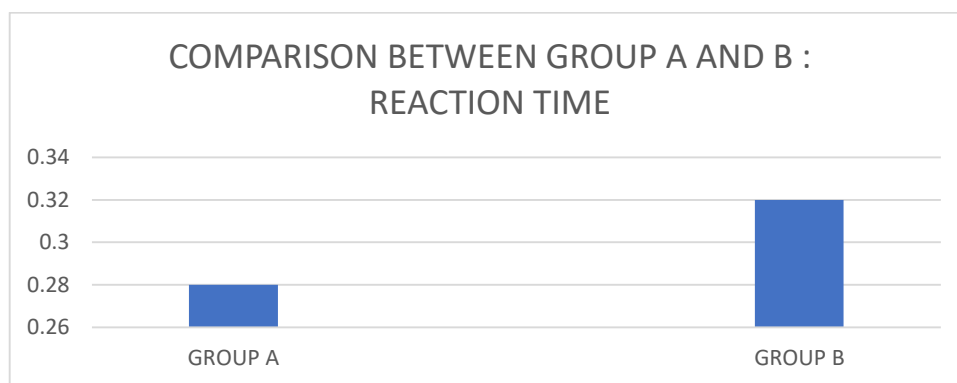


TABLE 9: mean difference pre and post of Reaction Time between both the groups

GROUPS	MEAN	STATISTICAL ANALYSIS
GROUP A	<u>0.2800</u>	P = 0.0649
GROUP B	<u>0.3200</u>	

Discussion:

The purpose of this study was to compare the effect of functional stretching along with dynamic balance training versus conventional stretching along with dynamic balance training on agility and balance in State level basketball players. The result of the study showed that functional stretching along with dynamic balance training was more beneficial than conventional stretching along with dynamic balance training in basketball players.

Agility drills and balance training are two of the most important aspects of professional sports conditioning. It is critical in bringing out the greatest performance from players during sports while also lowering the chance of injury. Agility is an essential component of an athlete's overall success. This research focuses on two key aspects of agility and balance.

According to McLeod TC et al. a study on the benefits of neuromuscular training on balance in high school basketball players, neuromuscular training helped the players improve their balance and agility. The neuromuscular training in this study comprised tandem standing on a firm and foam surface, stability exercises, and other exercises that improved proprioception and balance [8].

Saraswat A et al. found that a four-week strategy of progressive balance training improved agility and dynamic stabilization. After four weeks of progressive balance training, high school basketball players in the age bracket of 15-20 years who were participated in the study exhibited a significant improvement in their performance. This training included essential elements such as single leg standing and activities with single leg standing [9], and hop, Craig BW talked on the neurophysiology of agility and suggested that changes in agility are caused by neural circuit adaptation [10]. Training with increasing dynamic exercises improves proprioceptor activation and total motor recruitment, resulting in increased agility.

The current study was carried out to assess and compare the effect of four weeks of functional stretching along with dynamic balance training on agility and balance in group A and conventional stretching along with dynamic balance training on agility and balance in group B in State level Basketball players. The graphs show that both groups improved their agility and balance scores after the intervention.

Agility, balance, and posture are all interconnected. Effective balance training for various sports must be tailor-made to meet the varying demands of that sport.

Basketball players require agility to change directions in response to the ball, to leap and land repeatedly, and to make fast changes in direction even when in mid-air. A basketball player must have an excellent sense of balance. In basketball, balance is considered important for maintaining the balance and equilibrium while changing the direction of the body abruptly in response to the ball, whether on the ground or in the air while jumping. Balance training in neuromuscular training program reduces the incidence of sports-related injuries and improves functional performance following a sports injury. proprioception, kinaesthetic awareness and muscular strength, core strength [11-13]

Functional stretching also known as dynamic stretching is a type of stretching in which the stretching is performed while doing the functional movement. Many studies have evaluated various effects of stretching. Outcomes of this stretching are acute effect and training effect these are two types of effects. Acute effects are the immediate consequences of stretching, while training effects are the long-term effects of stretching. In contrast to static stretching or conventional stretching, functional stretching or dynamic stretching has shown improvement in running and jumping which is considered as an important factor in Basketball.

CONCLUSION

It can be concluded from the above study that both functional stretching along with dynamic balance training and conventional stretching along with dynamic balance training proved to be effective in improving agility and balance in State level Basketball players. But it was seen that functional stretching along with dynamic balance training showed more improvement compared to conventional stretching along with dynamic balance training in improving agility and balance in State level Basketball players.

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