

# EFFECT OF DUAL TASK EXERCISES ON REACTION TIME IN SCHOOL BASKETBALL PLAYERS.

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## ABSTRACT

**Background:** Reaction time is the time taken to respond to a stimulus. Reaction time is a pre-requisite of any sports player. A short reaction time is an indicative of swift movements and attentiveness on field of the player. A player on field should have the ability to multitask. This ability is strengthened using dual task exercises.



**Method:** Participants- 27 school basketball players of 13-16 years were included in the study. Hand dominance was assessed using the handedness questionnaire and leg dominance was assessed by asking the participant to kick the ball. Reaction time was assessed using the reaction timer and dynamic balance was assessed using the Y balance test. Both the parameters were recorded as a pretest and posttest after intervention of dual task exercises. As an intervention 3 dual task exercises throwing and catching a ball while walking, spot marching and jump up to reach targets and side marching and passing the ball were used. Each exercise was done for a period of 8-10 mins respectively. During this time their regular basketball practice and physical fitness exercises were continued in school respectively.

**Results:** The data was analyzed using SPSS version 24.0. A significant change was found in the reaction time of basketball players with p Value obtained as 7.26E-06. The balance component showed a significant improvement as well. P Values obtained for Anterior direction is 0.048, for posteromedial direction is 0.053 and for posterolateral direction is 0.014.

**Conclusion:** Dual task exercises along with basketball training were effective in improving the reaction time and dynamic balance in basketball players.

**KEY WORDS:** Reaction time, dual task exercises, Dynamic balance, Y balance test, School basketball players.

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## INTRODUCTION

Reaction time is the amount of time taken to respond to a stimulus. Reaction time is divided into perception time or cognitive time and movement time [1]. Reaction time is of various types. Simple reaction time and choice reaction time. Reaction time is required in our daily activities. The stimulus for reaction can be of different types like visual, manual,

auditory or vocal. Reaction time is influenced by many factors number of stimuli, type of stimuli, intensity of stimuli, arousal level, age, gender, hand dominance, fatigue, fasting, distraction, etc [2, 3]. Reaction time is a key to player's performance and has greater importance in sports [4]. It is one of the parameters that helps a player improve his physical and motor skills and also enables them to enhance

their performance [5].

A player requires high level of perceptual ability and efficient execution of motor behaviour for a successful performance in sports [6]. Decision making becomes easy as the player is able to perceive information quickly [4]. The player gets more time for executing an appropriate movement with a decreased reaction time. A player's on the field responses are better executed with a decreased reaction time [4].

Multitasking is necessary for an efficient performance in sports. Individuals usually prioritize one task over another depending upon the environmental requirement e.g. 'a batsman pays attention on the grip of the bowler to predict the direction in which the ball will be bowled' [7]. Practicing dual tasks improves the perception time and gives more time to make an appropriate movement. This improves the quality of sport being played. Dual tasks consist of one primary and one secondary task. Dual task training is a training in which two or more tasks are performed simultaneously [7].

Dynamic balance requires strength flexibility and proprioception [8]. A player is required to change directions randomly, hop on one leg reach out in many directions when performing on field. Dynamic balance plays an important role in these tasks by stabilizing the body. Risk of injury may increase if a player has an impaired balance [9].

## MATERIALS AND METHODS

Pre post study was conducted at Schools and Sports grounds. 30 Students of age 13-16 years both girls and boys were selected using Convenient sampling. They were given an intervention of dual task exercises for 4 weeks.

**Outcome measures:** Reaction time measured using a reaction timer; Intrarater reliability - ICC 0.7 to 0.8. Y Balance Test; Intrarater reliability - ICC 0.85 to 0.91.

**Inclusion Criteria:** Age – 13 to 16 years, Both males and females, Basketball Players

**Exclusion Criteria:**

- Recent Injuries like Sprain , Strain , Back pain , Neck pain in past 6 weeks.

- Surgeries or any fractures in the last 6 months.
- Suffering from any co-morbidities – Diabetes- type 1, Exercise induced asthma.
- Persons who refuse to participate.

**Method:** The present study was conducted after the approval of the Institutional Ethical Committee. Permission letter to recruit school students for study was taken from college and a copy was given to various schools and sports grounds.

Adolescents playing basketball were screened on the basis of inclusion and exclusion criteria. Adolescents fulfilling the inclusion criteria were selected.

Subjects were informed about the study procedure and an informed Consent/Assent was taken from parents.

- Hand dominance of the subject was determined using the handedness questionnaire [10].

- Leg dominance was determined by the leg preferred to kick the ball [11, 12].

Reaction time was recorded on the new developed reaction timer (ICC 0.7-0.85). The subject was made to sit comfortably on a chair; reaction timer was kept in front of the subject on a table. The dominant hand of the subject was placed over the pedal. The subjects were asked to press the pedal down as soon as they saw the red light glowing on the machine. A demonstration of the procedure was done before recording the reaction time of the subjects. The test was performed three times by the subject. A best of three readings was taken.

**Y-Balance test:** To assess balance Y Balance Test was used. Three tapes were used to describe the three directions to reach. The posterior tapes were positioned 135 degrees from the anterior tape with 45 degrees between the posterior tapes. Subjects were instructed about how to perform the test. The subjects were asked to stand barefoot on dominant leg with the foot placed on the central junction of the three tapes. While maintaining single leg stance, the subject was asked to reach with the free limb in the anterior, posteromedial and posterolateral directions in relation to the Dominant foot. The distance reached was

marked and measured using a measuring tape. Three readings were taken in each direction of reach. The subjects were instructed to maintain contact of the foot of the stance limb while performing the test. If the subject lost contact of the foot while performing the test the readings were not considered.

### Dual Task Exercises

**Throwing and Catching the ball while walking:** A 10 meter distance was measured. The start and end points were marked using colored sticking tape. The subjects had to walk in between the two ends at a comfortable speed by throwing the ball (basketball) in the air with both hands and catching it without dropping the ball.

This exercise was conducted for 8-10 minutes. Difficulty was added by increasing the speed of walking.

**Spot marching and Jumping to reach the targets:** Chart of random numbers was put up on the wall. The subject had to do spot marching and jump up to reach the target called out by the therapist.

This exercise was done for 8-10 minutes. Difficulty was increased by asking the subject to jump as high as possible and reach for higher targets.

**Side marching and Passing the ball:** Two subjects were standing facing each other 2 meters away from each other. The subjects had to do side marching and pass the basketball to the other subject without dropping the ball. This exercise was done for 10 minutes. Difficulty was added increasing the speed of passing the ball.

5 minutes were given between each exercise for the subjects to shift from one exercise point to other. After the warmup exercises subjects were asked to perform dual task exercises in a sequential manner and were to resume practice thereafter. Subjects could carry out dual task exercises before the cool down exercises.

### RESULTS

Table 1 shows the Pre MEAN±SD and Post MEAN±SD with the p Value.

Pre MEAN±SD was 274.37±66.11ms, where as

post MEAN±SD was 248.35±60.36ms. p Value obtained was 7.26E-06 indicating that a significant change was obtained in this group.

**Table 1:** Reaction time.

Group A	Pre MEAN±SD	Post MEAN±SD	p Value	Significance
Reaction Time (ms)	274.37±66.11	248.35±60.36	7.26E-06	Significant

Table 2 shows the Pre and Post MEAN±SD values obtained with the p Values.

Pre MEAN±SD for anterior direction of Y Balance test was 86.11±12.84 cm, whereas post MEAN±SD was 90.52±14.63cm. A significant change was obtained in this group with p Value of 0.048.

Pre MEAN±SD for posteromedial direction of Y Balance Test was 92.98±11.51 cm, whereas post MEAN±SD was 97.40±12.36 cm. A significant change was obtained in this group with the p Value of 0.053.

Pre MEAN±SD for posterolateral direction of Y balance test was 91.75±16.43 cm, whereas post MEAN±SD was 96.93±13.32 cm. A significant change was obtained in this group with the p value of 0.014.

**Table 2:** Y Balance Test.

Group A	Pre MEAN±SD	Post MEAN±SD	p Value	Significance
Y Balance - Anterior (cm)	86.11±12.84	90.52±14.63	0.048	Significant
Y Balance - Posteromedial (cm)	92.98±11.51	97.40±12.36	0.053	Significant
Y Balance - Posterolateral (cm)	91.75±16.43	96.93±13.32	0.014	Significant

### DISCUSSION

The present study was conducted to find the effect of dual task exercises on reaction time and dynamic balance in basketball players.

Reaction time and dynamic balance are two important factors which helps a player to improve the quality of the sport being played. In basketball, players are required to pass the ball amongst the players such that the point is scored. It also required to prevent the ball reaching in the opposite teams court. For this, a player has to analyze the team line up on field, swiftly pass the ball in between players and score points in a short amount of time. Analyzing the field line up and appropriately passing the ball requires a quick reaction time. Dynamic balance is required to move efficiently



on field without undergoing a fall or injury

A significant change ( $p=7.26E-06$ ) was obtained in reaction time. There was a reduction in the post test values (Pre mean-274.37 ms; Post mean-248.35 ms) indicating that dual task exercises have a significant effect in improving reaction time. Exercises like throwing and catching the ball while walking required the subjects to visualize the surrounding area to prevent fall while walking, throw the ball to an appropriate height so it could be caught easily without missing a catch; spot marching and jumping to reach target required the subjects to view the target before jumping up to reach it; side marching and passing the ball required the subjects to visualize the appropriate distance to throw a ball so that the ball would reach the opposite partner.

The speed with which a response is given to a stimuli is important in sports. Reaction time should be minimum in sports players. In our study visual reaction time was assessed but a motor response was required to note it by pressing the hand pedal. Ghuntla tejas p. in his study has stated that people trained in physically reactive sports may have the ability to select a corrective motor response. This relationship of exercise and mental processing can be explained by various mechanisms. One of the most well favoured mechanism is that exercises done at moderate to high intensity improves the cerebral blood flow which results in enhancement of cognitive functioning as the necessary nutrients of glucose and oxygen are provided in surplus [1]. We had recorded visual reaction time of subjects in which the subjects had to view the red light glowing (visual stimulus) and respond to it by pressing the hand pedal (motor response). All of these exercises had a pre-requisite of viewing the surrounding first (variety of visual stimuli) and then giving a motor response to the stimulus which could have led to an improvement in the reaction time. The participants might have learnt to combine two tasks into one super task and used one single cognitive operation to give a response to both the tasks at the same time [13].

Dual task practice also may have helped in task integration and possibly reducing the refractory period, thereby improving the reaction time [13]. The quick reaction time in basketball players could also be attributed to increased speed of movement, increased accuracy, alertness, better muscle co-ordination and better concentration.

Y balance test was used as an outcome measure to assess dynamic balance. A significant change was obtained ( $p=0.048$ ) in Anterior (Pre mean-86.11 cm; Post mean 90.52cm) direction. According to Garrison et al. anterior direction reaching requires the activation of quadriceps muscles and unilateral squatting [15]. In his study he has also shown the activation of quadriceps muscles while reaching in anterior direction in Y Balance Test [14]. The dual task intervention might have led to an improvement in quadriceps muscles strength and unilateral squatting and thereby improving the reaching distance. Posteromedial direction requires activation of hip abductor muscles on stance limb and gluteus maximus muscles on moving limb [15]. A significant change ( $p=0.053$ ) was obtained in the posteromedial direction (Pre mean-92.98 cm; Post mean-97.40 cm). The same muscles could have been activated when doing the dual task activity of side marching and passing the ball. A significant change ( $p=0.014$ ) was obtained in the posterolateral direction (Pre mean-91.75 cm; Post mean-96.93cm). Posterolateral reaching requires strength in hip abductors, adductors and also maintaining the lateral tilt of pelvis. The dual task exercises like side marching and passing the ball incorporated of movements which helped in strengthening those muscles. Motor learning has 3 stages namely information processing, response selection and response programming [4]. These stages of motor learning could be a major source of improvement in reaction time and dynamic balance scores as repeated practice shortens the information processing time. According to Tejas et al. practice helps in improving the reaction time as practice has an influence on information processing, memory and learning of new tasks [1].

The dual task exercise intervention has thereby

led to an improvement in reaction time and dynamic balance.

## CONCLUSION

To conclude the study, we state that dual task exercises along with the basketball training do improve the reaction time and dynamic balance in basketball players.

**Conflicts of interest: None**

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