

**A STUDY TO COMPARE THE EFFECT OF SINGLE TASK EXERCISES VS DUAL TASK EXERCISES FOR IMPROVING BALANCE AND GAIT AMONG NON-ELITE FOOTBALL PLAYERS WITH POST- CONCUSSION SYNDROME****Manjula S.\*, Dr. P. Senthil Selvam and P. Sujitha**<sup>1</sup>MPT, Asst Prof, School of Physiotherapy, VISTAS, Thalambur, Tamil Nadu- 600130, India.<sup>2</sup>PHD, Prof, HOD, School of Physiotherapy, VISTAS, Thalambur, Tamil Nadu- 600130, India.<sup>3</sup>School of Physiotherapy, VISTAS, Thalambur, Tamil Nadu- 600130, India.**\*Corresponding Author: Prof. Manjula S.**

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**ABSTRACT****BACKGROUND:** Football is a popular sport in India. Non-elite football players would have long term impact on gait and balance after the withdrawal of post-concussion symptoms.**AIM:** To compare the effect of single task exercises vs dual task exercises for improving balance and gait among non-Elite football players with post-concussion syndrome.**OBJECTIVES OF THE STUDY:**

- To assess the effect of single task exercises for improving balance and gait among non elite football players with post-concussion syndrome.
- To assess the effect of dual task exercises for improving balance and gait among non elite football players with post-concussion syndrome.
- To compare the effect of single task exercises vs dual task exercises for improving balance and gait among non-elite football players with post-concussion syndrome.

**PROCEDURE:** In this experimental study, 30 subjects were selected according to the inclusion criteria and were randomly divided into 2 groups- Group A and B. Baseline assessment was taken in the form of SCAT-5 (Sports Concussion Assessment Tool-5) for the subjects diagnosed and referred by physician after which the pre test of balance and gait parameters of the subjects were assessed using the Star Excursion Test and Foot print method. Group A subjects were given single task exercises and Group B were given dual task exercises for 6 weeks (5 days per week for 30 minutes). Post-test balance and gait assessment was done using the Star Excursion Test and Foot print method.**RESULT:** Statistical analysis was done using Wilcoxon signed rank test which showed a significant improvement in post-test assessment of balance for right and left leg stance in both Group A and group B subjects ( $p < 0.05$ ). Comparison of post-test mean values of Group A and B subjects, showed improvement in the balance of Group B than group A. Comparison of pre-test and post-test values after single task exercise program showed significant improvement in cadence and step length gait parameters ( $p < 0.05$ ) while stride length and walking speed gait parameters did not show significant improvement ( $p > 0.05$ ) in Group A, while comparison of pre-test and post-test values after dual task exercise program showed significant improvement in all the gait parameters in Group B. Comparison of post-test mean values of Group A and Group B subjects showed improvement in the gait parameters in Group B than group A.**CONCLUSION:** From this study, it can be concluded that dual task exercises have significant effect on balance and gait among non-elite football players with post-concussion syndrome.**KEYWORDS:** concussion, star excursion test, foot print method, single task exercise, dual task exercise, non-elite football players.**INTRODUCTION**

Sports related concussions have been steadily increasing over the past two decades. Youth football is of particular concern, especially the contact involved in routine play and the possible risk of concussion suggests the high rates of concussion in high school and college.

The sports concussion would exhibit persistent impairment in gait and balance over a month or a year. There is growing evidence that concussion can affect locomotors characteristic for prolong periods of time even when physical signs and symptoms are absent In

recent times, literature has suggested that gait speed, stride length may also be affected in post-concussion.<sup>[4]</sup>

Dual task exercise might be promising approach for improving gait and balance (plummer2014).<sup>[5]</sup> Review came to the conclusion that cognitive - motor influence is effective for improving balance and gait. After a following concussion the functional capacity of balance and cognitive resource are often impaired making dual task more difficult.<sup>[6]</sup> The intention of this study is to determine the utility and feasibility of a dual task exercise to potentially be applied following concussion.

During single task, gait is predominantly controlled through sub cortical locomotor loops with little executive processing in healthy pollution and executive control. During dual task, gait involves executive function for simultaneously processing of cognitive and motor demand.<sup>[7]</sup> SCAT-5 currently represent the most well established and rigorously developed instrument available for side line and base line assessment.<sup>[8]</sup>

The Symptoms check list, however does demonstrate clinical utility in tracking recovery.<sup>[9]</sup> In a concussion syndrome, dynamic balance test are star excursion balance test which is valid and reliable (Coughlan et al.,2011).<sup>[10]</sup> In this study, effectiveness of dual task exercise in post-concussion non elite foot ball players are included to improve the balance and gait performance.

### AIM OF THE STUDY

To compare the effect of single task exercises vs dual task exercises for improving balance and gait among non-Elite football players with post-concussion syndrome.

### OBJECTIVES OF THE STUDY

- To assess the effect of single task exercise for improving balance and gait among post-concussion non elite football players with post-concussion syndrome.
- To assess the effect of dual task exercise for improving balance and gait in post-concussion non elite football players with post-concussion syndrome.
- To compare the effect of single task exercise vs dual task exercise for improving balance and gait among non-Elite football players with post-concussion syndrome.

### RESEARCH DESIGN AND METHODOLOGY

An experimental study design was conducted with 30 patients within the age group of 18 to 25 years who fulfilled the inclusion and exclusion criteria.

### INCLUSION CRITERIA

- Age group 18 to 25 years
- Male
- History of concussion
- Physician diagnosed case.

### EXCLUSION CRITERIA

- Neurological disorder such as seizure
- Musculoskeletal disorder such fracture, ligament injury, pain on leg and surgery
- Cardiovascular diseases
- Unwillingness
- Cognitive problem
- Dehydration
- Migraine

### PROCEDURE

In this experimental study, 30 subjects who were selected according to the inclusion and exclusion criteria were randomly divided into 2 groups namely Group A and B. Baseline screening assessment was taken in the form of SCAT-5 (Sports Concussion Assessment Tool-5) for subjects diagnosed and referred by physician. Then the balance and gait parameters of the subjects were assessed for pre and post test using the Star Excursion Test and Foot print method.

In the gait analysis method (Foot print method), blue ink was applied to the subject's feet and then the subjects were asked to walk on a 10meter walkway and count only middle five steps and were evaluated to avoid the variables step associated with initiation and termination of gait. The gait velocity, step length, stride length, cadence was measured for quantitative gait analysis.

The procedure of star excursion balance test includes the assessment of dynamic balance. The testing grid of Star excursion balance test consists of 8 lines each of 120 cm in length extending from a common point at 45 degree and a 3-inch wide adhesive tape placed on firm floor. The 8 lines positioned on grid are labelled according to the direction of excursion relative to the stance leg: Anterolateral (AL), anterior (A), anteromedial (AM), medial (M), posteromedial (PM), posterior (P), posterolateral (PL) and Lateral(L).

The subjects were instructed to maintain a stable single leg stance with the test leg with shoes off and to reach for maximal distance with the other leg in each of the 8 directions. Marks at regular intervals (1cm) were set on the tape; a pencil was used to point and read the distance to which each subject's foot reached. Subjects practiced each direction 3 times before the main test in order to minimize learning effect. This was followed by the recording of 3 successful trials in each direction for both legs, always with a 10 second rest between each test. Outcome value of the test were the mean normalized reach distance of the 3 trials.

Group A subjects were given single task exercises and Group B were given dual task exercises for 6 weeks (5 days per week for 30 minutes). Post-test balance and gait assessment was done using the Star Excursion Test and Foot print method.

**SINGLE TASK EXERCISES**

- TANDEM LEG STANCE-EYES OPEN
- TANDEM STANCE-EYES CLOSED
- HEEL RAISE -EYES OPEN
- HEEL RAISE -EYES CLOSED
- SL STANCE-EYES CLOSED
- SL STANCE-EYES OPEN
- WALKING
- OBSTACLE WALKING

**DUAL TASK EXERCISES**

Single task exercises followed by dual task exercises which are as follows:

- SPELLING A 5-LETTER WORD BACKWARD

- SUBTRACTING BY 6s OR 7s FROM RANDOMLY PRESENTED 2-DIGIT NUMBER
- RECITING THE MONTH IN REVERSE ORDER

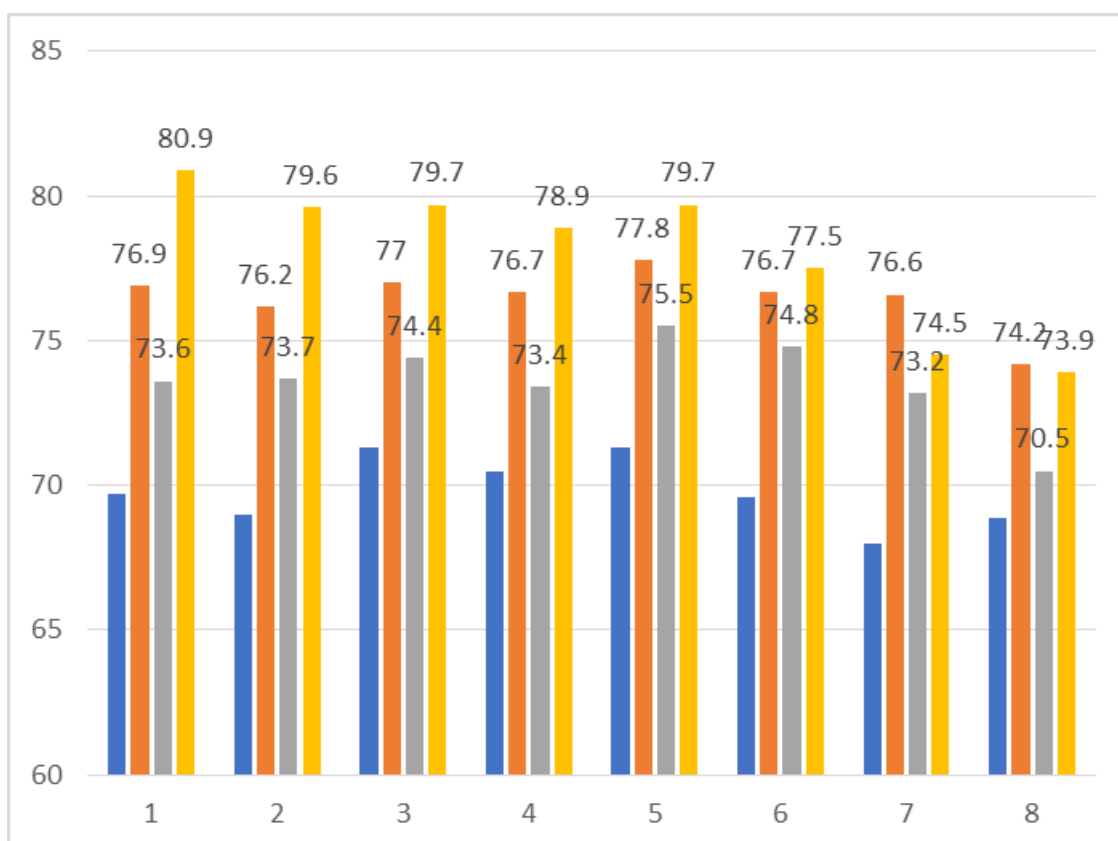
Post intervention assessment was taken in the form of star excursion test and foot print gait analysis method. Data analysis and statistical analysis were done.

**DATA ANALYSIS**

The collected pre and post test data were analysed and tabulated using wilcoxon signed rank test by SPSS version 22. For the descriptive statistics, the mean and standard deviation were calculated. The results were tabulated and the graphs were plotted accordingly.

**Table 1: Comparison Between The Post Test Values Of Star Excursion (Right And Left Stance) Between Group A And Group B.**

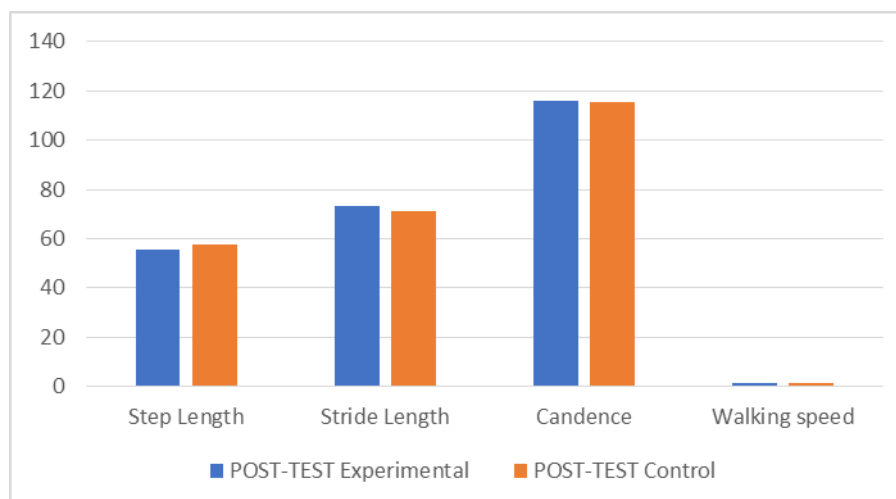
STAR EXCURSION TEST	GROUP A	GROUPA	GROGROUPB	GGROUPB
	POST TEST-LEFT LEG STANCE	POST TEST-RIGHT LEG STANCE	POST TEST-LEFT LEG STANCE	POST TEST -LEFT LEG STANCE
Anterior	69.7	73.6	76.9	88.909
Posterior	69.0	73.7	76.2	79.6
Medial	71.3	74.4	77.0	79.7
Lateral	70.5	73.4	76.7	78.9
Antero lateral	71.3	75.5	77.8	79.7
Antero medial	69.6	74.8	76.7	77.5
Postero lateral	68.0	73.2	76.6	74.5
Postero medial	68.9	70.5	74.2	73.9



**Graph-1: Comparison Between The Post Test Values Of Star Excursion (Right And Left Stance) Between Group A And Group B.**

**Table-2: Comparison Between The Post Test Values Of Gait Parameter Between Group A And Group B.**

GAIT PARAMETER	GROUP A	GROUP B
	POST- TEST MEAN	POST-TEST MEAN
Step Length(cm)	57.8	55.7
Stride Length(cm)	71.4	73.0
Cadence (steps/min)	115.3	116.1
Walking speed (m/sec)	1.46	1.53

**Graph- 2: Comparison Between The Post Test Values Of Gait Parameter Between Group A And Group B.**

## RESULTS

TABLE 1: shows that comparison of post-test values of Group A and B subjects, showed improvement in the balance of Group B hence ( $p < 0.05$ ). than group A  
TABLE 2: shows that comparison of post-test mean values of Group A and B subjects, showed improvement in the gait parameters of Group B than group A

## DISCUSSION

This study was done to compare the effects of single task exercises and dual task exercises in improving balance and gait among non-elite football players with post-concussion symptoms.

The findings of the study revealed that the dual task exercises had a greater effect in improving the balance and gait compared to single task exercises. Previous studies have shown that slower gait speed were found in concussed individuals during acute (upto 10 days) and more persistent (90 days to 6 years) time frames. Measures of gait performance, particularly with the addition of a simultaneous cognitive task may represent a more sensitive measure of function after concussion that could improve the monitoring of recovery. The addition of a secondary cognitive task during gait has been used previously to examine a variety of patients with neurological diseases such as stroke, traumatic brain injury, Parkinson's disease and Alzheimer's disease.

Successful performance and avoidance of injury in sports requires the simultaneous integration of multiple stimuli. Examining cognitive performance during gait may

provide a functional method to determine readiness to return to sports activity following concussion. Single task gait is predominantly controlled through sub cortical locomotor loop with little executive processing in healthy population while dual task gait requires executive function for simultaneous processing of cognitive and motor demand. Theoretically, our findings support the 'posture-first' principle, which suggested that postural control is attentionally demanding, requiring increased allocation of attentional resources in accordance with the complexity of the postural task. Another study suggested that increased attention during a reaction-timed cognitive task increases muscular stiffness and subsequently, postural control.

One of the study suggested that dual task condition facilitate controlled at the sensory motor level, although attentionally demanding, postural stability occurs primarily via automatic process in everyday life, making a single task condition involving balance alone somewhat unnatural. Incorporating a secondary cognitive task into the dual task method may better represent every day and sport situation and force individuals to allocate attention to the secondary cognitive task, leaving postural stability to the aforementioned automatic processes.<sup>[9]</sup>

Balance and neurocognitive improvements may prove to be clinically significant for sports medicine professionals working with athletes suffering protracted recovery following concussion.

## CONCLUSION

The study reveals that dual task exercises have significant effect than single task exercises on balance and gait among non-elite football players with post-concussion syndrome.

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