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Effect of single task balance vs dual task balance training on balance in moderate COPD patients: A pilot study

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Abstract
Background: The global initiative for obstructive lung diseases (GOLD) describes COPD as a common preventable and treatable disease, characterized by persistent airflow limitation that is usually advanced and associated with an augmented chronic inflammatory response within the airway and the lungs to harmful particle or gases. COPD was among leading conditions leading to number of falls, secondary to osteoarthritis. People with COPD also suffer from many non-respiratory manifestations including skeletal muscle dysfunction, malnutrition, nutritional depletion etc. There are different intrinsic and precipitating factors to analyze the different aspects that can increase fall occurrence in people with COPD.
Objective: To compare the effect of single task balance training vs dual task balance training on balance in moderate COPD patients.
Method: Various clinics and hospitals were visited in around the city. According to inclusion and exclusion criteria participants were selected. Group of subjects were divided into Group A and Group B by chit method. Both groups were assessed for balance with BERB Balance Scale and data was recorded. Group A and Group B subjects were given the protocol with single task balance training and dual task balance training respectively. Both the groups were assessed for balance with BERG BALANCE SCALE after 4 weeks of protocol. The data was recorded and data analysis was done.
Results: Statistical Analysis showed that dual task balance training was more effective than single task balance training. Post comparison of both single task and dual task balance training showed p value < 0.0350 which was significant using unpaired t test.
Conclusion: This study showed that dual task balance training was more effective than single task balance training.

Key words: single task balance training, dual task balance training, chronic obstructive pulmonary disease, pulmonary rehabilitation

Introduction

COPD is most common preventable and treatable disease which is characterized by persistent and progressive airflow limitation and associated with an increased chronic inflammatory response in the airways and the lung to harmful particles or gases by GOLD [1]. The Prevalence of COPD ranges from 3% to 8% amongst Indian males and approximately 2.5 % to 4.5% of Indian females [2]. Chronic obstruction pulmonary disease has an estimated disease burden of 210 million people worldwide. Globally in 2004 COPD was a fourth leading expectation for death (5.1%) in 2004 occupies the third position. It is now well recognized that people living with COPD also suffer from many non-respiratory manifestations including skeletal muscle dysfunction, systemic inflammation, nutritional depletion and malnutrition [3]. COPD was found to be one of the leading conditions which is further related to number of falls, secondly to osteoarthritis [3]. There are different factors to analyze the different aspects that can increase fall occur in people with COPD [3] a. Intrinsic factors includes those associated with the physical and psychological status of the individual, muscle weakness, gait, balance, visual deficits, use of an assistive device, impaired activities of daily living, depression, cognitive impairments, medications, nutritional depletions and malnutrition which are common in people with COPD are also include d as potential intrinsic factors [3] b. Precipitating factors are acute episodes (e.g., syncope and postural hypotension, exacerbation, dyspnea) which might increase the risk of fall.

BERG BALANCE SCALE (r-0.98): It is an objective to measure static and dynamic balance abilities. The scale consists of 14 functional tasks usually performed in day to day activities. Scoring is done on the basis of five -point scale with score ranging from 0-4, 0 –lowest level of function and 4-highest level of function.

Single Task Balance Training

It involves practicing functional task requiring balance (e.g., Standing, walking, transfer) in isolation.

Dual Task Balance Training

It involves practicing functional task along with the secondary task simultaneously.

Pulmonary Rehabilitation

It is a cornerstone of management of COPD. The aim of exercise prescription in PR is to address to the multiple contributor that cause exercise limitation, including ventilatory and cardiovascular limitation, gas exchange abnormalities, and p eripheral and respiratory muscle changes. Pulmonary

rehabilitation is based on exercises like endurance training, incorporating upper and lower limb weight training.

Materials

Consent forms, Pen and Paper, Berg Balance Score Sheets, Foam sheets high density foam pad (49cm length* 40cm width* 6cm height thickness 6cm), Stethoscope, Weight cuffs and dumbbells, chair.

Method

Various clinics and hospital were visited in and around the city.

The study was explained to the participants who were selected based on inclusion (both males and females, 45-65 years of age and with moderate airway obstruction, Berg Balance Score 0-40) and exclusion criteria (Patients with Dyspnea Grade 3-4, hemodynamically unstable, not able to communicate, heart disease) individually and written consent was taken from the them.

The participants were divided into two groups i.e. group A and B by odd even method.

Prior assessment of Berg balance scale was done. Group A were given pulmonary rehabilitation with Single task balance training and Group B were given pulmonary rehabilitation with Dual task balance training.

After 4 week of balance training Post assessment of Berg balance scale was done and Data analysis was done.

Protocol

Pulmonary Rehabilitation and balance training protocol was given alternate days. Pulmonary Rehabilitation protocol of 30 min thrice a week and balance training protocol of 45 mins thrice a week for four weeks. Group A: Pulmonary Rehabilitation and Single Task Balance Training Group B: Pulmonary Rehabilitation and Dual Task Balance Training

Group A

Pulmonary Rehabilitation + Single Task Balance Training

Single Task Balance Training (45 Min Session 3 Times A Week For 4 Week) Week 1

Table 1

	Day 1	Day 2	Day 3
Stance activities		1. Narrow BOS, eyes closed (20sec) 2. Semi tandem (30sec), eyes open 3. Stepping	1. Semitandem (30sec), eyes closed 2. Stand on foam eyes open
Transitional activities	1. Sit to stand (5 reps)	4. 4. Sit to stand and walk	3. Sit to stand and pickup 4. objects from floor
Gait activities	2. Walk narrow BOS (1 min)		5. Walk narrow BOS (1min) 6. Walk around obstacle. 7. Walk narrow BOS holding a toy

Week 2

Table 2

	DAY4	DAY 5	DAY 6
Stance activities	1. Stand on foam(20sec), eyes open 2. Stand hip abd\add 3. Stepping 4. Stand narrow BOS + reach Different direction	1. Stand narrow BOS, eyes closed(20sec) 2. Semi tandem(30sec), eyes open 3. Step sideways 4. Roll the stick with the foot 5. Stand narrow BOS + reach diff direction 6. Throw a ball	1. Hip knee flex extend 2. step sideways
Transitional activities	5. Sit to stand and stop at different speed.	7. Sit on a ball and perturbations	3. Sit to stand on different chair height
Gait activities	6. Walk narrow BOS (1 min)	8. Walk narrow BOS (1 min)	4. Walknarrow BOS (1 min) 5. Walk and kick a ball

Week 3

Table 3

	Day 7	Day 8	Day 9
Stance activities	1. Step on stool different directions 2. semi tandem eyes open, arm alternation	1. Stepping exercise 2. Roll ball with foot 3. Semi tandem eyes open touch body part	1. Hip movement in all direction 2. Roll hip 3.Basket a ball 4.Bowling a ball
	3. Draw letter with right foot 4. Draw letter with left foot		
Transitional activities	5. Sit to stand and stop different speed and holding object		
Gait activities	6. Walk narrow BOS 7. Walk narrow BOS changing direction	4. Walk narrow BOS Walk under diff light condition 6. Walk and trunk rotations (holding stick) 7. Walk around obstacle head turn (holding ball)	5. Walk narrow BOS 6. walk with book on head 7. Walk around obstacle, cross leg, sideways, backward

Week 4

Table 4

	Day 10	Day11	Day 12
Stance activities	1. Semi tandem, eyes open, arm alternation 2. semi tandem eyes closed, arm variations 3.Draw letter with right foot and left foot 4.Perturbed standing holding a ball	1. Rock the foot 2. Reach the hand to reach opposite knee	1. Roll the waist holding a ball 2. Hold a ball and move trunk in diff direction
Transitional activities		3. Sit to stand and walk with head turn different speed	
Gait activities	. Walk narrow BOS Walk narrow BOS, step sideways, backwards, avoiding obstacle 6. Walk and kick a ball to hit can . Walk and reach along with trunk rotations (holding stick)	4. Walk narrow BOS . Walk up and down stair sit, semi tandem, walk, stand on foam, walk sideways, backward avoiding obstacle Walk and kick a ball to hit a can 8. Walk and reach trunk twisting	3. Walk narrow BOS . Tandem walking, standing on foam, walking sideways, backward walking, stepping, walk backward by avoiding obstacle (holding glass of water) Walk around obstacle (eyes closed) with arm alternation 6. Walk up and down stairs (holding basket) 7. Walk long steps, stepping, walk with high steps, pick objects from floor (holding baskets)

Group B
Pulmonary rehabilitation + dual task balance training
Dual task balance training (45 min session 3 times a week for 4 weeks) (8)

Dual task balance training includes Single Task Balance Training along with Secondary Tasks.

Secondary Task

Table 5

Stance activities	Secondary task
Semi-tandem, eyes open, arm alternation	Spell a word forward
Draw letter with right foot	Name any words start with letter P or R

Table 6

Perturbed standing holding a ball	Remember prices (e.g. Bill payments)
Transitional & Gait Activities	Secondary Task
Walk narrow BOS	Count backward by 3
Walk, narrow BOS, step sideways, backward avoiding obstacle (holding basket)	Remember words
Walk and kick the ball to hit the cans	Tell the opposite direction of ball
Walk and reach and trunk twisting	Task including Visual Imaginary (tell the road direction from home to lab)

Pulmonary rehabilitation

Table 7

Pulmonary rehabilitation	Protocol
• Stretching exercises Strengthening exercises • Aerobic exercises Breathing control and chest clearance exercises	30 mins session for 3 times per week for 4 weeks According to ACSM guidelines.

Outcome Measure
Berg Balance Scale

Results and Table
The statistical analysis for this study was done using the software "instat graph pad". Statistical test used was paired t test in pre post single and dual task.
The post single task and post dual task analysis was done by unpaired t test

Single Task Pre-Post

Table 8

Mean	Std Deviation	P-value
25.50	3.41	0.0003- SIGNIFICANT
32.50	3.86	0.0003- SIGNIFICANT

P value

The two-tailed P value is 0.0003 is considered to be extremely significant. t = 19.000 with 3 degrees of freedom**.**

Dual Task Pre-Post

Table 9

Mean	Std deviation	P-value
25.75	3.94	0.0001- SIGNIFICANT
37.50	3.69	0.0001- SIGNIFICANT

P value, the two-tailed P value is < 0.0001 is considered to be extremely significant. t = 47.000 with 3 degrees of freedom.

Post-Post Single Task and Dual Task

Table 10

Mean	Std deviation	P-value
32.50	3.86	0.035- SIGNIFICANT
37.50	3.69	0.035- SIGNIFICANT

P value, the two-tailed P value is 0.0350 is considered to be significant. t = 2.712 with 6 degrees of freedom.

Conclusion

The present study concluded that dual task balance training is more effective than single task balance training on balance in moderate COPD Patients.

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