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Original Research Article

Comparison of Physiological Response to Glittre ADL Test and 6 Minute Walk Test in Patients with COPD: Observational Study

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ABSTRACT

Background: The Glittre activities of daily living (ADL) test is supposed to evaluate the functional capacity of COPD patients. Aim was to compare the physiological responses to Glittre-ADL test and 6 min walk test in patient with COPD.
Methods: This study included 23 subjects: 15 male and 8 female. Subjects were made to perform the Glittre ADL and six minute test on two consecutive days. Parameters such as time taken, distance walked, SpO2, HR, SBP, DBP, VO_2 max and dyspnoea were recorded before and after the tests.
Results: Our results reveal that there was no significant difference in SpO2, SBP, DBP and significant difference in HR, VO_2max and borg. Distance walked in the six-minute walk test (358.7 ± 60.1) and time for completion Glittre-ADL test was (4.20 ± 0.58).
Conclusion: Glittre ADL test induced similar Cardio-respiratory responses when compared to the six-minute walk test. The VO2max was better in Glittre ADL test when compared to the six-minute walk test.
Key words: COPD, Physiological response, Heart rate, SpO2, Blood pressure, VO_2 max, Borg.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a common, preventable and treatable disease that is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities usually caused by significant exposure to noxious particle or gases. [1] WHO reports a prevalence of 251 million cases of COPD globally. [2] According to WHO patients with COPD are around 65 millions around the globe and major cause for both mortality and morbidity all across the globe, it is estimated that 30 million COPD patients are there in India. [3] India has growing COPD mortality, which is estimated to be highest among in the world. [4] In all severity stages of COPD, physical activity starts to decrease, and this decline is paralleled by a worsening of lung function and health status. [5]

The 6-minute walk test (6MWT) has been regarded as an important index of exercise tolerance in patients with COPD in various studies and correlates with mortality. [6] COPD patients have deterioration in there functional capacity. COPD patients frequently report dyspnea related to everyday task, there functional capacity is usually tested by submaximal test. [8] To assess functional capacity 6-minute walk test (6MWT) is used but it shows limitations for ADL performance. [7] 6MWT uses walking to evaluate functional capacity but it do not uses upper limb to

evaluate ADL limitation. In 6MWT COPD patients assume a constant speed that is equivalent to the maximum sustainable load and critical walking speed. [8] The 6MWT was chosen because it is considered the most widely used functional capacity and exercise test in clinical and scientific protocols. [9]

Increase oxygen demand is there in unsupported upper limb activities, there is consumption of ventilatory reserve which shows ADL limitation among COPD patient. [10]

Different ways of assessing functional status are available, including field tests that have been widely used in clinical practice. Among them, those including more than 3 tasks are thought to be the best choice to simulate activities of daily living (ADL); however, few tests include more than 1 task. The Glittre-ADL test (TGlittre) combines multiple tasks and was designed to evaluate the ADL that are most impaired in patients with COPD. Skumlien et al. developed the Glittre ADL-test (TGlittre) for assessment of functional capacity. This test included activities such as sitting and rising from chair, standing, walking, climbing up and down stairs performing activities with unsupported hands. Hence Glittre-ADL test can show more information to perform ADLs. [11]

TGlittre was proposed to evaluate essential ADL in patients with COPD and it may be considered more complete than the 6MWT for evaluating these individuals' functional capacity, especially that of more compromised patients, because it involves, besides walking, activities such as sitting and rising from a chair, ascending and descending steps and arm movements while carrying weight. [12]

This test is reproducible, quick and easy to apply and responsive to a pulmonary rehabilitation program. Skumlien et al. report that more than half of their sample showed a test time less than or equal to 4 minutes, with a mean time of 4.67 (2.7-14.47) minutes. These authors reported that 2 minutes is the shortest time in which healthy individuals could complete the test without violating the protocol. [11] Nevertheless, this study tested only individuals with COPD. In TGlittre, as well as in 6MWT, the test rhythm is governed by the patients and, thus, it is hypothesized that this rhythm induces a cardio-respiratory response similar that of 6MWT

AIMS AND OBJECTIVES

AIM: To study and compare the physiological responses to Glittre-ADL test and 6 min walk test in patient with COPD.

Objectives:

- To study the effect of physiological response of Glittre ADL test in patients with COPD.
- To study the effect of physiological response of 6 minute walk test in patients with COPD.
- To compare the physiological response to Glittre ADL test and 6 minute walk test in patients with COPD.

METHODOLOGY AND MATERIALS

Study design: Cross sectional Observational Study
Study area: IPD and OPD of Pulmonary Medicine of general medical hospital.
Study population: Mild COPD (GOLD).
Sample size: 23
Sampling method: Convenient sampling
Study duration: 6 months

INCLUSION CRITERIA:

- Male and female Age 40-65.
- Who are not taking part in pulmonary rehabilitation
- Who are mild COPD.

EXCLUSION CRITERIA:

- Recent fracture
- Any neurological and musculoskeletal disease.
- other pulmonary disease.

MATERIALS REQUIRED:

- Pulse Oximeter, Borg scale, Sphygmomanometer, Adjustable shelves, Set of 3 (1 kg each) Weights, Cones, stop watch, stepper, bag pack

2.5kg women and 5 kg for men, polar heart rate monitor

OUTCOME MEASURE:

- SpO_2, Heart rate, Systolic and diastolic blood pressure, Vo_2max and borg.

PROCEDURE:

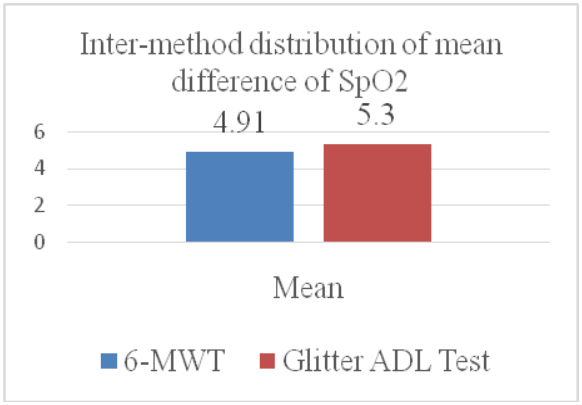
- Ethical committee clearance was obtained and permission.
- Subject's written consent was taken & those fulfilling the inclusion criteria were recruited for the study.
- The subjects were given trails of both the test.
- subjects randomly performed on 1 day Glittre-ADL test and 6 MWT
- Pre and Post test subjects parameters were taken.

STATISTICAL ANALYSIS:

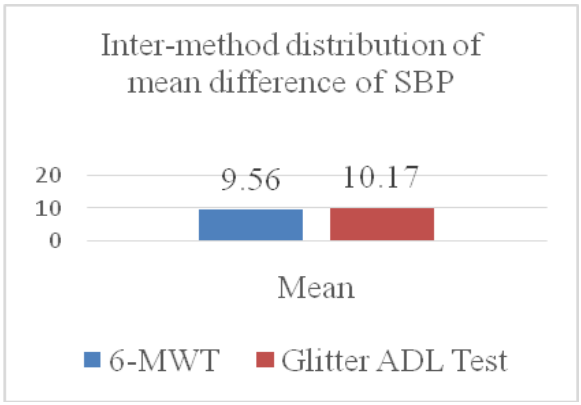
The present study recruited 23 participants. From the results of the study physiological value was taken for data analysis. The data was processed in Winpepi (Version 11.65) and Primer of Biostats (Version 7.0) for statistical analysis. The data were reported as means with standard deviations (SD). The Shapiro-Wilk test was used to analyse data normality. A paired t-test or the Wilcoxon test was used to compare both testing conditions (TGlittre and 6MWT).

RESULTS

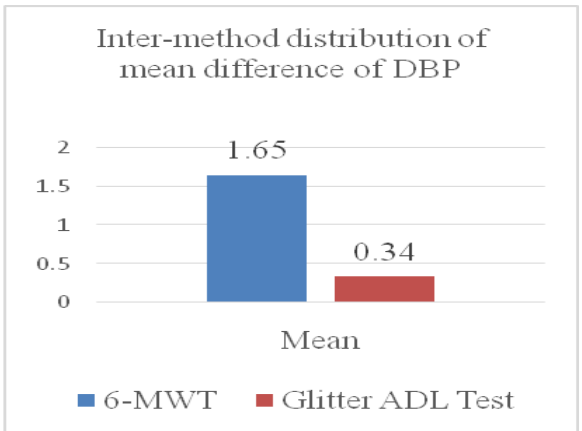
	6MWT				Glittre ADL test			
	Pre Mean and SD		Post Mean and SD		Pre Mean and SD		Post Mean and SD	
Spo2	95.39	0.78	90.48	1.44	95.04	0.70	89.74	1.42
SBP	122.8	9.31	132.8	9.05	122.6	8.36	132.8	7.30
DBP	69.91	4.19	68.26	4.36	69.65	3.7	69.30	6.70
Vo2max	80.52	7.03	94.74	6.98	79.96	7.20	97.83	6.52
Borg	32.01	2.91	27.16	2.19	32.25	2.97	26.27	1.895



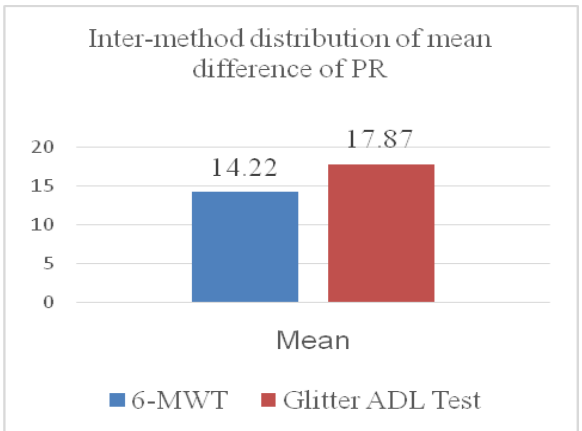
Graph 1: Inter-method distribution of mean difference of SpO2



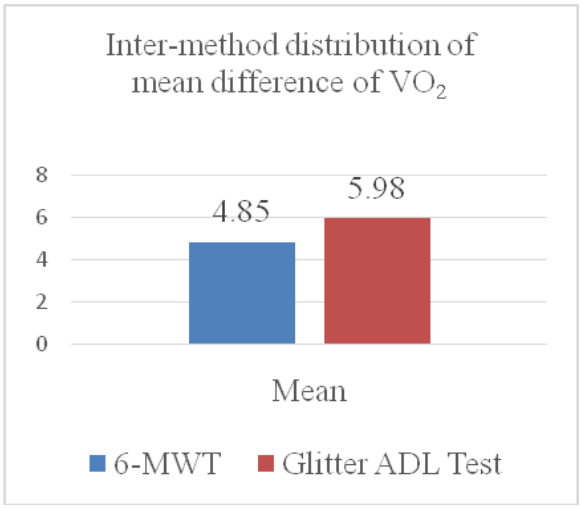
Graph 2 : Inter-method distribution of mean difference of Systolic blood pressure.

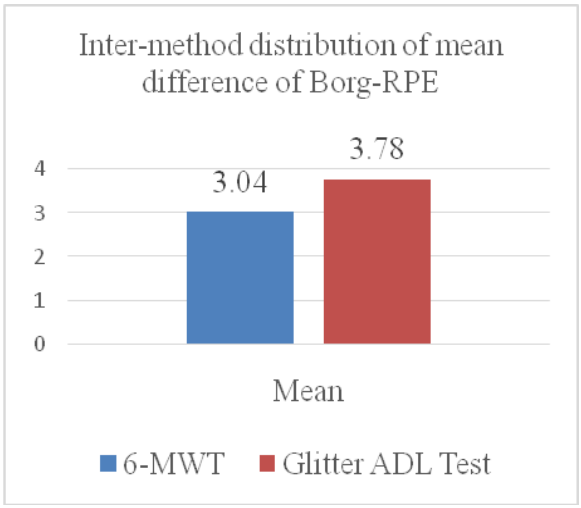


Graph 3 : Inter-method distribution of mean difference of diastolic blood pressure.



Graph 4 : Inter-method distribution of mean difference of Pulse rate.





Graph 5 : Inter-method distribution of mean difference of VO_2max. Graph 6 : Inter-method distribution of mean difference of Borg-RPE.

DISCUSSION

In this study it was found that SpO2 was not significant statistically difference in Glitter ADL test as compared to six minute walk test (p value 0.11) the result shows the presence of exercise-induced reduced peripheral oxygenation.

A study was conducted by Ravoori Hena et. al. there study showed the presence of exercise-induced desaturation, which is the characteristic of chronic pulmonary disease such as bronchiectasis. The six-minute walk test induced decrease of peripheral oxygen in the bronchiectasis group when compared to the Glitter ADL test bronchiectasis group, it could be due to the sitting task in the Glitter ADL. [13]

There studied showed desaturation was more in six-minute walk test than Glitter ADL test for bronchiectasis population. In this study desaturation was slightly more in Glittre ADL test for COPD population.

The probable reason for desaturation as suggested by Muhammad Ahsan Zafar et al, Dynamic hyperinflation produces functional weakness of the diaphragm by altering length–tension relationships through acute increase in the end expiratory lung volume caused by increased minute ventilation and reduced expiratory time in patients such as COPD. Dynamic hyperinflation has been shown to correlate with lower oxygen levels at peak exercise and higher end expiratory CO2. [14]

In this study it was found that systolic blood pressure and diastolic blood pressure there was no significance change. The SBP (p=0.24) and DBP (p=0.26) when compared between six-minute walk test and Glitter ADL test.

This is in accordance to Arnoldus van Geste et al. who conducted a study on Blood pressure variability during the 6-minute walk test in patients with chronic obstructive pulmonary disease this study concluded that During exercise the speed of fluctuations in SBP increases both in patients with COPD and healthy controls. [15]

In this study the blood pressure was not significant statistically it may be due to that both the methods are showing similar workload on the subjects. In six minute walk test patient is walking continuously where as in Glittre ADL test patient is sitting standing walking performing test and then again back to starting postion.

In this study it was found that heart rate was significant statistically (p value 0.00)

A study was done by Krislainy S. Corrêa in their study the HR behavior was similar in both groups for both the TGlittre test and the 6MWT. There was a significant increase in heart rate in both groups at the

end of both tests that did not vary between groups. [8]

HR increase is an expected physiological result when metabolic demand increases during exercise because cardiac output increases to supply the need for peripheral oxygen. During exercise in a standing position, such as walking, the increase in cardiac output is due, initially, to increased HR and stroke volume. However, after having reached 110-120 beats per minute, the stroke volume stabilizes, and HR alone contributes to increased cardiac output 30. The initial HR increase, until approximately 100 beats per minute, is due to the removal of the parasympathetic tonus; at higher rates of work, the sympathetic nervous system becomes responsible for its increase. [16]

In this study it was found that VO2max was statistically significant (p value 0.00) mean value was increased in Glittre ADL test than six mintue walk test.

A study was done by Karloh et al. they showed that the Glittre ADL test can induce slightly higher VO2max than the 6MWT with similar cardiovascular and ventilatory demand. [14] the slightly higher VO2max observed in TGlittre in the present study may be associated with the involvement of a greater number of muscle groups, since it adds other ADL-based activities besides walking. Also, during the TGlittre tasks that require unsupported upper limb movements, the accessory muscles of inspiration are recruited to participate in primary motor action Evidence suggests that higher respiratory muscle work and fatigue compromise blood flow to postural and gait muscles, probably contributing to a further increase in metabolic demand.

This is in accordance to Velloso et al. who conducted a study on Metabolic and Ventilatory Parameters of Four Activities of Daily Living Accomplished With Arms in COPD Patients. This study had four activities such as sweeping, erasing a blackboard, lifting pots, and replacing lamps they concluded that when performing these four activities, patients with moderate- to-severe COPD present a high VO2max.

In this study it was found that borg was statistically significant (p value 0.00) there was slightly increase dyspnea in Glittre ADL test as compared to six minute walk test.

This is in accordance Krislainy S. Corrêa et al. who conducted a study on Can the Glittre ADL test differentiate the functional capacity of COPD patients from that of healthy subjects?. this study concluded that the dyspnea score on the Borg scale ranged significantly between groups in both tests. The reason for increased dyspnea in glittre is due that upper-limb activities with COPD patients provoke a greater degree of dyspnea than those that only use the lower limbs. [8]

Although 6MWT reflects the functional capacity of COPD patients, it uses only walking, which may induce a metabolic expenditure and degree of dyspnea that are different from those induced by daily activities. TGlittre may be more complete in the evaluation of functional capacity, since it better mimics ADLs and, consequently, may more reliably portray the daily activity suffered by COPD patients.

The time required to complete the Glittre ADL test was 4.20 ± 0.58. this suggest that Glittre ADL test can be used in clinical setup as it required less time and it is easily administrated.

The study finding support the hypothesis that there is difference in physiological response between Glittre-ADL test and 6 minute walk test in the patients with COPD.

CONCLUSION

This study concluded that there was difference between physiological response to Glittre-ADL test and 6 minute walk test in the patients with COPD.

TGlittre can induce a slightly higher oxygen uptake than the 6MWT, which is probably related to the characteristics of the activities performed during the test and to the greater

muscle demand. This study also concludes that Glittre ADL-test is a time efficient.

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Conflict of interest:

Conflict of interest declared none.

Clinical implication:

This suggests that a PR programme for patients with COPD should include TGlittre as it will improve upper limb strength and improve functional capacity.

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