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Relationship Between Upper and Lower Extremity Functional Capacity and Clinical Parameters in Individuals With COPD

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ABSTRACT

Introduction: Chronic Obstructive Pulmonary Disease-(COPD) leads to loss of function in the muscles of the upper and lower extremities, thereby negatively affecting activities of daily living and quality of life. Therefore, it is important to determine the relationships among functional capacity–assessing tests themselves and with clinical parameters.
Aim: To examine the relationships between lower and upper extremity functional capacity measurements and clinical parameters according to disease severity, as well as their interrelationships, in individuals with COPD, thereby revealing the heterogeneous effects of COPD on muscle functions.
Methods: Seventy-one patients diagnosed with COPD according to the GOLD 2023 criteria were received in the evaluation. The demographic characteristics of the participants were recorded. Lower extremity functional capacity was assessed using the 6-Minute Walk Test-(6MWT), while upper extremity functional capacity was evaluated with the 6-Minute Pegboard and Ring Test-(6PBRT). Clinical parameters included CAT, dyspnea and fatigue severity, pulmonary function tests, handgrip, and peripheral muscle strength.
Results: The mean age was 65.4±9.3 years, and 42 (59.2%) of the patients were in GOLD Stage A. A moderate, positive correlation was found between 6MWT and 6PBRT (r=0.544; p<0.001). The results of 6MWT were positively associated with pulmonary function, handgrip strength, and peripheral muscle strength (p<0.05), and negatively associated with dyspnea (p<0.05). The 6MPRT was positively correlate only with handgrip strengths (p<0.05).
Conclusion: In COPD, lower and upper extremity functional capacities are interrelated in a complementary manner. Studies conducted with larger sample groups may clarify the clinical value of these tests, particularly in planning pulmonary rehabilitation.

Keywords: COPD, 6-Minute Walk Test, 6-Minute Pegboard-Ring Test, Clinical status, Pulmonary Functions.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a major public health problem worldwide, drawing attention due to its high mortality and morbidity rates. The World Health Organization says that COPD is one of the top causes of death around the world (1). The pathophysiology of the disease is characterized by persistent airflow limitation, increased airway resistance, structural changes in the lung parenchyma, and a chronic inflammatory response (2).

COPD affects not only the lungs but also has prominent multisystemic effects. Due to chronic inflammation in the lungs, narrowing of the small airways, mucus hypersecretion, destruction of the alveolar walls, and loss of elastic recoil occur. As a result, airflow limitation, hyperinflation, and gas exchange impairments develop, leading to increased work related breathing, ventilatory insufficiency, chronic hypoxia/hypercapnia, and respiratory and peripheral muscle dysfunction through systemic inflammation (3). In addition to respiratory symptoms, functional losses develop in upper and lower extremity muscles. Due to these multidimensional effects, the functional capacities of patients become limited, and their quality of life decreases (4,5).

The use of functional tests representing activities of daily living is an important tool for revealing the relationship between clinical findings and muscle functions. Functional assessment is an important parameter in the clinical evaluation of COPD patients. In this context, the 6-Minute Walk Test (6MWT) provides information about the individual's mobility and walking capacity and reflects global effort capacity; the 6-Minute Pegboard-Ring Test (6PBRT), on the other hand, is one of the practical and valid

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methods developed to assess upper extremity functional capacity by measuring ventilatory stress and muscle function associated with upper extremity use (6–10).

Activities of the upper extremities, especially those performed above shoulder level, play a triggering role for dyspnea and hyperinflation due to their intense use in the home environment and self-care. On the other hand, considering the importance of the lower extremities for ambulation and physical activity, the negative effects of the pathophysiological process and lower extremity muscle dysfunction associated with COPD are well known. In the literature, both the 6MWT and the 6PBRT have been shown to be valid and reliable methods in COPD; however, the relationship between these two tests in terms of disease severity has not been comprehensively examined (6,11,12). In the multidimensional management of COPD, it is important to identify how both lower and upper extremity functions, along with clinical status, reflect the condition. For this reason, our study aimed to examine the relationship between the performance of the 6MWT, which represents the lower extremity, and the 6PBRT, which represents the upper extremity, with clinical parameters according to disease severity, and with each other, thereby evaluating the heterogeneous effects of COPD on muscle functions.

METHOD

This descriptive cross-sectional study was conducted in the pulmonology clinic of a city hospital between 2024 and 2025 after obtaining ethics committee approval (Approval Number: XXXXXXXX), in accordance with the Declaration of Helsinki. Individuals deemed eligible for participation by the pulmonologist were informed about the study and invited to participate. After verbal information, written informed consent was obtained from all participants. Demographic and clinical data of volunteered individuals were collected. In addition to measurements of upper (6PBRT) and lower (6MWT) extremity functional capacity, assessments were conducted for disease severity using the COPD Assessment Test (CAT) (13), Modified Medical Research Council (mMRC) Dyspnea Scale, fatigue, pulmonary function tests, handgrip strength, and peripheral muscle strength.

Participants

Patients diagnosed with COPD and followed in the Pulmonology Clinic, classified as Groups A, B, and E according to the GOLD 2023 staging method, were invited to participate in the study (14). According to the GOLD 2023 criteria, grouping was performed as follows:

- Group A: Low symptoms (mMRC 0–1 or CAT<10), low exacerbation risk (≤1 exacerbation, no hospitalization)

- Group B: Significant symptoms (mMRC≥2 or CAT≥10), low exacerbation risk (≤1 exacerbation, no hospitalization)

- Group E: High exacerbation risk (≥2 exacerbations or ≥1 hospitalization), with varying symptom levels

Inclusion Criteria: Individuals aged 40 years or older, in stable COPD stage A, B, or E, without orthopedic, rheumatic, or neurological problems in the upper extremities, and who voluntarily agreed to participate in the study were included.

Exclusion Criteria: Individuals with an exacerbation within the past month and those who did not complete all evaluation sessions were excluded from the study.

Sample Size and Statistical Analysis

Following sample size calculations performed using the G*Power program and considering a 20% potential loss, the minimum required number of participants was determined as 80 (effect size 0.4; $\alpha = 0.05$; 80% power). For classification of the collected data, qualitative and quantitative statistical methods were evaluated using the SPSS 11.5 program with a 95% confidence interval and a significance level of $p < 0.05$.

Normality of distribution was assessed using the Kolmogorov–Smirnov test and normal distribution plots. The relationship between the assessment parameters of the 6MWT and 6PBRT was evaluated using Pearson correlation analysis. The degree of relationship was interpreted based on the correlation coefficient (r) : r = 0–0.2 (very weak); r = 0.2–0.4 (weak); r = 0.4–0.6 (moderate); r = 0.6–0.8 (strong); r > 0.8 (very strong) (15).

Outcome Measures

Sociodemographic Data: Age, sex, height, weight, smoking history, disease duration, and annual exacerbation count were recorded.

6-Minute Walk Test (6MWT): The test was performed in a flat 30-meter corridor according to American Thoracic Society (ATS) standards (16). Participants were asked to walk as fast and safely as possible for six minutes. The total walking distance was recorded in meters (6).

6-Minute Pegboard and Ring Test (6-PBRT): This test, developed by Celli and colleagues, is a non-invasive upper extremity exercise test that evaluates functional capacity through unsupported arm activities (17). The test setup consisted of four horizontal rods mounted on the wall: two rods at shoulder height and two rods were positioned 20 cm above shoulder level. Ten rings were initially placed on the two lower rods. Participants were seated on a chair with back support, ensuring their feet contacted the ground fully. During the test, participants were asked to move two rings at a time (one with each hand) from the lower rod to the upper rod. Once all twenty rings were transferred to the upper rods, participants were instructed to return them to the lower rods. This sequence was repeated continuously for six minutes. The number of rings moved during the test was recorded as the final performance score. Participants were verbally encouraged with standardized commands every minute (18).

COPD Assessment Test (CAT): The CAT is an eight-item scale measuring health status in COPD. This short questionnaire has strong measurement properties, is sensitive to changes in disease status, and provides information about the patient's symptom severity, dyspnea score, pulmonary function values, and quality of life (13).

Modified Medical Research Council (mMRC) Dyspnea Scale: The mMRC scale is a simple and valid method used to categorize COPD patients in terms of disability caused by dyspnea. The scale consists of five items based on activities that induce breathlessness. Patients indicate the activity level that causes dyspnea for them. Dyspnea is rated from level "0," indicating no breathlessness, upwards. It is particularly used in GOLD guidelines to determine COPD severity. The mMRC scale parallels results from lung function tests and arterial blood gas measurements and is easy to administer and repeat (19).

Borg Dyspnea and Fatigue Scales: The Borg Scale and Borg Dyspnea Scale were used to assess dyspnea and fatigue after exertion. These scales, scored from 0 to 10, allow individuals to subjectively express the level of breathlessness and fatigue during or after exertion. "0" indicates no dyspnea or fatigue, while "10" indicates the most severe sensation. The scales are widely used along with exercise tests in COPD because they reliably reflect symptom burden. The literature reports significant relationships between the Borg scores and dyspnea severity, exercise tolerance, and functional capacity (20).

Pulmonary Function Tests (PFTs): Pulmonary function tests are fundamental measurement tools to objectively evaluate airflow capacity in COPD. Spirometry measurements were performed according to ATS/ERS standards, ensuring correct and safe forced expiratory maneuvers. The FEV_1, FVC, FEV_1/FVC ratio. parameters were recorded.

An FEV_1/FVC ratio <70% indicates the presence of obstruction in COPD. These measurements are critical not only for diagnosis but also for determining disease severity, monitoring prognosis, and evaluating relationships with functional capacity. The literature strongly supports the association between PFT parameters and COPD symptom burden and exercise capacity (20-22).

Handgrip Strength: A Jamar hand dynamometer was used to measure this parameter. Measurements were performed with the participant seated, the shoulder in adduction and neutral rotation, the elbow flexed at 90°, and the forearm in mid-position. Participants were asked to perform maximal voluntary grip. Three measurements were taken, allowing one minute of rest between trials. The mean value of the measurements for each hand was recorded (23).

Peripheral Muscle Strength: Peripheral muscle weakness is common in COPD due to systemic inflammation, hypoxemia, and physical inactivity. In this study, upper and lower extremity peripheral muscle strength was assessed using Manual Muscle Testing (MMT). MMT classifies muscle force between 0 and 5 according to the muscle's ability to resist gravity and external force (24). The literature demonstrates that muscle strength measured via MMT is associated with functional capacity, dyspnea, and exercise performance in COPD (25-26). Muscles evaluated included: deltoid anterior fibers, deltoid middle fibers, biceps brachii, iliopsoas, quadriceps femoris muscles.

RESULTS

Eighty individuals were invited to participate in the study. Among these, 71 participants who met the research criteria were included. No adverse events were observed during the evaluations; all procedures were completed safely by the patients.

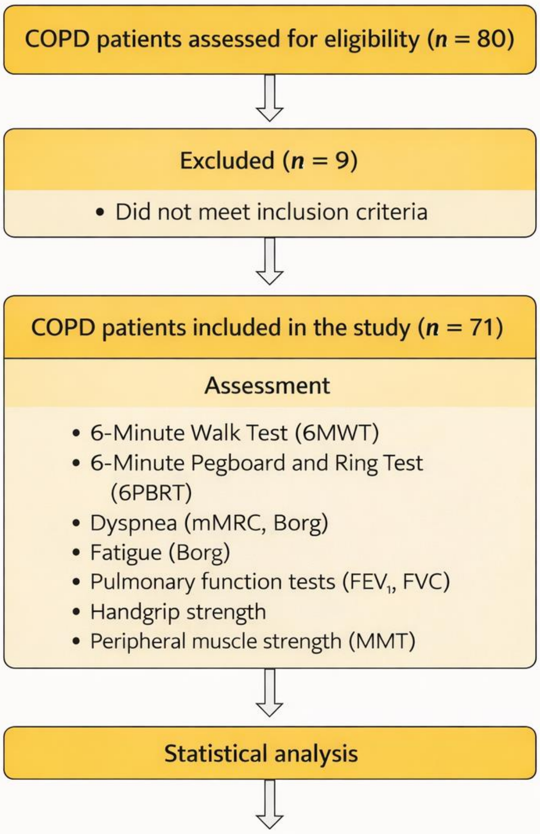

Figure 1. Flow diagram of patient inclusion and assessment procedures.

The ages of the participants ranged from 40 to 86 years, with a mean age of 65.4 ± 9.3 years. Among the participants included in the study, 59.2% consisted of GOLD Stage A patients, 14.1% consisted of Stage B patients, and 26.8% consisted of Stage E patients. Demographic and clinical data of the individuals are presented in Table 1.

Table 1. Demographic and clinical characteristics of the participants

	Mean ± SD
Age (years)	65,4 ± 9,3
Height(cm)	166,8 ± 8,9
Weight (kg)	74,5 ± 14,2
Attacks (n)	1,8 ± 1,2
	n (%)
Gender (female/male)	13 (18.3%) / 58 (81.7%)
Smoking (Yes/No)	47 (%66,2) / 24 (%33,8)
Biomass exposure (Yes/No)	19(%26,8) / 52 (%73,2)
COPD stage (GOLD)	
Stage A	42 (%59.2)
StageB	10 (%14.1)
Stage E	19 (%26.8)

COPD: Chronic Obstrüktif Pulmonary Disease , GOLD: Global Initiative for Chronic Obstructive Pulmonary Disease

Clinical assessment outcomes including functional capacity tests, symptom scores, pulmonary function tests, dyspnea and fatigue scores, handgrip strength, and peripheral muscle strength findings are shown in Table 2.

Table 2. Clinical evaluation results of the participants

Parameters		**Subgroup**	**Mean ± SD**	**Min–Max**
6MWT distance (m)		**Total**	512.4 ± 100.1	180–702
		COPD Stage A	551.9 ± 75.5	408–702
		COPD Stage B	465.5 ± 70.4	388–579
		COPD Stage E	449.6 ± 120.3	180–630
6DPRT score		**Total**	134.0 ± 23.6	68–182
		COPD Stage A	138.9 ± 22.2	74–182
		COPD Stage B	121.2 ± 24.7	76–164
		COPD Stage E	129.7 ± 23.7	68–164
CAT score		**Total**	8.58 ± 5.83	2–24
		COPD Stage A	3.45 ± 2.38	0–9
		COPD Stage B	7.70 ± 2.75	4–13
		COPD Stage E	8.58 ± 5.83	2–24
mMRC dyspnea score		**Total**	1.63 ± 0.96	0–3
		COPD Stage A	0.71 ± 0.46	0–1
		COPD Stage B	1.80 ± 0.42	1–2
		COPD Stage E	1.63 ± 0.96	0–3
BORG Dyspnea		**Total**	0.45 ± 0.69	0–2
		COPD Stage A	0.08 ± 0.27	0–1
		COPD Stage B	0.10 ± 0.32	0–1
		COPD Stage E	0.45 ± 0.69	0–2
BORG Fatigue		**Total**	0.37 ± 0.50	0–1
		COPD Stage A	0.17 ± 0.38	0–1
		COPD Stage B	0.50 ± 0.53	0–1
		COPD Stage E	0.37 ± 0.50	0–1
	Subdimensions			
Respiratory Function Tests	**FEV_1 (%)**	**Total**	51.31 ± 21.91	20–107
		COPD Stage A	57.87 ± 16.31	31–95
		COPD Stage B	60.53 ± 15.44	35–90
		COPD Stage E	51.31 ± 18.89	25–118
	FVC (%)	**Total**	65.95 ± 20.01	29–94
		COPD Stage A	76.40 ± 18.89	25–118
		COPD Stage B	74.46 ± 16.14	53–105
		COPD Stage E	65.95 ± 20.01	29–94
	FEV_1/FVC (%)	**Total**	62.94 ± 11.93	43.7–94.2

		COPD Stage A	58.59 ± 8.63	38.2–70.7
		COPD Stage B	63.69 ± 9.17	53–86.4
		COPD Stage E	62.94 ± 11.93	43.7–94.2
Hand grip strength	**Right**	**Total**	27.13 ± 7.73	12.7–40.4
		COPD Stage A	35.60 ± 9.38	17.6–57.0
		COPD Stage B	27.57 ± 8.96	14.3–40.9
		COPD Stage E	27.13 ± 7.73	12.7–40.4
	Left	**Total**	27.33 ± 7.11	18.1–39.7
		COPD Stage A	32.93 ± 9.51	20.0–51.3
		COPD Stage B	27.14 ± 6.57	16.6–37.1
		COPD Stage E	27.33 ± 7.11	18.1–39.7
Peripheral muscle strength	**Deltoid anterior fibers (R)**	COPD Stage A	4.98 ± 0.15	4–5
		COPD Stage B	4.30 ± 0.48	4–5
		COPD Stage E	4.37 ± 0.50	4–5
	Deltoid anterior fibers (L)	COPD Stage A	4.98 ± 0.15	4–5
		COPD Stage B	4.40 ± 0.52	4–5
		COPD Stage E	4.37 ± 0.50	4–5
	Deltoid middle fibers (R)	COPD Stage A	4.70 ± 0.20	4–5
		COPD Stage B	4.10 ± 0.40	3–5
		COPD Stage E	4.15 ± 0.45	3–5
	Deltoid middle fibers (L)	COPD Stage A	4.70 ± 0.20	4–5
		COPD Stage B	4.20 ± 0.45	3–5
		COPD Stage E	4.15 ± 0.45	3–5
	Biceps brachii (R)	COPD Stage A	5.00 ± 0.10	4–5
		COPD Stage B	4.50 ± 0.35	4–5
		COPD Stage E	4.45 ± 0.40	4–5
	Biceps brachii (L)	COPD Stage A	5.00 ± 0.10	4–5
		COPD Stage B	4.55 ± 0.35	4–5
		COPD Stage E	4.50 ± 0.40	4–5
	Iliopsoas (R)	COPD Stage A	5.00 ± 0.00	5–5
		COPD Stage B	4.70 ± 0.25	4–5
		COPD Stage E	4.65 ± 0.25	4–5
	Iliopsoas (L)	COPD Stage A	5.00 ± 0.00	5–5
		COPD Stage B	4.75 ± 0.20	4–5
		COPD Stage E	4.70 ± 0.25	4–5
	Quadriceps femoris (R)	COPD Stage A	4.90 ± 0.20	4–5
		COPD Stage B	4.40 ± 0.40	4–5
		COPD Stage E	4.35 ± 0.40	4–5
	Quadriceps femoris (L)	COPD Stage A	4.90 ± 0.20	4–5
		COPD Stage B	4.45 ± 0.40	4–5
		COPD Stage E	4.35 ± 0.40	4–5

COPD: Chronic Obstrüktif Pulmonary Disease, 6MWT: 6 Minute Walk Test, FEV1: Forced Expiratory Volume-one second, FVC: Force Vital Capacity, R: Right, L: Left

A statistically significant, moderate positive correlation was found between the results of the 6MWT and the results of the 6PBRT ($r = 0.544$; $p < 0.001$). The correlation coefficients between the functional capacity tests and clinical parameters, together with the distribution across GOLD stages, are presented in Table 3.

When the relationship between the 6MWT and 6PBRT and pulmonary function test results within their GOLD stages was examined: In GOLD B, the strongest correlation was found between both tests and the FEV_1/FVC ratio. When evaluated in GOLD A and GOLD E, there was no significant correlation between the tests and pulmonary function test results. In all groups, the lower the CAT score and the dyspnea severity, and the better the fatigue level, the higher was the functional performance level. When the functional capacity parameters were compared according to the GOLD stage, no statistically significant difference was found in 6PBRT performance between the groups. For 6MWT, a statistically significant difference was found with certain GOLD levels, the distance covered in the test decreased with increasing GOLD stage ($p<0.05$).

Table 3. The correlations between the parameters according to COPD stages.

	COPD STAGE-A		COPD STAGE-B		COPD STAGE-E	
	6 MWT (r, p)	6 DPRT (r, p)	6 MWT (r, p)	6 DPRT (r, p)	6 MWT (r, p)	6 DPRT (r, p)
BMI	NS	NS	NS	NS	NS	NS
CAT	-0.41/.004	NS	-0.38/.012	NS	-0.33/.021	NS
Dyspnea	-0.28/.031	NS	-0.25/.044	NS	-0.31/.025	NS
FEV1%	0.33/.012	NS	0.29/.028	NS	0.26/.039	NS
FVC%	0.28/.028	NS	0.25/.041	NS	NS	NS
FVC/FEV1	NS	NS	NS	NS	NS	NS
Hand grip R	0.36/.006	0.33/.011	0.31/.019	0.26/.040	0.28/.030	0.23/.049
Hand grip L	0.31/.017	0.29/.024	0.28/.031	0.24/.048	0.26/.041	NS
Deltoid ant R	0.31/.019	NS	NS	NS	0.24/.048	NS
Deltoid ant L	0.29/.027	0.27/.018	0.28/.030	NS	0.27/.035	NS
Deltoid mid R	0.28/.032	0.25/.026	0.24/.045	NS	NS	NS
Deltoid mid L	0.36/.007	NS	0.31/.020	NS	0.29/.029	NS
Biseps R	0.55/<.001	0.22/.049	0.51/<.001	NS	0.48/.001	NS
Biseps L	0.57/<.001	NS	0.52/<.001	NS	0.49/.001	NS
İliopsoas R	0.40/.004	NS	0.38/.013	NS	0.33/.021	NS
İliopsoas L	0.42/.002	0.24/.033	0.39/.011	NS	0.36/.018	NS
Quadriceps R	0.46/.001	NS	0.41/.008	NS	0.29/.028	NS
Quadriceps L	0.52/ <.001	0.25/.028	0.44/.004	NS	0.31/.022	NS
6MPRT	0.454/ .002	NS	0.686 / 0.029	NS	0.555 / 0.014	NS

COPD: Chronic Obstrüktif Pulmonary Disease; 6MWT: 6 Minute Walk Test; 6MPRT: 6 Minute Pegboard and Ring Test; BMI: Body mass index; CAT: COPD Assessment Test; FEV1: Forced Expiratory Volume-one second; FVC: Force Vital Capacity; R: Right; L: Left; NS:Not significant.

DISCUSSION

In this study, the relationship between the functional capacities of the lower and upper extremities and clinical parameters was examined in individuals diagnosed with COPD. The study results showed that both of extremity functional capacity are associated with dyspnea scores and some clinical parameters such as CAT scores, pulmonary functions, peripheral muscle strength, handgrip strength. The moderate and significant relationship between the 6MWT and 6PBRT indicates the important role of both tests in evaluating the functional status of these individuals and demonstrates that both parameters are affected by similar physiological mechanisms.

Functional capacity constitutes a multidimensional structure affected by the systemic consequences of COPD. The literature shows that COPD, through mechanisms such as chronic inflammation, hypoxemia, hypercapnia, and increased energy expenditure, leads to reductions in peripheral muscle endurance. These reductions negatively affect mobility, exercise tolerance, and activities of daily living (27, 28). The results of this study support the literature by demonstrating the relationships of both lower and upper extremity performance with some clinical parameters especially in COPD stage A.

The 6MWT, which is widely used in COPD, is an important indicator of functional capacity, reflecting overall endurance and cardiovascular performance. It is also associated with exercise capacity, pulmonary functions, quality of life, and mortality (6, 25, 26, 29). Despite its less frequent use in this field, the 6PBRT remains a crucial test for assessing upper extremity functional capacity and ventilatory workload. Studies have shown that unsupported arm exercises provoke dyspnea and increase dynamic hyperinflation; therefore, upper extremity assessment has great importance in COPD (28, 30, 31). This study's findings reveal a correlation between the 6PBRT and clinical parameters, as well as CAT scores, dyspnea, hand grip strength. The performance differences between the GOLD stages and the decreasing distance in the 6MWT with increasing GOLD stage are consistent with the deteriorating exercise capacity observed in advanced COPD (14, 30).

Upper extremity functional capacity gains particular importance in daily living activities. Unlike the lower extremities, upper extremity movements rely less on muscle groups that can withstand higher loads and require more ventilatory effort. It is known that upper extremity exercises cause greater dyspnea than lower extremity exercises in individuals with COPD, and the literature shows that upper extremity training reduces dyspnea and increases exercise capacity (31-34).

The significant moderate correlation between the 6MWT and 6PBRT found in this study is an indicator that lower and upper extremity functions mutually interact and may be influenced by common pathophysiological mechanisms. Evaluating both upper and lower extremity functions in COPD allows for a broader understanding of the disease and facilitates the creation of more individualized and effective rehabilitation programs.

In the literature, it is also stated that it is important to evaluate upper extremity functionality in addition to lower extremity functionality in COPD patients (35, 36). Studies have demonstrated that the 6PBRT is a valid and reliable measurement tool and can be safely used even in individuals with acute exacerbations (11, 30, 37). This information supports the idea that the 6PBRT can be used as an important assessment tool in the management of COPD. Unfortunately, this study could not confirm the high-level association reported in the literature. This may be due to the insufficient number of cases per COPD stages.

In the present study, the relationship between peripheral muscle strength and functional parameters is also consistent with the findings in the literature. Studies have shown that patients with COPD exhibit reduced muscle strength, especially in the quadriceps muscles. This study also supports this finding and reveals the relationship between peripheral muscle strength and functional capacity. The relationship between handgrip strength and functional tests may help predict the overall functional capacity of individuals.

In a study conducted by Khan et al., in 2025, measuring thoracic muscle strength (pectoralis, serratus anterior, upper limb muscles) through MMT tests was reported to be associated with 6MWT performance in patients with stable COPD. Our study supports this finding and further shows the relationships between the 6PBRT and MMT test values in patients with Stage A (38). This may indicate the importance of evaluating upper extremity strength along with lower extremity strength in future studies.

This study has several limitations. Subgroup analyses such as gender, phenotype, height-normalized values, and the dominance of upper vs. lower extremity muscles could not be performed. The minimal clinically important difference (MCID) of the 6PBRT has not yet been established in the literature. Additional parameters such as body composition, physical activity level, or inflammatory markers were not included. Therefore, future studies should evaluate these parameters and investigate predictive norms for both tests in COPD.

CONCLUSION

This study revealed that the 6-Minute Pegboard and Ring Test (6PBRT) is a valid assessment tool that reflects functional capacity in individuals diagnosed with COPD. The moderate and significant relationship between the 6MWT and 6PBRT shows that these two tests complement each other and may be important parameters for clinical evaluation in COPD, especially in stages A. Evaluating both lower and upper extremity functional capacities in COPD contributes to the multidimensional understanding of the disease and offers guidelines regarding rehabilitation approaches.

The relationships of the 6PBRT and 6MWT with pulmonary functions, dyspnea severity, and muscle strength emphasize the importance of supporting both upper and lower extremity functions in COPD management. Future research could focus on the effectiveness of 6PBRT in tele-assessment and telerehabilitation applications, particularly in individuals with advanced disease, limited mobility, or difficulty accessing face-to-face assessments, with the participation of more patients.

DESCRIPTIONS

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