

Online Supplementary material

Title: Performance-based outcome measures to assess functionality in hospitalised patients with COPD Exacerbations: A systematic review of the measurement properties.

Search strategy used for database search on the performance-based outcome measures to assess functionality in hospitalised patients with ECOPD:

Pubmed

(((((Pulmonary Disease, Chronic Obstructive[Title/Abstract]) OR ("Chronic Obstructive Lung Disease"[Title/Abstract])) OR ("Chronic Obstructive Pulmonary Diseases"[Title/Abstract])) OR (COPD[Title/Abstract])) OR ("Chronic Obstructive Airway Disease"[Title/Abstract])) OR ("Chronic Obstructive Pulmonary Disease"[Title/Abstract]))

AND

(((((acute[Title/Abstract]) OR (exacerbat*[Title/Abstract]) OR (severe[Title/Abstract])) OR (inpatient[Title/Abstract])) OR (hospital*[Title/Abstract]))

AND

((((((((((((((((((((((((((function*[Title/Abstract]) AND (function*[Title/Abstract])) OR (performance[Title/Abstract])) OR (physical[Title/Abstract])) OR ("physical functional performance"[Title/Abstract])) OR ("physical performance"[Title/Abstract])) OR ("functional performance"[Title/Abstract])) OR ("exercise tolerance"[Title/Abstract])) OR (tolerance[Title/Abstract])) OR ("cardiorespiratory fitness"[Title/Abstract])) OR (cardiorespiratory[Title/Abstract])) OR ("physical activity"[Title/Abstract])) OR (inactivity[Title/Abstract]) OR (mobility[Title/Abstract]) OR (endurance[Title/Abstract]) OR ("muscle strength"[Title/Abstract]) OR (capacity[Title/Abstract]) OR (ability[Title/Abstract]) OR ("exercise capacity"[Title/Abstract]) OR ("functional capacity"[Title/Abstract]) OR ("aerobic capacity"[Title/Abstract]) OR ("functional status"[Title/Abstract]) OR ("physical exertion"[Title/Abstract]) OR (walk*[Title/Abstract]) OR (ambulation[Title/Abstract]) OR (balance[Title/Abstract]) OR (fatigue[Title/Abstract])) OR ("respiratory muscle"[Title/Abstract]))

AND

((instrumentation[sh] OR methods[sh] OR "Validation Studies"[pt] OR "Comparative Study"[pt] OR "psychometrics"[MeSH] OR psychometr*[tiab] OR clinimetr*[tw] OR clinometr*[tw] OR "outcome assessment (health care)"[MeSH] OR "outcome assessment"[tiab] OR "outcome measure*" [tw] OR "observer variation"[MeSH] OR "observer variation"[tiab] OR "Health Status Indicators"[Mesh] OR "reproducibility of results"[MeSH] OR reproducib*[tiab] OR "discriminant analysis"[MeSH] OR reliab*[tiab] OR unreliab*[tiab] OR valid*[tiab] OR "coefficient of variation"[tiab] OR coefficient[tiab] OR homogeneity[tiab] OR homogeneous[tiab] OR "internal consistency"[tiab] OR (cronbach*[tiab] AND (alpha[tiab] OR alphas[tiab])) OR (item[tiab] AND (correlation*[tiab] OR selection*[tiab] OR reduction*[tiab])) OR agreement[tw] OR precision[tw] OR imprecision[tw] OR "precise values"[tw] OR test-retest[tiab] OR (test[tiab] AND retest[tiab]) OR (reliab*[tiab] AND (test[tiab] OR retest[tiab])) OR stability[tiab] OR interrater[tiab] OR inter-rater[tiab] OR intrarater[tiab] OR intra-rater[tiab] OR intertester[tiab] OR inter-tester[tiab] OR intratester[tiab] OR intra-tester[tiab] OR interobserver[tiab] OR inter-observer[tiab] OR intraobserver[tiab] OR intra-observer[tiab] OR intertechnician[tiab] OR inter-technician[tiab] OR intratechnician[tiab] OR intra-technician[tiab] OR interexaminer[tiab] OR inter-examiner[tiab] OR intraexaminer[tiab] OR intra-examiner[tiab] OR interassay[tiab] OR inter-assay[tiab] OR intraassay[tiab] OR intra-assay[tiab] OR interindividual[tiab] OR inter-individual[tiab] OR intraindividual[tiab] OR intra-individual[tiab] OR interparticipant[tiab] OR inter-participant[tiab] OR intraparticipant[tiab] OR intra-participant[tiab] OR kappa[tiab] OR kappa's[tiab] OR kappas[tiab] OR repeatab*[tw] OR

((replicab*[tw] OR repeated[tw]) AND (measure[tw] OR measures[tw] OR findings[tw] OR result[tw] OR results[tw] OR test[tw] OR tests[tw])) OR generaliza*[tiab] OR generalisa*[tiab] OR concordance[tiab] OR (intraclass[tiab] AND correlation*[tiab]) OR discriminative[tiab] OR "known group"[tiab] OR "factor analysis"[tiab] OR "factor analyses"[tiab] OR "factor structure"[tiab] OR "factor structures"[tiab] OR dimension*[tiab] OR subscale*[tiab] OR (multitrait[tiab] AND scaling[tiab] AND (analysis[tiab] OR analyses[tiab])) OR "item discriminant"[tiab] OR "interscale correlation*" [tiab] OR error[tiab] OR errors[tiab] OR "individual variability"[tiab] OR "interval variability"[tiab] OR "rate variability"[tiab] OR (variability[tiab] AND (analysis[tiab] OR values[tiab])) OR (uncertainty[tiab] AND (measurement[tiab] OR measuring[tiab])) OR "standard error of measurement"[tiab] OR sensitiv*[tiab] OR responsive*[tiab] OR (limit[tiab] AND detection[tiab]) OR "minimal detectable concentration"[tiab] OR interpretab*[tiab] OR ((minimal[tiab] OR minimally[tiab] OR clinical[tiab] OR clinically[tiab]) AND (important[tiab] OR significant[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR (small*[tiab] AND (real[tiab] OR detectable[tiab]) AND (change[tiab] OR difference[tiab])) OR "meaningful change"[tiab] OR "ceiling effect"[tiab] OR "floor effect"[tiab] OR "Item response model"[tiab] OR IRT[tiab] OR Rasch[tiab] OR "Differential item functioning"[tiab] OR DIF[tiab] OR "computer adaptive testing"[tiab] OR "item bank"[tiab] OR "cross-cultural equivalence"[tiab]))

Cochrane Trials

ID	Search Hits
#1	MeSH descriptor: [Pulmonary Disease, Chronic Obstructive] explode all trees 6042
#2	COPD 17635
#3	"Chronic Obstructive Pulmonary Disease" 12646
#4	"Chronic Obstructive Lung Disease" 6910
#5	exacerbat* 21521
#6	severe 119345
#7	MeSH descriptor: [Inpatients] explode all trees 1017
#8	hospital* 367192
#9	#1 OR #2 OR #3 OR #4 22209
#10	#5 OR #6 OR #7 OR #8 456420
#11	#9 AND #10 12369
#12	function* 286258
#13	MeSH descriptor: [Physical Functional Performance] explode all trees 273
#14	performance 111251
#15	"functional performance" 1996
#16	"physical performance" 4833
#17	MeSH descriptor: [Exercise Tolerance] explode all trees 2708
#18	"physical activity" 36082
#19	inactivity 2317
#20	mobility 13551
#21	endurance 11730
#22	MeSH descriptor: [Cardiorespiratory Fitness] explode all trees 335
#23	cardiorespiratory 4941
#24	MeSH descriptor: [Muscle Strength] explode all trees 6160
#25	capacity 43324

#26	ability	52974	
#27	"functional capacity"	4540	
#28	"exercise capacity"	5909	
#29	"aerobic capacity"	3225	
#30	MeSH descriptor: [Functional Status]	explode all trees	50
#31	MeSH descriptor: [Physical Exertion]	explode all trees	3925
#32	walk*	40220	
#33	ambulation	3818	
#34	MeSH descriptor: [Postural Balance]	explode all trees	2935
#35	MeSH descriptor: [Fatigue]	explode all trees	3972
#36	MeSH descriptor: [Respiratory Muscles]	explode all trees	836
#37	#12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36	441742	
#38	#11 AND #37	6452	
#39	validat*	47035	
#40	psycomet*	3	
#41	clinimetr*	109	
#42	reprodu*	40844	
#43	reliab*	30659	
#44	correlation	45878	
#45	precision	8252	
#46	test-retest	2288	
#47	stability	16982	
#48	interrater	2628	
#49	inter-rater	1355	
#50	intrarater	708	
#51	intra-rater	323	
#52	intertester	42	
#53	inter-tester	22	
#54	intra-tester	28	
#55	intratester	42	
#56	interobserver	1856	
#57	inter-observer	739	
#58	intraobserver	694	
#59	intra-observer	321	
#60	interexaminer	196	
#61	inter-examiner	113	
#62	intraexaminer	148	
#63	intra-examiner	105	
#64	kappa	4794	
#65	kappa's	4772	
#66	repeatab*	1633	
#67	replicab*	443	
#68	repeated	58396	
#69	concordance	3299	
#70	intraclass	3599	
#71	discriminant	1424	
#72	error	20352	
#73	variability	26115	

#74 viability 2491
 #75 viable 6106
 #76 feasib* 57855
 #77 responsiv* 14140
 #78 MeSH descriptor: [Reproducibility of Results] explode all trees 11018
 #79 minimal difference 9527
 #80 interpretab* 787
 #81 predictor 16377
 #82 predictive 29338
 #83 MeSH descriptor: [Safety] explode all trees 4058
 #84 #39 OR #40 OR #41 OR #42 OR #43 OR #44 OR #45 OR #46 OR #47 OR #48
 OR #49 OR #50 OR #51 OR #52 OR #53 OR #54 OR #55 OR #56 OR #57 OR
 #58 OR #59 OR #60 OR #61 OR #62 OR #63 OR #64 OR #65 OR #66 OR #67
 OR #68 OR #69 OR #70 OR #71 OR #72 OR #73 OR #74 OR #75 OR #76 OR
 #77 OR #78 OR #79 OR #80 OR #81 OR #82 OR #83 335625
 #85 #38 AND #84 1873

EMBASE

#26 #24 AND #25
 #25#5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15
 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21
 #24 #1 AND #23
 #23 #2 OR #3 OR #4 OR #22
 #22 'disease exacerbation'/mj AND ([embase]/lim OR [medline]/lim)
 #21 'breathing muscle'/mj AND ([embase]/lim OR [medline]/lim)
 #20 exercise AND capacity
 #19 'muscle fatigue'/mj AND ([embase]/lim OR [medline]/lim)
 #18 'balance disorder'/mj AND ([embase]/lim OR [medline]/lim)
 #17 'walking'/mj AND ([embase]/lim OR [medline]/lim)
 #16 'aerobic capacity'/mj AND ([embase]/lim OR [medline]/lim)
 #15 'physical capacity'/mj AND ([embase]/lim OR [medline]/lim)
 #14 'muscle strength'/mj AND ([embase]/lim OR [medline]/lim)
 #13 'endurance'/mj AND ([embase]/lim OR [medline]/lim)
 #12 'physical activity, capacity and performance'/mj AND ([embase]/lim OR
 [medline]/lim)
 #11 'physical activity'/mj AND ([embase]/lim OR [medline]/lim)
 #10 'cardiorespiratory fitness'/mj AND ([embase]/lim OR [medline]/lim)
 #9 'exercise tolerance'/mj AND ([embase]/lim OR [medline]/lim)
 #8 'functional status'/mj AND ([embase]/lim OR [medline]/lim)
 #7 'physical disease'/mj AND ([embase]/lim OR [medline]/lim)
 #6 'physical performance'/mj AND ([embase]/lim OR [medline]/lim)
 #5 'functional assessment'/mj AND ([embase]/lim OR [medline]/lim)
 #4 'hospitalization'/mj AND ([embase]/lim OR [medline]/lim)
 #3 'hospital patient'/mj AND ([embase]/lim OR [medline]/lim)
 #2 'exacerbation'/mj AND ([embase]/lim OR [medline]/lim)
 #1 'chronic obstructive lung disease'/mj AND ([embase]/lim OR [medline]/lim)

PEDro

Exacerb* AND COPD

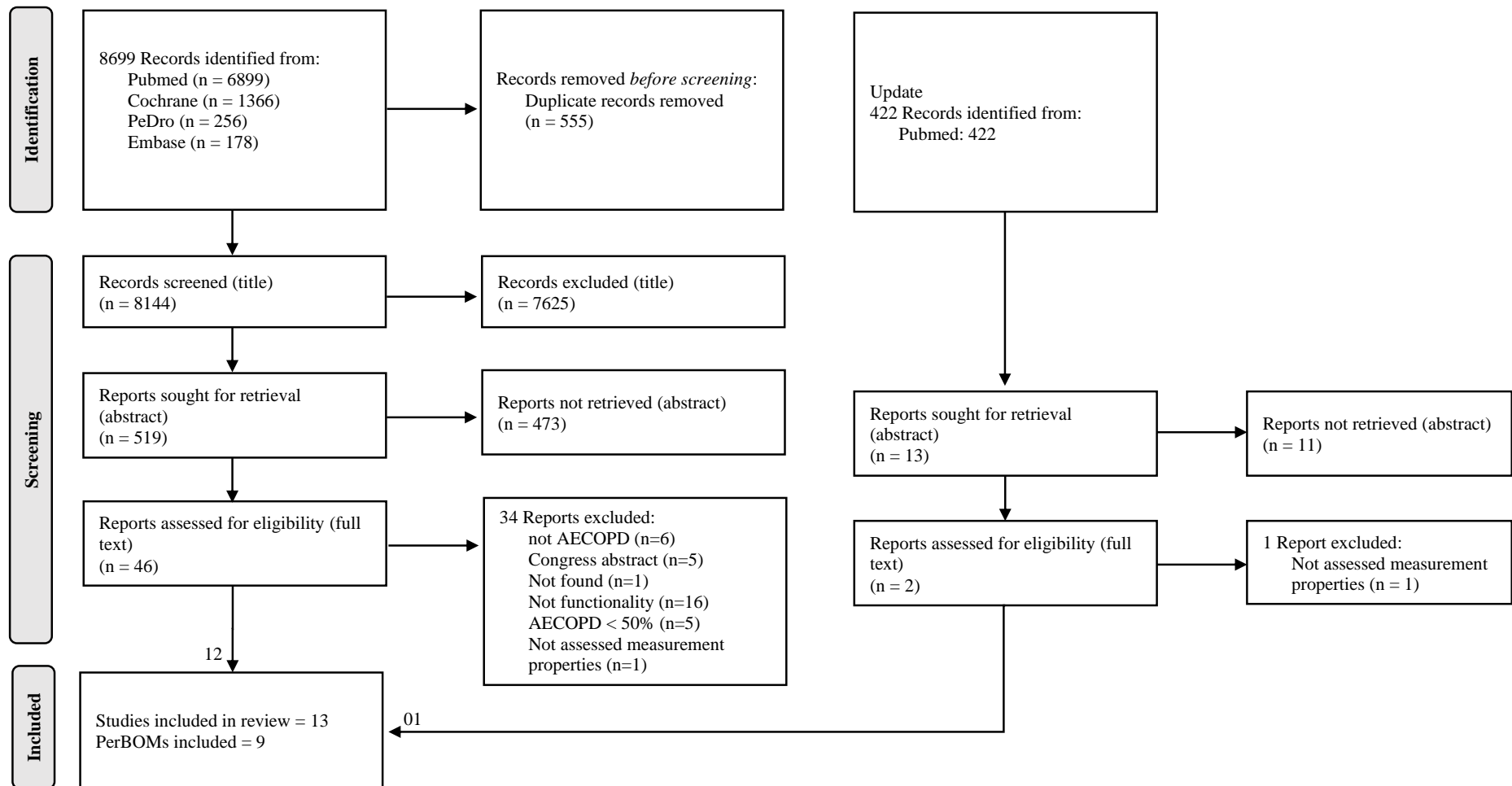


Figure S1: Flow diagram of included studies. *Adapted from:* Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;372:n71. doi: 10.1136/bmj.n71 [1]

Table S1: Classification of performance-based outcome measures within ICF categories

Outcome	Performance-based outcome measures								
	6MST	HGS	MIP	6PBRT	BBS	DEMMI	4mGS	ISWT	6MWT
<i>Body functions</i>									
<i>Functions of the cardiovascular and respiratory systems</i>									
b445. Respiratory muscles			X						
b455. Exercise tolerance	X			X				X	X
<i>Neuromusculoskeletal and movement-related functions</i>									
b710. Mobility of joints									
b730. Muscle power	X	X		X					
b740. Muscle endurance	X			X				X	X
b760. Control of voluntary movement				X					
b770. Gait pattern									
<i>Activities</i>									
<i>Mobility</i>									
d410. Changing basic body position	X				X	X			
d4000. Lying down						X			
d4101. Squatting						X			
d4102. Kneeling									
d4103. Sitting					X	X			
d4104. Standing					X	X			
d4105. Bending									
d4106. Shifting the body's center of gravity	X				X	X	X	X	X
b415. Maintaining body position	X				X	X		X	X
d430. Lifting and carrying objects									
d435. Moving objects with lower extremities									
d445. Hand and arm use				X					
d450. Walking						X	X	X	X
d4500. Walking short distances							X		
d4501. Walking long distances						X		X	X
d4502. Walking on different surfaces									
d4503. Walking around obstacles									
d455. Moving around	X								

Note: ICF: International Classification of Functioning Disability and Health; and6MST: 6-minute stepper test; HGS: handgrip strength; MIP: maximal inspiratory pressure; 6PBRT: 6-minute peg board ring test; BBS: Berg Balance scale; DEMII: de Morton mobility index; 4mGS: 4-metre gait speed; ISWT: Incremental Shuttle Walk test; 6MWT: 6-minute walk test

Table S2: Characteristics of the functionality performances-based outcome measures of the included studies

Functionality construct	PerBOM	Reference (author; year)	Used reference (author, year/ population)	Protocol	Variable	Equipment
Lower limb function and exercise tolerance	6-minute stepper test (6MST)	Ribeiro et al., 2022[2, 3]	Borel, et al, 2010 / COPD population[4]	“The stepper used have a support rod to allow the patients to support themselves when they are unbalanced or exhausted. The initial position of the stepper is as follows: right or left foot, according to the individual’s choice, in the elevated position and the other foot in the lower position, with the arms along the body. The adjustment of the height of the elevated position of the stepper is 20 cm. The test is performed after the patient’s familiarization with the equipment, remaining at rest in the initial position for a period of up to 2 minutes, if necessary.”	Cycles performed in six minutes	Stepper; stopwatch
Peripheral muscle strength	Handgrip strength (HGS)	Turan et al., 2019[5]	Richards and Palmiter-Thomas, 1996 / NR[6]	“After the explanation of the procedure, subjects are seated placing their arms by their sides with the elbow flexed to 90°, the forearm mid-prone, and the wrist in neutral position. Subjects are asked to squeeze the vigorimetre with maximal effort to measure maximal voluntary HGS (in bars) for both the dominant and the nondominant hand. Standard verbal encouragement is given to every patient. Three trials are performed with a 1-min rest between trials and the highest value is used for the analysis.”	Isometric grip strength (bars)	Handheld vigorimetre
Respiratory muscle strength	Maximal inspiratory pressure (MIP)	Mesquita et al, 2013; Tudorache et al, 2010[7, 8]	Black and Hyatt, 1969 / health subjects	“The subject is assessed in the seated position, wears a nose clip, the maximal pressure inspiratory (PImax) maneuver is begun near residual volume. The PImax maneuvers is maintained for at least 2 seconds, and the peak value was recorded. The subjects underwent between three and five maximal acceptable and reproducible maneuvers (with differences of 3%–9% between values).”	Maximum inspiratory pressure (cmH ₂ O)	Manuvacuometre or spirometre
Upper limb function and exercise tolerance	6-minute pegboard and ring test (6PBRT)	Barros, C.F. et al, 2020; Felisberto, et al.2018 [9, 10]	Zhan, et al, 2006 / COPD [11]	“Individuals are instructed to use both hands simultaneously and move the rings from the lower level to the upper one on a vertical support. After positioning all the rings on the upper level, the subjects reposition the rings on the lower level and so on. The individual is instructed to repeat the cycle as many times as possible in 6 minutes.”	Number of rings moved during 6-minute	Pins fixed on a vertical support and rings; stopwatch
Balance	Berg balance score (BBS)	Oliveira et al., 2017[12]	Berg et al., 1992 / elderly subjects [13]	NR	Score	Not

Mobility	Morton mobility index (DEMMI)	Camp, P.G. et al, 2019[14]	de Morton, N.A, Davidson, M; Keating, J.L, 2008 / Older acute medical patients [15]	“15 tests of mobility in the DEMMI tool divided into five categories: (1) bed—“roll onto side,” “bridge,” and “lying to sitting”; (2) chair “sit unsupported in chair,” “sit to stand from chair,” and “sit to stand without using arms”; (3) static balance (no gait aid)—“stand unsupported,” “stand feet together,” “stand on toes,” and “tandem stand with eyes closed”; (4) walking—“walking distance w/ gait aid,” “walking independence”; and (5) dynamic balance (no gait aid)—“pick up pen from floor,” “walks 4 steps backwards,” and “jump.”. The physiotherapist score “0,” “1,” or “2,” with higher scores indicating greater independence with mobility.”	Total score with a range of 0–100	Not
Walking capacity	4-metre gait speed (4MGS)	Nakano et al, 2021[16]	Karpman and Benzo, 2014 / COPD patients[17]	“4mGS is measured on a flat 4-m course involving a standing platform, with patients walking at their speed. During the test, patients are permitted to use their normal walking aids (e.g., stick or frame) and use oxygen, if required. Two cones are placed 8 m apart, and then an automated timing system or well-defined marker is set up 2 m after the first cone and 2 m before the second cone, providing a 2-m acceleration zone, a 4-m timing area, and a 2-m deceleration zone. Patients are instructed to “walk at a comfortable and natural pace” from one cone to the other.”	Gait speed (m/s)	8-metre corridor; stopwatch; cones; chair
Walking capacity and exercise tolerance	Incremental Shuttle Walk Test (ISWT)	Johnson-Warrington et al, 2015[18]	Singh, S.J. et al, 1992 / COPD[19]	“The ISWT is an externally paced, standardized walking test where participants are required to walk around a 10-metre course, identified by 2 cones. Participants walk at a set speed, as dictated by an audio signal and the pace progressively increases each minute. The test is terminated when the participants can no longer continue due to their symptoms or are unable to keep pace with the audio signal.”	Distance (m); VO ₂ peak estimated.	10-metre course; 2 cones; audio signal
	6-minute walk test (6MWT)	Blankenburg et al., 2012 [20]	Guyatt et al, 1984 / respiratory disease; heart failure [21]	“Patient walks on a 43-m-long corridor in the ward, guided by a physiotherapist. Patients are instructed to walk from end to end, covering as much ground as they could during the allotted time. During the walks in which no encouragement was given (E-) the supervisor sat in a chair at one end of the course keeping time, but avoiding eye contact with the subject and maintaining silence. During walks in which encouragement is given (E+) the supervisor ensured that at 30 second intervals she was facing the subject, and she would then deliver one of a predetermined set of encouraging phrases such as “ You’re doing well” or “Keep up the good work.”.”	Distance (m)	43-m long corridor; stopwatch; cones; chair

Liao et al., 2020[22]	Lin et al, 2016 / Community-dwelling older adults aged more than 65 years[23]	“Participants are instructed to walk as far as possible along a 30-m corridor in 6 minutes. The total distance walked within 6 minutes is recorded. The longer distance a patient walks, the better cardiopulmonary endurance the patient.”	Distance (m)	30-metre corridor; stopwatch; cones; chair
Osadnik, et al., 2016[24]	ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories, 2002 / Heart and lung disease[25]	“Testing is performed in a quiet indoor 30-m corridor with a minimum of 20 minutes between tests to enable sufficient rest. Participants are instructed to walk as far as they could in order to cover as much ground as possible during six minutes. Standardized encouragement was provided each minute.”	Distance (m);	30-metre corridor; stopwatch; cones; chair

Table S3. Results of the measurement properties analyses of included performance-based outcome measures

Functionality construct	PerBOM	Author, year	Country	Participants	Intervention/ Comparison	Measurement property	Statistical method	Results	Hypothesis	
Lower limb function and exercise tolerance	6-minute stepper test (6MST)	Ribeiro, Terrazas and Yamaguti, 2022 [3]	Brazil	Hospitalised patients with ECOPD, n=16; age 69.4±11.4y; 56% female; FEV ₁ 49.4±9.9%	6MWD	Construct validity (convergent validity)	Pearson's or Spearman's correlation coefficient	absolute value of 6MWT: rho=0.87 (p<0.001); predicted value of 6MWT: rho=0.86 (p<0.001)	Rho>0.7 ^a	
						Reliability (test-retest)	student's t test	first 6MST: 141.8 ± 55.2 cycles; second 6MST: 155.6 ± 62.9 cycles, difference of 13.82 cycles, (p = 0.0575).	NA	
Peripheral muscle strength	handgrip strength (HGS)	Turan et al., 2019[5]	Turkey	Hospitalised patients with ECOPD, n=101; age 68.3±9.1y; 26% female; FEV ₁ 38.9±14.6%	COPD exacerbation vs COPD stable vs non-COPD	Construct validity (known-groups)	ANOVA with post hoc Tukey analysis	dominant 0.47 ± 0.17bar* vs 0.57 ± 0.16bar vs 0.55 ± 0.16bar; nondominant 0.44 ± 0.16bar* vs 0.55 ± 0.16bar vs 0.52 ± 0.16bar (p<0.001)	(?)	
						6MWD	Construct validity (convergent validity)	Pearson's correlation coefficient	rho=0.516 (p<0.001)	Positive moderate correlation Rho>0.50[26] ^b
						Age			rho=-0.250 (p=0.012)	Dissimilar construct – Positive small correlation
						BMI			rho=0.086 (p=0.395)	rho=0.20 to 0.30 [27–29] ^b
						FEV1			rho=-0.070 (p=0.509)	

					Length of stay			rho=-0.247 (p=0.015)	
Respiratory muscle strength	Maximal inspiratory pressure (MIP)	Mesquita et al., 2013[7]	Brazil	Hospitalised patients with ECOPD, n=19; age 67±11y; 36.8% female; FEV ₁ 26 (19-32)%	Maximal expiratory pressure	Construct validity (convergent validity)	Spearman' correlation	rho=0.49 (p = 0.04)	Positive moderate correlation Rho>0.50[26] ^b
					Quadriceps peak torque			rho=0.57 (p = 0.01)	Rho>0.50[26] ^b
					Changes in MEP day 1 and 1 month after discharge	Responsiveness	Spearman's correlation	rho=0.58 (p = 0.01)	Positive moderate correlation rho≥0.50 ^b
		Tudorache, Oancea and Mlădinescu, 2010 [8]	Romania	Hospitalised patients with ECOPD, n=121; age 60±12y; 10% female; FEV ₁ 42.5±19.5%	6MWD	Construct validity (convergent validity)	Pearson' correlation	rho=0.53 (p=0.0003)	Positive moderate correlation Rho>0.50[26] ^b
						FEV ₁		rho=0.45 (p<0.01)	Positive small correlation Rho=0.20 to 0.30[27-29] ^b
Upper limb function and exercise tolerance	6-minute pegboard and ring test (6-PBRT)	Felisberto et al., 2018[10]	Brazil	Hospitalised patients with ECOPD, n=17; age 70.9±5.1y; 59% female; FEV ₁ 41.8±17.9 %.	Handgrip strength	Construct validity (convergent validity)	Person's or Spearman's correlation	rho=0.70 (p= 0.002)	rho≥0.70 ^a
					Elbow flexor torque peak			rho=0.52 (p=0.03)	rho≥0.70 ^a
					Elbow extensor torque peak			rho=0.61 (p=0.01)	rho≥0.70 ^a
					Total muscular work of the elbow flexor muscles			rho=0.59 (p=0.01)	rho≥0.70 ^a

					Total muscular work of the elbow extensor muscles			rho=0.57 (p=0.02)	rho≥0.70 ^a
					Endurance of elbow flexors			rho= -0.50 (p=0.04)	rho≥0.70 ^a
					Endurance of elbow extensor			rho= -0.51 (p=0.03)	rho≥0.70 ^a
					PFSDQ-M dyspnea			rho= -0.66 (p<0.001)	Rho≥-0.50 ^a
					PFSDQ-M fatigue			rho= -0.60 (p=0.01)	Rho≥-0.50 ^a
					PFSDQ-M change in ADLs			rho= -0.51 (p=0.03)	Rho≥-0.50 ^a
					CAT			rho= -0.51 (p=0.03)	Rho≥-0.50 ^a
					Dyspnea			rho= -0.63 (p=0.01)	Rho≥-0.70 ^a
					Fatigue upper limbs			rho= -0.76 (p<0.001)	Rho≥-0.70 ^a
					FEV ₁			p=0.16	Rho≥0.50 ^a
					FVC			p=0.16	Rho≥0.50 ^a
					Inspiratory capacity			p=0.22	Rho≥0.50 ^a
					Height	Construct validity (discriminative validity)	Pearson's or Spearman's correlation	p=0.19	Did not correlate ^a
					EADPOC vs healthy elderly	Construct validity (known group)	Mann-Whitney	248.7 ± 63.0 (number of rings moved) vs 361.6 ± 49.9 number of rings moved (p<0.001)	Difference higher that 24% between groups ^a
Balance	Berg Balance Scale (BBS) score	Oliveira et al., 2017 [12]	Australia	Hospitalised patients with ECOPD, n=26; age 72±7y; 50% female; FEV ₁ 48±11%.	Dyspnea (mMRC)	Construct validity (convergent validity)	Pearson' correlation	rho=-0.33 (p>0.05)	Positive low correlation Rho≥0.26[30] ^b
					Maximal isometric quadriceps's muscle strength (HHD)			rho=0.51 (p<0.05)	Rho≥0.26[31] ^b

					ECOPD vs stable COPD vs healthy controls	Construct validity (known-groups)	Mann-Whitney U-test	50.7 ± 4.3* vs 51.7 ± 4.4* vs 55.2 ± 1.4; (*p<0.05 versus healthy controls)	Difference of 5-7 points between groups[32] ^b
Mobility	De Morton mobility index (DEMMI)	Camp et al., 2019[14]	Canada	Hospitalised patients with ECOPD, n=22; age 60±10y; 36% female; FEV ₁ 57±37%	6MWD	Construct validity (convergent validity)	Spearman's correlation	rho = 0.69 (p=0.0006)	rho≥0.60 ^a
					Gait velocity			rho = 0.61 (p=0.0028)	rho≥0.60 ^a
					Steps			rho = 0.27 (p=0.25)	rho≥0.60 ^a
					Use gait aid vs does not use gait aid	Construct validity (known-group)	Independent t-test	58.5 ± 18.0 score x 79.5 ± 16.2 score (p=0.0094)	(?)
					Resting heart rate	Construct validity (discriminative validity)	Spearman's correlation	rho = -0.001 (p=0.97)	Not correlate ^a
			Quality of life (SGRQ – total)				rho = 0.20 (p=0.38)	Not correlate ^a	
Walking capacity	4-metre gait speed (4mGS)	Nakano et al., 2021[16]	Japan	Patients with COPD treated at hospital; exacerbation (N=62) and other causes (N=16), n=78; age 76.3±0.9y; 12% female; FEV ₁ 47.2±2.6%.	6MWD	Construct validity (convergent validity)	Pearson' correlation	rho=0.70 (p<0.0001)	Positive high correlation Rho≥0.70[33] ^b
					Dyspnea (mMRC)			rho=0.68 (p<0.0001)	Positive moderate correlation Rho≥0.50[17] ^b
Walking capacity and exercise tolerance	Incremental shuttle walk test (ISWT)	Johnson-Warrington, Mitchell and Singh, 2015[18]	United Kingdom	Hospitalised patients with ECOPD, n=39; age 67.7±7.8y; 48% female; FEV ₁ 42.5±13.2%.		Reliability (test-retest)	Bland-Altman	ISWT1: 88.2 ± 96.7m; ISWT2: 102.3 ± 100.4m; difference mean: 14.1 ± 28.4 - LoA calculated from Bland-Altman: - 41,56 to 69.76.	NA
						Measurement error			NA

6-minute walk test (6MWT)	Blankenburg et al., 2012 [20]	Germany	Hospitalised elderly patients with ECOPD, n=82; age 67±9.5y; 26% female; FEV ₁ 40%.	Drug treatment	Responsiveness	Independent t-test	6MWD increased from 97 ± 114m to 290 ± 190m (p < 0.05)	MCID of 30m[34] ^b
	Liao, Chen and Hsu, 2020[22]	Taiwan	Hospitalised patients with ECOPD, n=83; age 74.0±6.9y; 10% female; FEV ₁ NR	Maximal inspiratory muscle strength	Construct validity (convergent validity)	Pearson' correlation	rho=0.54 (p<0.001)	Positive moderate correlation rho≥0.50[26] ^b
				Maximal expiratory muscle strength			rho=0.49 (p<0.001)	rho≥0.50[26] ^b
				Lower limb muscle strength (HHD)			rho=0.34 (p=0.002)	rho≥0.50[26] ^b
				Lower limb muscle endurance (30s-STES)			rho=0.64 (p<0.001)	rho≥0.50[26] ^b
				Age ((1)65-74 vs (2)75-84 vs (3)>85)	Construct validity (known-group)	ANOVA	158.13 ± 95.83m vs 135.48 ± 72.49m vs 148.67 ± 69.57m (p= 0.016; 1>3)	(?)
				Gender (male vs female)			144.43 ± 89.28m vs 122.38 ± 103.94m (p=0.65)	
				COPD severity ((1) GOLD I vs (2) GOLD II vs (3) GOLD III vs (4) IV)			210.84 ± 79.16m vs 165.36 ± 79.89m vs 113.81 ± 79.87m vs 84.62 ± 73.0m4 (p=0.001; 1>3; 1>4)	
				BMI ((1) < 20 vs (2) 21-24 vs (3) >25)			134.69 ± 84.17m vs 137.94 ± 90.10m vs 156.54 ± 98.92m (p=0.657)	

Dyspnea ((1) mMRC
1 vs (2) mMRC 2 vs
(3) mMRC 3 vs (4)
mMRC 4)

201.45 ± 63.86m vs
210.06 ± 88.61m vs
113.19 ± 77.4m7 vs
63.50 ± 62.50m
(p=0.001; 1>3; 1>4;
2>3; 2>4)

Osadnik et al., 2016[24]	Brazil and Australia	Hospitalised patients with ECOPD, n=46; age 67.2±11.1y; 46% female; FEV ₁ 43.0±16.2%	Reliability (test- retest)	ICC _{2,1}	0.885 (0.801-0.934)	NA
			Measurement error	Bland-Altman method	Mean difference in 6MWT between T1 and T2 was 6.2m; LoA: -92.2 to 104.5m	NA

Note: COPD: Chronic Obstructive Pulmonary Disease; ECOPD: exacerbation of COPD; FEV₁: forced expiratory volume in the first second; FVC: forced vital capacity; PFSDQ-M: modified Pulmonary Functional Status Dyspnea Questionnaire ;ADLs: activities of daily living scale; CAT: COPD Assessment test; 6MWD: 6-minute walk distance; SGRQ: Saint George Respiratory Questionnaire; 30sCS: 30-second chair stand; HHD: handheld dynamometre; GOLD: Global Initiative Chronic Obstructive Lung Disease; mMRC: modified Medical Research Council; ICC: intraclass correlation coefficient; MEP: maximum respiratory pressure; BMI: body mass index. NA: not applicable; (?): hypothesis not formulated

^a: Hypothesis formulated by the authors of the included study

^b: Hypothesis formulated by the review team

Table S4. Feasibility and Interpretability of the included performance-based outcome measures

Performance-based outcome measures	Study	Feasibility						Interpretability			
		Complete test	Interruption	Cause of interruption	Adverse events	Length of the instrument	Completion time	Patient's required mental and physical ability level	Minimal important change (MIC) or minimal important difference (MID)	Distribution of scores in the study population	Floor and ceiling effects
6-PBRT	Barros, C.F. et al, 2020; Felisberto et al, 2018[9, 10]	All patients completed the test	10 patients (55.5%) for a few seconds; maximum time of 20 sec.	Dyspnea, upper limbs' fatigue	No records	6 minutes	11 ± 6.72 min. between transport and assembly	Increased dyspnea and upper limbs' fatigue after the end; dyspnea recovery in 2 min. and fatigue in 6 min. of rest.	NR	Mean of 120 to 344 rings moved	NR
DEMMI	Camp, et al, 2019[14]	NR	NR	NR	NR	15 minutes		NR	10 points	Mean score of 70±20; normally distributed	No participant had a score of 0 and 14% achieved a score of 100
ISWT	Johnson-Warrington, et al, 2015[18]	NR	NR	NR	NR	NR	NR	Post-Borg breathlessness 4; post-RPE: 13; post-HR: 108; post-SpO ₂ : 90.1%	NR	Mean distance: ISWT1 88.2±96.7m; ISWT2 102.3±100.4 m	NR
6MWT	Blankenburg, et al. 2012[20]	13 patients (15.8%) were not able to perform the walking test	NR	NR	NR	6 minutes	NR	Four patients were completely bed bound; nine patients were able to walk from bed to table but too weak to perform the test	NR	NR	NR

4MGS	Kon et al, 2015[35]	5 patients were unable to walk 5m unaided	NR	NR	NR	NR	NR	NR	NR	NR	Mean was 0.61±0.26 m/s. Patients with lower gait speed at discharge were older, had longer lengths of stay, worse respiratory disability, higher comorbidity burden and poorer health status	NR
6MST	Ribeiro et al., 2022[3]	All patients were able to perform the test	No presence of important clinical alterations that required interruption	NR	NR	6 minutes	6 minutes	NR	NR	NR	NR	NR

Note: NR: note reported; 6MST: 6-minute stepper test; HGS: handgrip strength; MIP: maximal inspiratory pressure; 6PBRT: 6-minute peg board ring test; BBS: Berg Balance scale; DEMII: de Morton mobility index; 4mGS: 4-metre gait speed; ISWT: Incremental Shuttle Walk test; 6MWT: 6-minute walk test; RPE: rating perceived exertion; HR: heart rate; SpO₂: pulse oxygen saturation

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