

Supplementary material has been published as submitted. It has not been copyedited, typeset or checked for scientific content by Journal of Rehabilitation Medicine

Table SI. Search strategy for Medline.

Comorbidity/ OR comorbid* OR co-morbid*

Multimorbidity OR multimorbid* OR multi-morbid* OR multidisease* OR multi-disease*

1 OR 2

Exercise/ OR exercise

Rehabilitation/ OR rehab*

Exercise therapy/ OR “exercise therap*”

4 OR 5 OR 6

3 AND 7

Note: All searches were limited to English and human

Table SII. Intervention details (n = 38).

Study	Intervention	Other interventions	Frequency (sessions/week)	Duration of Rehabilitation	Duration of session (minutes)	Intensity	Supervision (exercise)	Location
Abdelbasset 2019(1)	Int 1 = treadmill walking	Nil	3	12 weeks	20-40	Int 1 = 40-70% max HR	NS	Hospital-based
	Int 2 = treadmill walking	Nil	3	12 weeks	30	Int 2 = 60-70% max HR		
	Com = usual medical care	Nil						
Abd El-Kader 2013(2)	Int = exercise training: treadmill; basic physical fitness movements (running, jumping & playing with medicine ball)	Diet regime & medical treatment	4	8 weeks	15-35	Treadmill: 60-80% max HR	Physical education expert	NS
	Com = usual medical care	Nil						
Al-Jiffri 2013(3)	Int = aerobic exercise training: treadmill	Prescribed low-calorie diet	3	3 months	30	65-75% max HR	NS	NS
	Com = prescribed low-calorie diet	Nil						
Barnes 2009(4)	Int = aerobic & resistance exercise: combination of cycling, walking and jogging; resistance exercises – 7 exercises for upper & lower limb muscle groups	Very low-energy diet (with meal replacement)	3 (resistance) And 5 (aerobic)	16 weeks (resistance) And 12 weeks (aerobic)	3 sets of 12 repetitions (resistance) And 40 (aerobic)	80% (resistance) And 80% VO ₂ peak (aerobic)	Exercise physiologist & physiotherapist	Hospital-based & home-based
	Com = N/A							
Beaudoin 2017(5)	Int = aerobic & resistance exercise: walking, jogging, cycling or elliptical trainer; resistance exercises – 5-7 exercises for large muscle groups	Nil	3	12 weeks	20-40 (aerobic) And 1-3 sets of 8-15 repetitions (resistance)	60-80% VO ₂ peak (aerobic) And 30-50% 1-RM (resistance)	NS	Hospital-based
	Com = usual medical care	Nil						

Bernocchi 2018(6)	Int = exercise: mini-ergometer, callisthenic exercises, free walking OR mini-ergometer, muscle reinforcement exercises (with weights), free walking Com = usual medical care	Education Nil	3-7 Nil	4 months	45-55 (aerobic) And 30-40 (resistance)	Moderate or high level of dyspnoea on Borg scale	Physiotherapist	Home-based
Byrkjeland 2015(7)	Int = aerobic & resistance exercise: supervised - alternating between: circuit training/interval training (uphill walking or step)/spinning [resistance components used free weights]; home - walking/swimming/cycling/cross-country skiing Com = control group (usual care with GP)	Nil Nil	2 (supervised) And 1 (home-based)	12 months	60 (duration of class) 10-15 repetitions (resistance)	High intensity: RPE ≥ 15 (5-15 minutes) And Moderate intensity: RPE = 12-14 (remaining time)	Qualified instructors	Hospital-based & home-based
Castro 2015(8)	Int = aerobic & resistance exercise: cycle-ergometer or treadmill; resistance - elastic bands and dumbbells Com = N/A	Haemodialysis	3	16 weeks	20 (aerobic) And 20 (resistance)	NS (aerobic & resistance)	NS	Hospital-based
Chiang 2020(9)	Int = aerobic exercise: brisk walking, jogging, stationary ergometer exercise; individual session of physical activity promotion Com = individual session of physical activity promotion	Nil	3	12 weeks	30	70% HRR	NS	Home-based
Collins 2010(10)	Int = home-based walking program Com = bi-weekly phone call	Bi-weekly phone call Nil	3 (minimum)	6 months	50	NS	Exercise instructor	Home-based
Crisafulli 2010(11)	Int = pulmonary rehabilitation (peripheral limb training)	Educational sessions, chest	3	21 sessions (9 weeks)		NS	Physiotherapist	Hospital-based

physiotherapy, and psychological and nutritional counselling when indicated

180 (specific duration of exercise NS)

Com = N/A

de Groot 2012(12)	Int = aerobic & strengthening exercise: free-walking, treadmills, stationary cycling or elliptical machines; resistance exercises – sit-to-stand, single-arm curl, shoulder press, wall push-ups, side bends & forwards lunges (using body weight or commonly available items)	Cognitive behavioural therapy	150 minutes per week	12 weeks	20-30 (aerobic)	55-75% HRR	Exercise physiologist & community fitness director	Community exercise facility
				And 4-6 weeks (resistance)	And NS (resistance)	And Appropriate intensities using the RPE method		

Com = N/A

Freitas 2018(13)	Int = aerobic & resistance exercise: treadmill, bike or elliptical machine; resistance - targeting major muscle groups (pectoral, deltoid, quadriceps & hamstrings)	Education and diet regime (low-calorie) with nutritionist & psychologist input	2	3 months	NS (aerobic)	50-75% VO ₂ peak (aerobic)	Physiotherapist	Hospital-based
					And 2 sets of 10 repetitions per exercise	And 50-70% 1-RM (resistance)		

	Com = sham exercise: breathing (based on yoga's pranayama breathing exercises) & stretches - targeting major muscle groups: (trapezius, pectoralis, gluteus, hamstrings, quadriceps femoris, paraspinal, latissimus dorsi, and pubis adductors)	Education and diet regimen (low-calorie) with nutritionist & psychologist input	2	3 months	NS (breathing)	no intensity progression (breathing)	NS	NS
					And 10 seconds per stretch	And no progression (stretches)		

Halvari 2017(14)	Int = aerobic & resistance exercise: spinning classes; endurance & resistance circuit training; interval training – uphill walking/jogging; weight room training	Nil	3	12 months	60	High intensity: RPE ≥ 15 (5-15 minutes)	Students with Masters degrees from the Norwegian School of Sports Sciences	Hospital-based & home-based
---------------------	--	-----	---	-----------	----	---	--	-----------------------------

						Moderate intensity: RPE = 12-14 (remaining time)				
Com = usual physical activity		Nil								
Hassan 2016(15)	Int = pulmonary rehabilitation (exercise training targeting upper & lower limbs); treadmill (interval training); resistance - free weights	Education	3	8 weeks	NS (aerobic) And 30 repetitions (resistance)	60-80% max HR (aerobic) And According to patient's tolerance (resistance)	NS			NS
Com = N/A										
Hsu 2021(16)	Int = resistance exercise (elastic band open chain exercises for lower limb muscles)	Diet control	3	12 weeks	10 repetitions/5 sets	RM 10 and RPE 13	Clinical staff			Home-based
Int 2 = resistance exercise (elastic band open chain exercises for lower limb muscles)		Nil	3							
Com = Diet control										
		Nil								
Johnson 2014(17)	Int = aquatic exercise program – details not described	NS	NS	12 weeks	NS	NS	NS			Community-based
Com = NS										
Khadanga 2016(18)	Int = cardiac rehabilitation (aerobic & resistance exercise): treadmill and arm ergometer, stepper, trampoline or rower; resistance – 6 exercises (leg extension, leg curl, bench press, shoulder press, lateral pulldown & bicep curl), using weight-lifting equipment or free weights	Education	Up to 3	3-4 months (maximum 36 sessions)	45-60 (aerobic & resistance combined) 10 repetitions per exercise (resistance)	70-85% max HR (aerobic) And 50% 1-RM (resistance)	Cardiac specialist	rehabilitation		Medical centre
Com = N/A										

Kurian 2010(19)	Int = resistance exercise training – details not described	NS	NS	12 weeks	NS	NS	NS	NS
	Com = N/A							
Listerman 2011(20)	Int = cardiac rehabilitation (aerobic & resistance exercise): details not described	Individual counselling & group education	2-3	24-36 sessions	60	Each participant was given an individualized prescription based on baseline functional capacity	NS	Medical centre
	Com = N/A							
Lo 2021(21)	Int = aerobic exercise: cycle ergometry	MI	3-5	12 weeks	30-50	50-80% HRR	Physiotherapist/nurse	Hospital-based
	Com 1 = MI							
	Com 2 = usual care	Nil						
Martin 2016(22)	Int = cardiac rehabilitation (exercise-based program): details not described	NS	NS	12 weeks	NS	NS	NS	NS
	Com = N/A							
McNamara 2013(23)	Int 1 = land-based exercise (aerobic & resistance): upper & lower limb aerobic exercises (punching, kicking, stationary marching, walking: treadmill or free-walking, stationary cycling); upper & lower limb & thoracic cage stretches; resistance exercises – 3 unsupported arm exercises	Nil	3	8 weeks	60 (aerobic & resistance combined) And 3 sets of 10 repetitions (resistance)	80% average speed (walking) And 3-5 on modified Borg Scale (0-10) for dyspnoea & RPE	Physiotherapist	Hospital-based
	Int 2 = water-based exercise (aerobic & resistance): upper & lower limb aerobic exercises (extensive variety of exercises); upper & lower limb & thoracic cage stretches; resistance exercises – 3 unsupported arm exercises	Nil	3	8 weeks	60 (aerobic & resistance combined) And 3 sets of 10 repetitions (resistance)	3-5 on modified Borg Scale (0-10) for dyspnoea & RPE	Physiotherapist	

Nonoyama 2016(28)	Int = cardiac rehabilitation (aerobic & resistance exercise): walking; resistance exercises - lower & upper body & trunk-stabilizing exercises Com = N/A	Education and psychological & dietary counselling	1 per week (6-12 months) And 1 per month (4-12 months)	6-12 months	90 (duration of class) 60 maximum (aerobic) And 10-15 repetitions (resistance)	60-80% VO ₂ peak (aerobic) And NS (resistance)	Physiotherapist & kinesiologist	Hospital - based
Servantes 2012(29)	Int 1 = aerobic training: walking Int 2 = aerobic & resistance training: walking; resistance exercises – 3 exercises for upper limb & 4 exercises for lower limb (free weights) Com = untrained group	Education	3 (first and second months) And 4 (third month) 3 (first and second months) And 4 (third month)	3 months	30-45 30-45 (aerobic) And 1 set of 12-16 repetitions each exercise (resistance)	Borg exertion scale (0-15) to evaluate intensity Heart rate levels that correspond to anaerobic threshold (10 heart rates up & down) Borg exertion scale (0-15) to evaluate intensity Heart rate levels that correspond to anaerobic threshold (10 heart rates up & down) And 30-40% 1-RM (resistance)	Physiotherapist	Home-based
Soleimani 2009(30)	Int = cardiac rehabilitation (aerobic exercise): treadmill Com = N/A	Psychological & dietary counselling	3	8 weeks	20	Intensity of exercise was patient dependent: no	Physical therapist	Hospital-based

						NS	NS	NS	NS
						NS	NS	NS	NS
Sridhar 2010(31)	Int = aerobic exercise: treadmill or cycling Com = no exercise	Nil Nil	5	12 months	30	NS	NS	NS	NS
						NS	NS	NS	NS
Srinivasan 2014(32)	Int = Tai Chi Com = mind-body education	Antidepressant Antidepressant treatment treatment	2 2	8 weeks 8 weeks	60 60	NS	NS	NS	NS
						NS	NS	NS	NS
Takaya 2014(33)	Int = cardiac rehabilitation: walking, cycling & calisthenics Com = N/A Com = N/A	Education	5 (weeks 1-2 = 5 & remaining 10 weeks = 2 supervised session & home-based)	3 months	30-60	50-60% (aerobic) Or 12-13 Borg RPE scale (6-20)	HRR	NS	NS
						NS	NS	NS	NS
Tunsupon 2017(34)	Int = pulmonary rehabilitation: treadmill; stationary cycle; stretching; light floor exercises (with or without weights) Com = N/A	Nil	3	8 weeks	90 (duration of class)	NS	NS	NS	NS
						NS	NS	NS	NS
Verges 2004(35)	Int = cardiac rehabilitation: treadmill, cycle and arm ergo Com = N/A	Education	3	2 months	60	65-80% max HR And 13-15 Borg RPE scale	Exercise physiologist	NS	NS
						NS	NS	NS	NS
Wang 2013(36)	Int = aerobic interval training: bicycle ergometer Com = N/A	Nil	3	12 weeks	15 (5, 3- minute intervals)	80% VO ₂ peak	NS	NS	NS
						NS	NS	NS	NS
Woodard 1994(37)	Int = cardiac rehabilitation: walking or stationary cycling	Nil	3	6 months	45	50-85% symptom- limited HRR	NS	NS	NS

Com = N/A

Zwerink 2010(38)	Int = exercise program: cycling; walking; lifting; functional strength exercises	2 self-management sessions	2 (community-physio practice)	10 weeks	NS	NS	NS	Community-based & home-based
	Com = N/A		And 1 (home-based)					

Int = intervention; Com = comparison; max = maximum; HR = heart rate; NS = not stated; N/A = not applicable; RM = repetition maximum; VO₂ peak = peak oxygen consumption; GP = general practitioner; RPE = rating of perceived exertion; HRR = heart rate reserve; MI - motivational interviewing; 6MWT = 6-minute walk test

Table SIII. Quality assessment – Randomized Controlled Trials and Randomized Crossover Trial

Study	Random allocation	Concealed allocation	Groups similar at baseline	Participant blinding	Therapist blinding	Assessor blinding	Groups treated identically other than intervention	Follow up complete	Analysed in group randomized to	Outcomes measured in same way	Outcomes measured in a reliable way	Appropriate statistical analysis	Appropriate trial design for RCT
Abdelbasset(1)	UC	UC	Y	N	UC	UC	Y	Y	Y	Y	Y	Y	Y
Abd El-Kader(2)	UC	UC	Y	N	UC	UC	Y	Y	UC	Y	Y	Y	Y
Al-Jiffiri(3)	UC	UC	UC	N	N	UC	Y	Y	Y	Y	Y	Y	UC
Beaudion(5)	Y	N	Y	N	N	UC	Y	Y	Y	Y	Y	Y	Y
Bernocchi(6)	Y	N	N	N	N	UC	Y	Y	Y	Y	UC	Y	Y
Byrkjeland(7)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Chiang(9)	Y	Y	N	N	UC	Y	Y	Y	Y	Y	Y	Y	Y
Collins(10)	UC	UC	Y	N	N	UC	Y	UC	UC	UC	UC	Y	UC
Freitas(13)	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y
Halvari(14)	Y	Y	N	N	N	UC	Y	Y	Y	Y	Y	Y	Y
Hsu(16)	Y	Y	Y	Y	UC	UC	Y	Y	Y	Y	Y	Y	Y
Johnson(17)	UC	UC	UC	N	N	UC	UC	UC	UC	UC	UC	UC	UC
Lo(21)	UC	UC	Y	UC	UC	UC	Y	Y	Y	Y	Y	Y	Y
McNamara(23)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Mentz(24)	Y	Y	N	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Servantes(29)	Y	Y	Y	N	N	Y	Y	Y	Y	Y	Y	Y	Y
Sridhar(31)	UC	UC	Y	N	N	UC	Y	Y	Y	Y	Y	Y	Y
Srinivasan(32)	UC	UC	Y	N	N	UC	UC	Y	Y	Y	Y	UC	UC

Y = yes; N = no; UC = unclear

Table SIV. Quality assessment – cohort studies.

Study	Groups similar & recruited from same population	Exposures measured similarly in both groups	Exposures measured in a valid &reliable way	Identified confounding factors	Strategies to deal with confounding factors	Groups/participants free of outcome at start	Outcomes measured in a valid &reliable way	Follow up time reported & sufficient	Follow up complete & reasons why not	Strategies for incomplete follow up	Appropriate statistical analysis
Barnes(4)	NA	NA	Y	Y	N	NA	Y	Y	N	NA	Y
Castro(8)	NA	NA	Y	N	N	NA	Y	Y	N	N	UC
Crisafulli(11)	NA	NA	Y	NA	NA	NA	Y	Y	N	N	Y
Hassan(15)	NA	NA	Y	N	NA	Y	Y	Y	Y	N	Y
Khadanga(18)	NA	Y	Y	Y	N	NA	Y	Y	Y	N	Y
Kurian(19)	UC	UC	UC	UC	UC	UC	UC	Y	UC	UC	UC
Listerman(20)	NA	Y	Y	Y	Y	Y	Y	Y	Y	UC	Y
Martin(22)	UC	UC	UC	UC	UC	UC	UC	Y	UC	UC	UC
Mesquita(25)	NA	NA	UC	Y	Y	Y	UC	Y	Y	NA	Y
Mundra(26)	Y	Y	UC	N	N	Y	UC	Y	N	N	UC
Naz(27)	Y	NA	Y	Y	Y	Y	Y	Y	Y	Y	Y
Nonoyama(28)	NA	NA	Y	Y	Y	Y	Y	Y	Y	UC	Y
Soleimani(30)	Y	Y	Y	NA	NA	Y	UC	Y	Y	NA	Y
Takaya(33)	Y	NA	Y	NA	NA	Y	Y	Y	Y	NA	Y
Tunsupon(34)	NA	NA	Y	Y	Y	Y	UC	Y	Y	Y	Y
Verges(35)	Y	NA	Y	NA	NA	Y	Y	Y	Y	NA	Y
Wang(36)	Y	Y	Y	Y	Y	Y	Y	Y	N	N	Y

Woodard(37)	Y	NA	Y	N	N	Y	Y	Y	N	N	Y
Zwerink(38)	NA	NA	UC	Y	Y	Y	UC	Y	Y	UC	Y

Y = yes; N = no; UC = unclear; NA = not applicable

Table SV. Quality assessment – quasi-experimental studies.

Study	Clear 'cause' & 'effect'	Participants similar	Participants receiving similar treatment other than intervention	Control group	Outcome measures pre- & post- intervention	Follow up complete & reasons why not	Outcomes measured in same way	Outcomes measured in a reliable way	Appropriate statistical analysis
de Groot(12)	Y	Y	Y	N	Y	Y	Y	Y	Y

Y = yes; N = no

Supplement References

1. Abdelbasset WK, Alqahtani BA, Alrawaili SM, Ahmed AS, Elnegamy TE, Ibrahim AA, et al. Similar effects of low to moderate-intensity exercise program vs moderate-intensity continuous exercise program on depressive disorder in heart failure patients. *Medicine* 2019; 98: e16820. DOI: 10.1097/MD.00000000000016820.
2. Abd El-Kader MS, Al-Jiffri O, Ashmawy EM. Impact of weight loss on markers of systemic inflammation in obese Saudi children with asthma. *Afr Health Sci* 2013; 13: 682-688. DOI: 10.4314/ahs.v13i3.23.
3. Al-Jiffri O, Al-Sharif FM, Abd El-Kader SM, Ashmawy EM. Weight reduction improves markers of hepatic function and insulin resistance in type-2 diabetic patients with non-alcoholic fatty liver. *Afr Health Sci* 2013; 13: 667-672. DOI: 10.4314/ahs.v13i3.21.
4. Barnes M, Goldsworthy UR, Cary BA, Hill CJ. A diet and exercise program to improve clinical outcomes in patients with obstructive sleep apnea - A feasibility study. *J Clin Sleep Med* 2009; 5: 409-415.
5. Beaudoin N, Bouvet GF, Coriati A, Rabasa-Lhoret R, Berthiaume Y. Combined exercise training improves glycemic control in adult with cystic fibrosis. *Med Sci Sports Exerc* 2017; 49: 231-237. DOI: 10.1249/MSS.0000000000001104.
6. Bernocchi P, Vitacca M, La Rovere MT, Volterrani M, Galli T, Baratti D, et al. Home-based telerehabilitation in older patients with chronic obstructive pulmonary disease and heart failure: A randomised controlled trial. *Age Ageing* 2018; 47: 82-88. DOI: 10.1093/ageing/afx146.
7. Byrkjeland R, Njerve IU, Anderssen S, Arnesen H, Seljeflot I, Solheim S. Effects of exercise training on HbA1c and VO₂peak in patients with type 2 diabetes and coronary artery disease: A randomised clinical trial. *Diab Vasc Dis Res* 2015; 12: 325-333. DOI: 10.1177/1479164115590552.
8. Castro C, Gonzalez N, Oliveira M. Changing diabetic dialysis patients physical functioning with exercise training. *Nephrol Dial Transplant* 2015; 30: iii527-iii528.
9. Chiang S-L, Shen C-L, Chen L-C, Lo Y-P, Lin C-H, Lin C-H. Effectiveness of a home-based telehealth exercise training program for patients with cardiometabolic multimorbidity. *J Cardiovasc Nurs* 2020; 35: 491-501. DOI: 10.1097/JCN.0000000000000693.
10. Collins T, Lunos S. Home-based walking therapy improves walking ability and quality of life in persons with diabetes mellitus and peripheral arterial disease. *Vasc Med* 2010; 15: 155.
11. Crisafulli E, Gorgone P, Vagaggini B, Pagani M, Rossi G, Costa F, et al. Efficacy of standard rehabilitation in COPD outpatients with comorbidities. *Eur Respir J* 2010; 36: 1042-1048. DOI: 10.1183/09031936.00203809.
12. de Groot M, Doyle T, Kushnick M, Shubrook J, Merrill J, Rabideau E, et al. Can lifestyle interventions do more than reduce diabetes risk? Treating depression in adults with type 2 diabetes with

exercise and cognitive behavioral therapy. *Curr Diab Rep* 2012; 12: 157-166. DOI: 10.1007/s11892-012-0261-z.

13. Freitas PD, Silva AG, Ferreira PG, Carvalho CRF, Da Silva A, Salge JM, et al. Exercise improves physical activity and comorbidities in obese adults with asthma. *Med Sci Sports Exerc* 2018; 50: 1367-1376. DOI: 10.1249/MSS.0000000000001574.

14. Halvari H, Healey J, Olafsen AH, Byrkjeland R, Deci EL, Williams GC. Physical activity and motivational predictors of changes in health behavior and health among DM2 and CAD patients. *Scand J Med Sci Sports* 2017; 27: 1454-1469. DOI: 10.1111/sms.12757.

15. Hassan M, Mourad S, Abdel Wahab NH, Daabis R, Younis G. Effect of comorbidities on response to pulmonary rehabilitation in patients with chronic obstructive pulmonary disease. *Egyp J Chest Dis Tuberc* 2016; 65: 63-69. DOI.org/10.1016/j.ejcdt.2015.11.006.

16. Hsu Y-I, Chen Y-C, Lee C-L, Chang N-J. Effects of diet control and telemedicine-based resistance exercise intervention on patients with obesity and knee osteoarthritis: a randomised control trial. *Int J Environ Res Public Health* 2021; 18: 7744. DOI: 10.3390/ijerph18157744.

17. Johnson ST, Mundt C, Boule N, Bell G, Vallance J, Taylor L, et al. Improved functional status following the aquatic physical exercise for arthritis and diabetes (APEXD) study. *Can J Diab* 2014; 38: S63.

18. Khadanga S, Savage PD, Ades PA. Insulin resistance and diabetes mellitus in contemporary cardiac rehabilitation. *J Cardiopulm Rehabil Prev* 2016; 36: 331-338. DOI: 10.1097/HCR.000000000000187.

19. Kurian R, Gobejishvili L, Barve S, Mokshagundam SP. Effect of resistance training on cytokine responses in elderly subjects with peripheral neuropathy-effect of gender. *Proceedings of the 70th Scientific Sessions of the American Diabetes Association*. 2010 June 25-29; Orlando, United States of America.

20. Listerman J, Bittner V, Sanderson BK, Brown TM. Cardiac rehabilitation outcomes: impact of comorbidities and age. *J Cardiopulm Rehabil Prev* 2011; 31: 342-348. DOI: 10.1097/HCR.0b013e31822f189c.

21. Lo Y-P, Chiang S-L, Lin C-H, Liu H-C, Chiang L-C. Effects of individualised aerobic exercise training on physical activity and health-related physical fitness among middle-aged and older adults with multimorbidity: a randomised controlled trial. *Int J Environ Res Public Health* 2021; 18: 101. DOI: 10.3390/ijerph18010101.

22. Martin B, Hauer T, Austford LD, Arena R, Stone JA, Aggarwal S. Cardiac rehabilitation in subjects with peripheral arterial disease: A higher risk patient population who benefit from attendance. *Can J Cardiol* 2016; 134: A18122.

23. McNamara RJ, McKeough ZJ, McKenzie DK, Alison JA. Water-based exercise in COPD with physical comorbidities: a randomised controlled trial. *Eur Respir J* 2013; 41: 1284-1291. DOI: 10.1183/09031936.00034312.

24. Mentz RJ, Schulte PJ, Fleg JL, Fiuzat M, Kraus WE, Pina IL, et al. Clinical characteristics, response to exercise training, and outcomes in patients with heart failure and chronic obstructive pulmonary disease: findings from Heart Failure and A Controlled Trial Investigating Outcomes of Exercise Training (HF-ACTION). *Am Heart J* 2013; 165: 193-199. DOI: 10.1016/j.ahj.2012.10.029.
25. Mesquita R, Vanfleteren LE, Franssen FM, Sarv J, Taib Z, Groenen MT, et al. Objectively identified comorbidities in COPD: impact on pulmonary rehabilitation outcomes. *Eur Respir J* 2015; 46: 545-548. DOI: 10.1183/09031936.00026215.
26. Mundra V, Henquinet S, Moudry G. Outcomes of cardiac rehabilitation in obese patients. *Cardiol* 2013; 2: 482.
27. Naz I, Sahin H, Varol Y, Komurcuoglu B. The effect of comorbidity severity on pulmonary rehabilitation outcomes in chronic obstructive pulmonary disease patients. *Chron Respir Dis*. 2019; 16: 1479972318809472. DOI: 10.1177/1479972318809472.
28. Nonoyama ML, Marzolini S, Brooks D, Oh P. Comparison of cardiac rehabilitation outcomes in individuals with respiratory, cardiac or no comorbidities: A retrospective review. *Can J Respir Ther* 2016; 52: 43-49.
29. Servantes DM, Pelcerman A, Salvetti XM, Salles AF, de Albuquerque PF, de Salles FC, et al. Effects of home-based exercise training for patients with chronic heart failure and sleep apnoea: a randomized comparison of two different programmes. *Clin Rehabil* 2012; 26: 45-57. DOI: 10.1177/0269215511403941.
30. Soleimani A, Nejatian M, Hajizaynali MA, Abbasi SH, Alidoosti M, Sheikhfathollahi M, et al. Effect of gender and type 2 diabetes mellitus on heart rate recovery in patients with coronary artery disease after cardiac rehabilitation. *Endokrynol Pol* 2009; 60: 430-436.
31. Sridhar B, Haleagrahara N, Bhat R, Kulur AB, Avabratha S, Adhikary P. Increase in the heart rate variability with deep breathing in diabetic patients after 12-month exercise training. *Tohoku J Exp Med* 2010; 220: 107-113. DOI: 10.1620/tjem.220.107.
32. Srinivasan S, Reagan LP, Hardin JW, Matthews M, Leaphart E, Grillo CA, et al. Adjunctive tai chi in geriatric depression with comorbid arthritis: A randomized, controlled trial. *Am J Geriatr Psych* 2014; 22: S135-S136.
33. Takaya Y, Kumasaka R, Arakawa T, Ohara T, Nakanishi M, Noguchi T, et al. Impact of cardiac rehabilitation on renal function in patients with and without chronic kidney disease after acute myocardial infarction. *Circ J* 2014; 78: 377-384. DOI: 10.1253/circj.cj-13-0779.
34. Tunsupon P, Lal A, Khamis MA, Mador MJ. Comorbidities in patients with chronic obstructive pulmonary disease and pulmonary rehabilitation outcomes. *J Cardiopulm Rehabil Prev* 2017; 37: 283-289. DOI: 10.1097/HCR.0000000000000236.

35. Verges B, Patois-Verges B, Cohen M, Lucas B, Galland-Jos C, Casillas JM. Effects of cardiac rehabilitation on exercise capacity in Type 2 diabetic patients with coronary artery disease. *Diabet Med* 2004; 21: 889-895. DOI: 10.1111/j.1464-5491.2004.01262.x.
36. Wang JS, Fu TC, Lien HY, Wang CH, Hsu CC, Wu WC, et al. Effect of aerobic interval training on erythrocyte rheological and hemodynamic functions in heart failure patients with anemia. *Int J Cardiol* 2013; 168: 1243-1250. DOI: 10.1016/j.ijcard.2012.11.053.
37. Woodard CM, Berry MJ, Rejeski WJ, Ribisl PM, Miller HS. Exercise training in patients with cardiovascular disease and coexistent knee arthritis. *J Cardiopulm Rehabil* 1994; 14: 255-261.
38. Zwerink M, Van Der Meer S, Van Der Valk P, Van Der Palen J. Safety, feasibility and effectiveness of a community-based physiotherapy exercise program for patients with both copd and chronic heart failure a pilot study. *Am J Respir Crit Care Med* 2010; 181: A3452. DOI 10.1164/ajrcm-conference.2010.181.1.