SUPPLEMENTARY MATERIAL

Downhill: new rehabilitation frontier.
A systematic review of the literature

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Supplementary Table 1. Data extraction of included studies.

Author Year Title	Disease	Rehabilitation protocol	Frequency of intervention	Participants	Outcome measures	Evaluation times	Results
Azar Moezy 2018 [31] **Downhill walking influence on physical condition and quality of life in patients with COPD: A randomized controlled trial**	COPD	ET group: 10-minute warm-up with slow walking followed by 5 static stretching exercises for quadriceps, ischiocrucials, and calf. The duration of walking at the initial stages was 15-30 minutes, increasing to a maximum of 60 minutes in the final stage. The first 3 weeks the ~~pcs~~ patients performed 3 sets with 90-120 s rest with treadmill incline set at -5°. From week 6, the incline changed to -7.5°. Exercise intensity increased according to the tolerance of the ~~pcs~~ patients, without exceeding 90%. CG group: free walking 3 times a week on a flat surface. Duration and walking speed were set by the ~~pcs~~ patients	3 sessions per week for 12 weeks	Tot 32 patients ET group (n.16): -Mean age 64.71±7.52 -Gender: 28.6% F 71.4% M CG group (n.16): **-**Mean age:66.37±8.20 -Gender: 12.5% F 87.5% M	Primary: -pulmonary function tests (FEV1 e FEV1/FVC) -heart rate -SpO2 % -Stair climbing test (n) -TUG (s) -6MWT (m) Secondary: -QOL in patients con CODP measured by means of SGRQ	At baseline and at 12 weeks (post-treatment).	ET group: Statistically significant improvements over the CG group in the results of: -FEV1/FVC (p=0.002) -FEV1 (p=0.008) -TUG (p=0.023) -SGRQ; symptoms (p=0.022), activity (p=0.007), impact (p=0.033) and total score (p=0.013) -6MWT (p=0.029) 6MWD Conventional training program: - Pre: 438.87±110.47 - Post: 406.12±137.54 6MWD Downhill training program: - Pre: 422.88±136.75 - Post: 521.15±109.26 No significant differences were found in the remaining variables.

		according to their tolerance, without exceeding 90%. Warm-up program similar to ET group.					
Camillo C. A. 2020 [24] **Effects of downhill walking in pulmonary rehabilitation for patients with COPD: a randomized controlled trial.**	COPD	ET Group: Downhill walking training was performed with a fixed incline of -10% (i.e., a decline of 10 m for every 100 m walked) by the insertion of a customized bracket under the treadmill, fixed against the back feet. Downhill walking training was only progressed in terms of duration and speed. CG Group: Conventional walking training involved walking on a motorized treadmill with a neutral incline, progressed through increases in duration, speed and (positive) incline. Running on the treadmill was not	3 sessions per week for 12 weeks	44 total patients, 35 analyzed. 20 initial patients in the CT group, 17 finished treatments. -Mean age: 62±9 years -Gender: 45% F 55% M 24 initial patients allocated in the DT, 18 finished treatments. -Mean age: 62±8 years -Gender: 29% F 71% M	Primary: change (week 12 minus baseline) in 6MWD. Secondary: changes in peripheral muscle strength, CET, CPET, CK, physical activity levels, symptoms and quality of life.	At baseline and week 13. Serum ~~creatine kinase (CK)~~ was measured at baseline, weeks 2, 6 and 12.	Significant and clinically relevant increases in 6MWD were observed within both groups. Downhill walking training was associated with a faster weekly progression of treadmill speed and less perceived dyspnea after week 6 compared to conventional walking training AUC=34.73 in downhill walking training compared to 46.92U in conventional walking training; $p=0.04$). 6MWD Conventional training program: - Pre: 435±107 - Post: 491±111 6MWD Downhill training program: - Pre: 473±96 - Post: 550±90 Perceived fatigue was consistently reported to be lower in downhill than in conventional walking training.

		permitted in either group.					
Samaei A. 2016 [23] **Uphill and Downhill Walking in Multiple Sclerosis.**	MS	30 minutes of walking on a treadmill inclined positively or negatively by 10%. 3 days a week for 4 weeks. Under the supervision of a qualified therapist who observed performance and monitored heart rate using a heart rate monitoring system. ET Group: A negative gradient of 10% (a downhill running pattern) was used for eccentric training. CG Group: A positive gradient of 10% (a model of uphill running) was used for concentric training. In the first session, volunteers were asked to walk at a speed at which their heart rate	3 sessions per week for 4 weeks, 30 minutes per session.	34 randomized recruited patients, 31 patients completed the treatment. 17 patients in the Eccentric Group, 16 were analyzed. -EG Mean age: 33.9 ± 7.3 years -Gender: 82% F 18% M 17 patients in the Concentric Group, 15 were analyzed.-CG Mean age:	Primary: functional activity, muscle strength and balance control. Secondary: disability, mobility and fatigue.	At baseline and at the end of treatment.	Significant improvement in both experimental groups in terms of disability, fatigue and mobility, with the downhill group demonstrating a greater reduction in disability and fatigue intensity indices and a significant increase in the mobility index compared to the uphill group. Mobility Conventional training program: - Pre: 10.5 - Post: 11.5 Mobility Downhill training program: -Pre : 10.6 - Post: 13.4 Fatigue Conventional training program: - Pre: 29.7 - Post: 26.1 Fatigue Downhill training program: -Pre : 28.6 - Post: 23.3 The downhill and uphill walking groups showed

| | | reached 55% of the maximum heart rate. | | 32,1±7,6 years
-Gender:
82% F
18% M | | | significantly better functional activity performance after the intervention, but the downhill group showed better results in terms of functional activity and isometric torque of the quadriceps muscles than the uphill group, even after 4 weeks of follow-up.

MIQT Conventional training program:
- Pre: 507.1
- Post: 547.8

MIQT Downhill training program:
- Pre: 496.6
- Post: 651.7 |

6MWT, 6-minute walk test; 6MWD, 6-minute walk distance; Borg, perceived exertion; CAT, chronic obstructive pulmonary disease assessment test; CK, creatine kinase; CODP, chronic obstructive pulmonary disease; CON/CG, control group; DW, downhill walk; DWL, weighted downhill walk; ETG, exercise therapy group; LW, flat walk; mMRC, modified Medical Research Council dyspnea scale; MVV, maximum voluntary ventilation; QOL, quality of life; RCT, randomized control trial; SGRQ, St. George respiratory questionnaire; SpO_2, oxyhemoglobin saturation; TUG, time up and go test; Twqpot, enhanced contraction of quadriceps contractions; Twqunpot, non-enhanced contraction of quadriceps contractions; VCO_2, carbon dioxide elimination; VE, ventilation; VO_2, oxygen uptake; CT, conventional training; DT, downhill training; CET, cycle endurance test; CPET, cardiopulmonary exercise test; ET, endurance training; FEV1, forced expiratory volume in the first second; FVC, forced vital capcity, AUC, area under the curve; MIQT, maximum isometric quadriceps torque.

Supplementary Table 2. Methodological quality.

Author	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	PEDro score
Camillo, C. A. 2020	Y	Y	Y	Y	N	N	Y	Y	N	Y	Y	High
Azar Moezy 2018	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	High
Afshin Samaei 2016	Y	Y	Y	Y	N	N	Y	Y	Y	Y	Y	High

Y, yes; N, no.

PEDro scale domains: 1 = Eligibility criteria have been specified; 2 = Subjects were randomly assigned to groups (in crossover studies, the order in which subjects receive treatment is randomized); 3 = Subject assignment was hidden; 4 = The groups were similar at the beginning of the study regarding the most important prognostic indicators; 5= All subjects were "blind" to treatment; 6 = All therapists were "blind" to the type of treatment administered; 7 = All raters were "blind" to at least one of the study's primary objectives; 8 = Results for at least one study objective were achieved in more than 85% of subjects initially assigned to groups; 9 = All subjects analyzed at the end of the study received the treatment (experimental or control) to which they had been assigned or, if this was not the case, the data for at least one of the main objectives was analyzed for "intention to treat" ; 10 = Results of statistical comparison between groups are reported for at least one of the main objectives; 11 = The study provides both magnitude and variability measures for at least one of the primary objectives.

Satisfied domain = Y Unsatisfied domain = N