D.5 Non-pharmacological management of motor and non-motor symptoms

D.5.1 Physiotherapy and physical activity

Study details	Participants	Methods	Results	Comments
Full citation Tomlinson,C.L., Patel,S., Meek,C., Clarke,C.E., Stowe,R., Shah,L., Sackley,C.M., Deane,K.H., Herd,C.P., Wheatley,K., Ives,N., 20120926, Physiotherapy versus placebo or no intervention in Parkinson's disease. [Review][Update of Cochrane Database Syst Rev. 2012;7:CD002817; PMID: 22786482], Cochrane Database of Systematic Reviews, 8, CD002817-, 2012 Ref Id 227347 Country/ies where the study was carried out	Sample size 39 trials with 1827 participants Inclusion criteria RCT studies in patients with PD that examined the effectiveness of a physiotherapy intervention in comparison to placebo or best supportive care Exclusion criteria Reasons for exclusion: study design not an RCT outcomes not relevant	Details participants with a diagnosis of PD as defined by any duration of disease, all ages, any drug therapy, any duration of physiotherapy treatment methods 4 review authors independently identified and discussed papers inclusion criteria of papers validated by discussion Cochrane RCT assessment of bias tool used for each study all results combined and synthesized	Results for raw data results - please see Cochrane http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD002817.pub4/abstract summary: Freezing of gait questionnaire (FOG) Four trials for three physiotherapy interventions (exercise, cueing, and dance). Two hundred ninety-eight participants were included in this analysis. A borderline significant benefit was noted, with freezing of gait questionnaire score improved by 1.4 points with a physiotherapy intervention compared with no intervention (-1.41, 95% CI -2.63 to -0.19; P = 0.02) Step length Six trials for seven comparisons within five physiotherapy interventions (general physiotherapy, exercise, treadmill, tai chi, and cueing). (Note: Fisher 2008 contributed data to both the general physiotherapy and treadmill comparisons.) four hundred and seven participants were included in this analysis. No difference in step length was noted between the two treatment arms (0.02 m, 95% CI - 0.01 to 0.04; P = 0.14). Timed up and go test: Nine trials for ten comparisons within four physiotherapy interventions (exercise, cueing, dance, and martial arts). (Note: Hackney 2009 contributed data to both the dance and martial arts comparisons.) Six hundred thirty-nine participants were included in this analysis. Overall, the time taken to complete the Timed Up & Go test was significantly improved (i.e. reduced) with physiotherapy intervention compared with no intervention (-0.63 s, 95% CI -1.05 to -0.21; P = 0.003) Berg Balance Score Data on the Berg Balance Scale were available from five trials for six comparisons within four physiotherapy interventions (exercise, treadmill, dance, and martial arts). (Note: Hackney 2009 contributed data to both the dance and martial arts comparisons.) Three hundred eighty-five participants were included in this analysis. The Berg Balance Scale was significantly better after physiotherapy intervention (3.71 points, 95% CI 2.30 to 5.11; P <0.00001) Falls efficacy scale (FES) Data on the Falls Efficacy Scale were available from four trials for four comparisons within two physiotherapy interventions (exercise and cueing). Three hundred fifty-three participants were included in this analysis. No difference in the	Overall Risk of Bias Overall improvement in trial methodological quality reporting since last Cochrane review (Deane 2001 - included in CG35) Only 18/39 trials provided info on method of randomisation 24 used blinded assessors and 9 reported using intention to treat analyses 14/39 trials discussed participant compliance Follow-up period in the trials was relatively short - no indication if it is a long term benefit

Study details	Participants	Methods	Results	Comments
UK Study type systematic review Aim of the study To assess effectiveness of physiotherapy intervention compared with no intervention in patients with PD Study dates Any trial (that met inclusion criteria) published before Oct 2012 was included in the review Source of funding Cochrane collaboration	intervention not delivered by a physiotherapist occupational therapy inclusion of other neurological conditions crossover with data not presented for first treatment period multidisciplinary therapy rehab excessive number of withdrawals insufficient information	using meta-analysis methods to estimate overall effect of physiotherapy v no physiotherapy subgroup analyses also carried out to examine individual interventions effect on PD outcomes Interventions types of interventions - wide range of techniques: definition used was inclusive, including interventions not delivered by a physiotherapist, with trials of general physio, exercise, treadmill training, cueing, dance, martial arts	Falls Efficacy Scale was found between the two treatment arms (-1.91 points, 95% CI -4.76 to 0.94; P = 0.19) Speed of gait Two or 6 minute walk test Data on the two- or six-minute walk test were available from six trials for seven comparisons within four physiotherapy interventions (exercise, treadmill, dance, and martial arts). (Note: Hackney 2009 contributed data to both the dance and martial arts comparisons.) Two hundred forty-two participants were included in this analysis. A benefit of borderline significance was identified, along with a greater increase in the distance walked in two or six minutes with physiotherapy intervention compared with no intervention (mean difference 13.37 m, 95% confidence interval (CI) 0.55 to 26.20; P = 0.04) Ten or 20 min walk test Data on the 10- or 20-metre walk test were available from four trials for two physiotherapy interventions (exercise and treadmill). One hundred sixty-nine participants were included in the analysis. Borderline significance was reported in favour of no intervention for the time taken to walk 10 or 20 metres (0.40 s, CI 0.00 to 0.80; P = 0.05) Speed Data on speed were available from 15 trials for 19 comparisons within all six physiotherapy interventions. (Note: Fisher 2008;Hackney 2009; Mak 2008; and Thaut 1996 all contributed data to two physiotherapy comparisons.) Eight hundred fourteen participants were included in this analysis. A significant benefit was reported for physiotherapy, with speed increased by 4 cm/s with a physiotherapy intervention compared with no intervention (0.04 m/s, CI 0.02 to 0.06; P = 0.0002) Depression UPDRS mental component Data on the mental sub-scale of the UPDRS were available from two trials for three comparisons within two physiotherapy interventions (general physiotherapy and treadmill). (Note: Fisher 2008 contributed data to both the general physiotherapy and treadmill comparisons.) One hundred five participants were included in this analysis. No difference in UPDRS mental score was reported between the two treatment arms (-0.44, 95% CI -0.98 to 0.09; P = 0.10). UPDRS - total score Data on the total UPDRS score were available from three trials for three comparisons within four physiotherapy interventions (general physiotherapy, exercise, and treadmill). (Note: Fisher 2008 contributed data to both the general physiotherapy and treadmill comparisons.) Two hundred seven participants were included in this analysis. Overall, the UPDRS total score was significantly improved with physiotherapy intervention compared with no intervention (-6.15 points, 95% CI -8.57 to -3.73; P =< 0.00001). UPDRS - motor component Data on the motor sub-scale of the UPDRS were available from 13 trials for 15 comparisons within all six physiotherapy interventions.(Note: Fisher	

Study details	Participants	Methods	Results					Comments
			2008 and Hackney 2009 contributed data to two physiotherapy interventions.) Six hundred and seventeen participants were included in this analysis. Overall, the UPDRS motor score was significantly improved with physiotherapy intervention compared with no intervention (-4.50 points, CI -5.73 to -3.26; P < 0.00001) (PDQ39) Summary index Data on the Summary Index of the PDQ-39 were available from seven trials for eight comparisons within all six physiotherapy interventions. (Note: Hackney 2009 contributed data to both the dance and martial arts comparisons.) Four hundred five participants were included in this analysis. No difference between treatment arms was observed in patient-rated quality of life after physiotherapy intervention (-0.38 points, 95% CI -2.58 to 1.81; P =0.73). Mobility Data on the mobility domain of the PDQ-39 were available from two trials for three comparisons within three physiotherapy interventions (general physiotherapy, dance, and martial arts). (Note: Hackney 2009 contributed data to both the dance and martial arts comparisons.) One hundred five participants were included in this analysis. No difference in the PDQ-39 mobility score was observed between the two treatment arms (-1.43, 95% CI -8.03 to 5.18; P = 0.67).				

Study details	Participants	Methods	Results					Comments
Full citation Amano,S., Nocera,J.R., Vallabhajosula,S., Juncos,J.L., Gregor,R.J., Waddell,D.E., Wolf,S.L., Hass,C.J., The effect of Tai Chi exercise on gait initiation and gait performance in persons with Parkinson's disease, Parkinsonism and Related Disorders.19 (11)	Sample size N= 45 patients with idiopathic PD across 2 centres project a: 21 PD patients ; Tai chi n = 12, Qi-Gong n=9 project b: 24 PD patients ; Tai chi n=15, non-contact control N=9 Inclusion criteria	Details All pts in both projects visited the laboratory both before and after the assigned intervention period for evaluations of their gait initiation (GI), gait performance, parkinsonian disabilities all pts tested at same time of day for both pre	Results No baseline differences between groups in any score No statistically significant differences between groups in any measure of: GI, gait, UPDRS					Overall Risk of Bias (see table below)

Results table (within Results column):

test	intervention	pts	pre train	post train
GI S1 DisAP (cm)	Tai chi	15	2.03 (1.53)	1.55 (1.40)
GI S1 DisMl (cm)	control	9	2.02 (1.24)	2.12 (1.32)
GI S1 DisAP (cm)	Tai chi	15	2.16 (1.15)	1.63 (1.13)
GI S1 DisMl (cm)	control	9	1.42 (1.33)	1.97 (1.41)
Gait step length (m)	Tai chi	15	0.54 (0.13)	0.55 (0.11)
Gait step length (m)	control	9	0.58 (0.06)	0.59 (0.06)
UPDRS	Tai chi	15	23.1 (6.0)	23.4 (4.7)

Comments column (Overall Risk of Bias table):

	Author's judgement	Description
Adequate sequence generation?	Yes	Randomised
Allocation conce	N/A	N/A

Study details	Participants	Methods	Results						Comments
(pp 955-960), 2013.Date of Publication: November 2013., 955-960, 2013 Ref Id 230423 Country/ies where the study was carried out USA Study type RCT Aim of the study To investigate the effect of tai chi exercise on dynamic postural control during gait initiation and gait performance in persons with idiopathic PD , and to determine if benefits could be replicated in 2 different environments, as complementary projects Study dates First received Oct 2012, accepted	all participants were diagnosed with idiopathic PD by a fellowship trained movement disorders neurologist using standard criteria Exclusion criteria Participants were excluded if they had: any history or evidence of neurological deficit other than PD dementia - determined by MMSe < 26 inability to walk independently previous training in tai chi (TC) or current participation in other movement exercise training for	and post intervention evaluations at a time when they reported they were full responding to their antiparkinsonian medication evaluators were blind to group assignment in both trials pts performed at least 5 GI trials at a self-selected pace in both projects pts performed a minimum of 8 gait trials at self-selected speed in response to verbal signal Interventions Tai Chi (TC) individuals who were randomly assigned to TC participated in 60min TC	UPDRS	control	9	23.1 (4.8)	22.0 (5.6)		**almen t?** **Blindi ng? All outco mes** Yes Asses sor-blinde d

Study details	Participants	Methods	Results	Comments
June 2013. No further information on when data was collected. Source of funding This study was supported by a National institutes of health grant	>20min per week. inability to understand the protocol	sessions for 16 consecutive weeks TC group 1 - practiced TC forms 2 x per week TC group 2 - practiced TC moved 3x per week exercise groups kept small (<5pts) to promote intensive TC master/student interaction TC intervention consisted of 1st 8 movements of Yang-style short forms progression of exercises involved a gradual reduction of the base of standing support until a single limb is achieved, increased body and trunk rotation, and		

Study details	Participants	Methods	Results	Comments
		reciprocal arm movements that incorporate controlled breathing Qui Gong control group 1 practiced 60min Qui Gong meditation in stillness - involves a series of exercises in energy discipline involving deep, long, periods of intense meditation non-contact control group 2 individuals assigned to nc control did not participate in any intervention		

Physiotherapy vs usual care n=19 (reruns)

Full citation	Methods	Participants			Interventions	Outcomes	Risk of bias		
Canning,C.G., Allen,N.E., Dean,C.M., Goh,L., Fung,V.S., Home-based treadmill training for individuals with Parkinson's disease: a randomized controlled pilot trial, Clinical Rehabilitation, 26, 817-826, 2012	Randomised controlled pilot trial (6 weeks)		Intervention	Control	Intervention: semi-supervised home-based programme of treadmill walking for 20-40 minutes, four time a week. Control: Usual care.	Primary outcome: Walking capacity (6-minute walk test distance). Secondary outcomes: exercise heart rate, PDQ-39, walking speed, walking speed while performing a concurrent task(s), walking consistency during the 6 minute walk test, UPDRS III, and fatigue.		Author's judgement	Description
		Participants	Idiopathic PD patients				Adequate sequence generation?	Yes	Randomised
		Number randomised	10	10			Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	60.7(5.9)	62.9(9.9)			Blinding? All outcomes	Yes	Assessor-blinded
		Number of males (n (%))	5(50)	6(60)					
		Mean (SD) duration of PD (years)	6.1(4.0)	5.2(4.1)					
Canning,C.G., Sherrington,C., Lord,S.R., Close,J.C., Heritier,S., Heller,G.Z., Howard,K., Allen,N.E., Latt,M.D., Murray,S.M., O'Rourke,S.D., Paul,S.S., Song,J., Fung,V.S., Exercise for falls prevention in Parkinson disease: a randomized controlled trial, Neurology, 84, 304-312, 2015	Randomised controlled trial (6 months)		Intervention	Control	Intervention: 40 to 60 minutes of progressive balance and lower limb strengthening exercises 3 times a week and cueing strategies to reduce freezing of gait for participants reporting freezing. Control: Usual care from their medical practitioner and community services.	Primary outcome: Fall rates and proportion of fallers during the intervention period. Secondary outcome: Physical (balance, mobility, freezing of gait, habitual physical activity), psychological (fear of falling, affect), and quality of life measures.		Author's judgement	Description
		Participants	Community-dwelling people with PD				Adequate sequence generation?	Yes	Randomised
		Number randomised	115	116			Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	71.4(8.1)	69.9(9.3)			Blinding? All outcomes	Yes	Assessor-blinded
		Number of males (n (%))	69(60)	66(57)					

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Full citation	Methods	Participants				Interventions	Outcomes	Risk of bias		
		Mean (SD) duration of PD (years)	7.5(5.8)		8.3(6.0)					
Choi,H.J., Garber,C.E., Jun,T.W., Jin,Y.S., Chung,S.J., Kang,H.J., Therapeutic effects of Tai Chi in patients with Parkinson's disease, ISRN Neurology, 1, -, 2013	Randomised controlled trial (12 weeks)		Intervention		Control	Intervention: Therapeutic Tai Chi Control: No exercise	Physical function (lateral stance, agility, tandem gait, timed up and go, and 6 minute walk) and UPDRS I-III		Author's judgement	Description
		Participants	Idiopathic PD patients					Adequate sequence generation?	Yes	Randomised
		Number randomised	11		9			Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	60.81(7.6)		65.54(6.8)			Blinding? All outcomes	Yes	Assessor-blinded
		Mean (SD) duration of PD (years)	5.2(2.7)		5.2(2.7)					
Cholewa,J., Boczarska-Jedynak,M.FAU, Opala,G., Influence of physiotherapy on severity of motor symptoms and quality of life in patients with Parkinson disease, Neurol Neurochir Pol., 47, 256-262, 2013	Randomised controlled trial (12 weeks)		Intervention	Control		Intervention: Rehabilitation exercises twice a week for 60 minutes. Control: No exercise.	UPDRS I-III Schwab-England scale PDQ-39		Author's judgement	Description
		Participants	Idiopathic PD patients					Adequate sequence generation?	Yes	Randomised
		Number randomised	40	30				Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	70.2(5.75)	70.17(5.38)				Blinding? All outcomes	Not reported	Not reported
		Number of males (n)	27	19						
		Mean (SD) duration of PD (years)	8.03(3.41)	7.33(2.2)						

Full citation	Methods	Participants			Interventions	Outcomes	Risk of bias		
Clarke,C.E., Patel,S., Ives,N., Rick,C.E., Dowling,F., Woolley,R., Wheatley,K., Walker,M.F., Sackley,C.M., Physiotherapy and Occupational Therapy vs No Therapy in Mild to Moderate Parkinson Disease: A Randomized Clinical Trial, JAMA Neurol, 73, 291-299, 2016	Multicenter, randomised, open-label, parallel group, controlled trial (15 months).		Intervention	Control	Intervention: Individualised combined physiotherapy and occupational therapy. Control: No therapy.	Primary outcome: Total NEADL score at 3 months after randomisation. Secondary outcomes: HrQoL measures (PDQ-39 and EuroQoL-5D), adverse events and caregiver QoL.		Author's judgement	Description
		Participants	Idiopathic PD patients with limitations in ADL						
		Number randomised	381	381			Adequate sequence generation?	Yes	Randomised (computer generated)
		Mean (SD) age (years)	70(9.1)	70(9.3)					
		Number of males (n (%))	240(63)	258(68)			Allocation concealment?	N/A	N/A
		Mean (SD) duration of PD (years)	4.5(4.9)	4.6(4.5)			Blinding? All outcomes	Unclear	Not reported
Conradsson,D., Lofgren,N., Nero,H., Hagstromer,M., Stahle,A., Lokk,J., Franzen,E., The Effects of Highly Challenging Balance Training in Elderly With Parkinson's Disease: A Randomized Controlled Trial, Neurorehabil.Neural Repair, 29, 827-836, 2015	Randomised controlled trial (10 weeks)		Intervention	Control	Intervention: HiBalance program, a highly challenging balance training regimen that incorporates both dual-tasking and PD-specific balance components. Control: Usual care	Primary outcomes: Balance performance (Mini-BESTest), gait velocity (during normal and dual-task gait) and concerns about falling (Falls Efficacy Scale-International). Secondary outcomes: Performance of a cognitive task while walking, physical activity level		Author's judgement	Description
		Participants	Community-dwelling idiopathic PD patients						
		Number randomised	51	49			Adequate sequence generation?	Yes	Randomised
		Mean (SD) age (years)	72.9(6.0)	73.6(5.3)			Allocation concealment?	N/A	N/A
		Number of males (n (%))	28(60)	23(51)			Blinding? All outcomes	Unclear	Not reported

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Full citation	Methods	Participants				Interventions	Outcomes	Risk of bias		
		Mean (SD) duration of PD (years)	6.0(5.1)		5.6(5.0)		(average steps per day), and ADL.			
Cugusi,L., Solla,P., Serpe,R., Carzedda,T., Piras,L., Oggianu,M., Gabba,S., Di,Blasio A., Bergamin,M., Cannas,A., Marrosu,F., Mercuro,G., Effects of a Nordic Walking program on motor and non-motor symptoms, functional performance and body composition in patients with Parkinson's disease, Neurorehabilitation, 37, 245-254, 2015	Randomised controlled trial (12 weeks)		Intervention		Control	Intervention: Nordic walking program consisting of exercise group sessions Control: Conventional care	Motor and non-motor symptoms, functional performances and body composition		Author's judgement	Description
		Participants	Idiopathic PD patients							
								Adequate sequence generation?	Yes	Randomised
		Number randomised	10		10					
		Mean (SD) age (years)	68.1(8.7)		66.6(7.3)			Allocation concealment?	N/A	N/A
		Number of males (n (%))	8(80)		8(80)			Blinding? All outcomes	Unclear	Not reported
		Mean (SD) duration of PD (years)	7(2)		7(4)					
Frazzitta,G., Maestri,R., Bertotti,G., Riboldazzi,G., Boveri,N., Perini,M., Uccellini,D., Turla,M., Comi,C., Pezzoli,G., Ghilardi,M.F., Intensive rehabilitation treatment in early Parkinson's disease: A randomized pilot study with a 2-year follow-up, Neurorehabilitation and Neural Repair.29 (2) (pp	Randomised control pilot study (2 years)		Intervention		Control	Intervention: MIRT - two 28 days multidisciplinary intensive rehabilitation treatments, at 1 year interval. Control: No exercise therapy.	UPDRS II and III 6-minute walking test Timed Up-and-Go test PD disability scale (PDDS) L-dopa equivalents		Author's judgement	Description
		Participants	Newly diagnosed PD patients on rasagiline					Adequate sequence generation?	Yes	Randomised (computer-generated)
		Number randomised	20		20					
		Mean (SD) age (years)	69(6)		68(8)			Allocation concealment?	N/A	N/A

Full citation	Methods	Participants			Interventions	Outcomes	Risk of bias		
123-131), 2015.Date of Publication: 02 Mar 2015., 123-131, 2015		Number of males (%)	45%	45%			Blinding? All outcomes	Yes	Assessor-blinded
Ganesan, M., Sathyaprabha, T. N., Pal, P. K., Gupta, A., Partial Body Weight-Supported Treadmill Training in Patients With Parkinson Disease: Impact on Gait and Clinical Manifestation, 96, 1557-65, 2015	Randomised trial (4 weeks)		Intervention	Control	Intervention 1: 20% weight-supported treadmill training for 30mins/day, 4 days/week	Outcomes were evaluated in their best on status: UPDRS and its subscores		Author's judgement	Description
		Participants	Idiopathic PD patients		Intervention 2: Conventional gait training for 30 mins/day, 4 days/week	Gait was measured by 2 minutes of treadmill walking and the 10-m walk test	Adequate sequence generation?	Yes	Randomised
		Number randomised	20	20			Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	58.15(8.7)		Placebo: No exercise		Blinding? All outcomes	Unclear	Not reported
Gao,Q., Leung,A., Yang,Y., Wei,Q., Guan,M., Jia,C., He,C., Effects of Tai Chi on balance and fall prevention in Parkinson's disease: a randomized controlled trial, Clin Rehabil, 28, 748-753, 2014	Randomised control trial (6 months)		Intervention	Control	Intervention: 24-form Yang style Tai Chi exercise for 60 minutes, 3 times a week and lasted 12 weeks	Berg Balance Scale UPDRS III Timed Up-and-Go Occurrences of falls		Author's judgement	Description
		Participants	Idiopathic PD patients		Control: No intervention		Adequate sequence generation?	Yes	Randomised (random number table)
		Number randomised	37	39			Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	69.54(7.32)	68.28(8.53)			Blinding? All outcomes	Yes	Assessor-blinded
		Number of males (n (%))	23(62.16)	27(69.23)					

Full citation	Methods	Participants				Interventions	Outcomes	Risk of bias		
		Mean (SD) duration of PD (years)	9.15(8.58)	8.37(8.24)						
Hashimoto,H., Takabatake,S., Miyaguchi,H., Nakanishi,H., Naitou,Y., Effects of dance on motor functions, cognitive functions, and mental symptoms of Parkinson's disease: a quasi-randomized pilot trial, Complement.Ther Med, 23, 210-219, 2015	Quasi-randomised pilot trial (12 weeks)		Intervention 1	Intervention 2	Control	Intervention 1: Dance group - one 60mins session/week Intervention 2: PD exercise group - one 60mins session/week Control: No intervention	Motor function (Timed-up-and-Go test and Berg Balance Scale) Cognitive function (Frontal Assessment Battery at bedside and Mental Rotation Task) Mental symptoms (Apathy Scale and Self-rating Depression Scale) General PD assessment (UPDRS)			
		Participants	Mild-moderate PD patients						Author's judgement	Description
		Number randomised	15	17	14			Adequate sequence generation?	Yes	Randomised (using a coin)
		Mean (SD) age (years)	67.9(7.0)	62.7(14.9)	69.7(4.0)			Allocation concealment?	N/A	N/A
		Number of males (n)	3	2	7			Blinding? All outcomes	Yes	Assessor-blinded
		Mean (SD) duration of PD (years)	6.3(4.6)	7.8(6.2)	6.9(4.0)					
Landers,M.R., Hatlevig,R.M., Davis,A.D., Richards,A.R., Rosenlof,L.E., Does attentional focus during balance training in people with Parkinson's disease affect outcome? A randomised controlled	Randomised controlled trial (12 weeks)		Intervention 1	Intervention 2	Intervention 3	Control	Intervention 1: Balance training + external focus instructions, three times per week, approximately 45 minutes per day, for 4 weeks.	Sensory Organisation Test Berg Balance Scale Self-Selected Gait Velocity Dynamic Gait Index Activities-Specific Balance Confidence Scale			
		Participants	Idiopathic PD patients						Author's judgement	Description
								Adequate sequence generation?	Yes	Randomised (random numbers table)

Full citation	Methods	Participants					Interventions	Outcomes	Risk of bias		
clinical trial, Clin Rehabil, 30, 53-63, 2016		Number randomised	10	11	10	10	Intervention 2: Balance training + internal focus instructions, three times per week, approximately 45 minutes per day, for 4 weeks. Intervention 3: Balance training + no attentional focus instructions, three times per week, approximately 45 minutes per day, for 4 weeks. Control: No balance training	Obstacle course completion time	Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	72.2(4.4)	70.2(4.4)	70.1(9.5)	74.3(8.8)			Blinding? All outcomes	No	
		Number of males (n)	4	8	7	6					
Liao,Y.Y., Yang,Y.R., Cheng,S.J., Wu,Y.R., Fuh,J.L., Wang,R.Y., Virtual Reality-Based Training to Improve Obstacle-Crossing Performance and Dynamic Balance in Patients With Parkinson's Disease, Neurorehabil.Neural Repair, 29, 658-667, 2015	Randomised controlled trial (6 weeks)		Intervention 1	Intervention 2	Control		Intervention 1: Virtual reality-based Wii Fit exercise (45 mins) using both the Wii Fit Plus gaming system and Wii Fit balance board + additional treadmill training (15 mins) - 12 sessions (2 sessions per week) Intervention 2: Traditional exercise involving 10 mins of stretching exercises, 15 mins of	Primary outcomes: Obstacle crossing performance (crossing velocity, stride length, and vertical toe obstacle clearance) and dynamic balance (maximal excursion, movement velocity, and directional control measured by the limits-of-stability test).		Author's judgement	Description
		Participants	Idiopathic PD patients						Adequate sequence generation?	Yes	Randomised
		Number randomised	12	12	12				Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	67.3(7.1)	65.1(6.7)	64.6(8.6)				Blinding? All outcomes	Yes	Assessor-blinded

Full citation	Methods	Participants				Interventions	Outcomes	Risk of bias		
		Number of males (n)	6	6	5	strengthening exercises, 20 mins of balance exercises + additional treadmill training (15 mins) - 12 sessions (2 sessions per week) Control: Only fall prevention education	Secondary outcomes: Sensory organisation test, PDQ-39, fall efficacy scale (FES-I), and Timed Up-and-Go test.			
		Mean (SD) duration of PD (years)	7.9(2.7)	6.9(2.8)	6.4(3.0)					
Ni,M., Signorile,J.F., Balachandran,A., Potiaumpai,M., Power training induced change in bradykinesia and muscle power in Parkinson's disease, Parkinsonism.Relat.Disord., 23, 37-44, 2016	Randomised controlled trial (3 months)		Intervention	Control		Intervention: Power based resistance training (PWT) involving the use of evolving optimal loads on 11 pneumatic machines. Each session included 3 circuits of 10-12 repetitions on each machine, twice weekly, for 12 weeks. In addition, two 2-week combined balance and agility drills were incorporated into the PWT program - 3 months, 2 sessions/week. Control: 1 hr non-exercise, health education classes, once per month over 12 weeks.	Upper and lower limb bradykinesia scores, one repetition maximums and peak powers on biceps curl, chest press, leg press, hip abduction and seated calf, and QoL.		Author's judgement	Description
		Participants	Idiopathic PD patients					Adequate sequence generation?	Yes	Randomised
		Number randomised	14	10				Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	71.6(6.6)	74.9(8.3)				Blinding? All outcomes	Unclear	Not reported
		Number of males (n)	9	4						
		Mean (SD) duration of PD (years)	6.6(4.4)	5.9(6.2)						

Full citation	Methods	Participants				Interventions	Outcomes	Risk of bias			
Ni,M., Signorile,J.F., Mooney,K., Balachandran,A., Potiaumpai,M., Luca,C., Moore,J.G., Kuenze,C.M., Eltoukhy,M., Perry,A.C., Comparative Effect of Power Training and High-Speed Yoga on Motor Function in Older Patients With Parkinson Disease, Arch Phys Med Rehabil, 97, 345-354, 2016	Randomised controlled trial (12 weeks)		Intervention 1	Intervention 2	Control	Intervention 1: Power based training (PWT) (high speed, low resistance) using evolving optimal loads on 11 pneumatic machines. Each session included 3 circuits of 10-12 repetitions, twice per week, for 12 weeks (24 sessions). Upper and lower body exercises were alternated during the circuits. In addition, two 2-weeks combined balance and agility drills were incorporated into the PWT program. Intervention 2: Power Vinyasa yoga designed to improve movement speed, muscle strength and power and balance specific to PD-related decrements. 1 hour per class, twice per week for 12 weeks (24 classes)	UPDRS III Berg Balance Scale Mini-Balance Evaluation Systems Test Timed Up-and-Go Functional reach Single leg stance Postural sway test 10-m usual and maximal walking speed tests 1 repetition maximum Peak power for leg press		Author's judgement	Description
		Participants	Idiopathic PD patients					Adequate sequence generation?	Yes	Randomised (block randomisation)
		Number randomised	14	13	10			Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	71.6(6.6)	71.2(6.5)	74.9(8.3)			Blinding? All outcomes	Unclear	Not reported
		Number of males (n)	9	11	4					
		Mean (SD) duration of PD (years)	6.6(4.4)	6.9(6.3)	5.9(6.2)					

Full citation	Methods	Participants		Interventions	Outcomes	Risk of bias		
				Control: 1 hour non-exercise, health education class, once per month over 12 weeks.				
Nocera,J.R., Amano,S., Vallabhajosula,S., Hass,C.J., Tai Chi Exercise to Improve Non-Motor Symptoms of Parkinson's Disease, J Yoga.Phys Ther, 3, -, 2013	Randomised controlled trial (16 weeks)			Intervention: Tai Chi, 60 minutes, 3 times per week Control: No intervention	Indices of cognitive-executive function including visuomotor tracking and attention, selective attention, working memory, inhibition, processing speed and task switching. PDQ-39 Tinetti's Falls Efficacy Scale			

For the Nocera study, Participants sub-table:

	Intervention	Control
Participants	Community-dwelling idiopathic PD patients	
Number randomised	15	6
Mean (SD) age (years)	66(11)	65(7)
Number of males (n)	7	4
Mean (SD) duration of PD (years)	8.1(5.4)	6.8(1.3)

Risk of bias sub-table:

	Author's judgement	Description
Adequate sequence generation?	Yes	Randomised
Allocation concealment?	N/A	N/A
Blinding? All outcomes	Yes	Assessor-blinded

Full citation	Methods	Participants	Interventions	Outcomes	Risk of bias
Park,A., Zid,D., Russell,J., Malone,A., Rendon,A., Wehr,A., Li,X., Effects of a formal exercise program on Parkinson's disease: a pilot study using a delayed start design, Parkinsonism Relat	Randomised pilot delayed-start design study (48 weeks)		Intervention: Early start group involving rigorous formal group exercise for 1 hour, 3 times/week for 48 weeks. Control: Delayed-start group participated in the identical exercise	UPDRS Walking Test (Get Up-and-Go) Tinetti Mobility Test PDQ-39 Beck Depression Inventory	

For the Park study, Participants sub-table:

	Intervention	Control
Participants	Idiopathic PD patients	
Number randomised	16	15

Risk of bias sub-table:

	Author's judgement	Description
Adequate sequence generation?	Yes	Randomised

Full citation	Methods	Participants				Interventions	Outcomes	Risk of bias		
Disord., 20, 106-111, 2014		Mean (SD) age (years)	59.8(6.3)		60.1(6.6)	program as the early start group, from weeks 24-48.		Allocation concealment?	N/A	N/A
		Number of males (n (%))	10(63)		10(67)			Blinding? All outcomes	Unclear	Not reported
Qutubuddin,A., Reis,T., Alramadhani,R., Cifu,D.X., Towne,A., Carne,W., Parkinson's disease and forced exercise: A preliminary study, Journal of Parkinson's Disease, 3, 156-, 2013	Randomised controlled trial (3 months)		Intervention		Control	Intervention: Forced exercise (30 mins) using a motorised stationary bicycle, twice weekly for 8 weeks. Control: Conventional clinic care with no specialised physical therapy or exercise conditioning	Measured during ON state of medication: UPDRS III Berg Balance Scale Finger tapping test PDQ-39		Author's judgement	Description
		Participants	3-year confirmed PD diagnosis					Adequate sequence generation?	Yes	Randomised
		Number randomised	13		10			Allocation concealment?	N/A	N/A
								Blinding? All outcomes	Yes	Assessor-blinded
Stozek,J., Rudzinska,M., Pustulka-Piwnik,U., Szczudlik,A., The effect of the rehabilitation program on balance, gait, physical performance and trunk rotation in Parkinson's disease, Aging Clin Exp Res, -, 2015	Randomised controlled trial (4 weeks)		Intervention	Control		Intervention: Rehabilitation program consisting of 28 therapeutic sessions. Each lasted 2 hrs with breaks, two times per day during the first 2 weeks and during 2 consecutive weeks: 3 times per week, one session per day. Treatment focused on various exercises	Balance (Pastor test and tandem stance). Gait assessment (10 m walk at preferred speed and 360o turn. Motor performance (Physical Performance Test and timed motor activities).		Author's judgement	Description
		Participants	PD patients					Adequate sequence generation?	Yes	Randomised)computer-generated)
		Number randomised	30	31				Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	34.0(9.9)	67.0(11.3)						

Full citation	Methods	Participants				Interventions	Outcomes	Risk of bias		
		Number of males (n (%))	13(43.3)		16(51.6)	improving balance, postural stability, walking and performance of ADL, including changing position of the body. Control: Only medication therapy.	The range of spinal rotation measured in the lumbar and thoraco-lumbar spin with a tape measure. A digital stopwatch to time the motor tasks.	Blinding? All outcomes	Unclear	Not reported
		Mean (SD) duration of PD (years)	4.6(2.7)		4.3(2.6)					
Stallibrass C., Sissons P., Chalmers C. Randomised controlled trial of the Alexander Technique for idiopathic Parkinson's disease. Clinical Rehabilitation 2002; 16:695-708	Randomised controlled trial (6 months)		Intervention	Control		Intervention: 24 lessons in the Alexander Technique Control: No intervention	Self-assessment PD disability scale (SPDDS) at best, MD (95% CI): -3.5 (-7.7 to -0.0) Self-assessment PD disability scale (SPDDS) at worst, MD (95% CI): -6.3 (-11.8 to -0.9) BDI, MD (95% CI): -0.9 (-2.6 to 0.9)		Author's judgement	Description
		Participants	Clinically confirmed idiopathic PD patients					Adequate sequence generation?	Yes	By a computer programme, MINIM
		Number randomised	29	30				Allocation concealment?	N/A	N/A
		Mean (SD) age (years)	64.1(9.1)	64.8(10.8)				Blinding? All outcomes	Yes	Data collection performed by an independent person.
		Number of males (n)	19	21						
		Mean (SD) duration of PD (years)	4.8(4.3)	4.9(3.5)						