

Web table 1: Characteristics of included studies

Study/Trial	Eligibility	Intervention	Dose/ Duration of treatment	Outcomes
General physiotherapy trials				
Chandler 1999 [25]	Inclusion criteria: Idiopathic Parkinson's Disease, not receiving physiotherapy, no access (including self-referral) to a physiotherapy review system. No exclusion criteria stated.	Gait and balance exercises using verbal, auditory and visual cues.	5 visits (minimum) / 12 months	Functional Independence Measure; Nottingham extended Activities Daily Living; UPDRS - motor subsection; Timed walk; 9 hole peg test; SF-36; PDQ-39.
Ellis 2005 [26]	Inclusion criteria: Stable medication usage, Hoehn and Yahr stage 2 or 3, at least 1 score of 2 or more for at least 1 limb for either the tremor, rigidity or bradykinesia item of the UPDRS, ability to walk independently, age 35-75 years, no severe cognitive impairment (MMSE \geq 24), no other severe neurologic, cardiopulmonary or orthopaedic disorders, not having participated in a physical therapy or rehabilitation program in the previous 2 months. No exclusion criteria stated.	Physical therapy session consisting of stretching, functional training, gait training, auditory cueing, balance, recreational, relaxation.	18 hours/ 6 weeks	Sickness Impact Profile (SIP-68); UPDRS (Sections I, II, III); Comfortable walking speed.
Fisher 2008 [27]	Inclusion criteria: Early stage Parkinson's disease, diagnosis of	Less than 3 METs. This group was representative of general or	24 sessions/ 8	UPDRS (Total, I, II and III subscores); Hoehn and

	<p>Parkinson's disease within 3 years of study participation, Hoehn and Yahr stage 1 or 2, 18 years or older, medical clearance from primary care physician to participate in exercise programme, ability to walk.</p> <p>Exclusion criteria: Medical or physical screening examination showed a score of less than 24 on the MMSE, there were physician determined major medical problems such as cardiac dysfunction that would interfere with participation, they had musculoskeletal impairments or excessive pain in any joint that could limit participation in an exercise programme, had insufficient endurance and stamina to participate in exercise 3 times per week for a 1 hour session.</p>	<p>traditional physical therapy. Each 45 min session was individualised and consisted of activities from 6 categories 1) passive range of motion and stretching 2) active range of motion 3) balance activities 4) gait 5) resistance training 6) practice of functional activities and transitional movements.</p>	<p>weeks</p>	<p>Yahr; Functional assessments; Walking test; Sit-to-stand test; Transcranial magnetic stimulation.</p>
<p>Homann 1998 [28] (Abstract, published data only)</p>	<p>Inclusion criteria: Idiopathic Parkinson's Disease according to UK Brain Bank diagnostic criteria. No exclusion criteria.</p>	<p>Individual Bobath program focusing on proprioceptive skills to improve posture and gait.</p>	<p>14 units/ 5 weeks</p>	<p>UPDRS; Axial symptoms; Stride length; Walk velocity; Stride cadence.</p>
<p>Keus 2007 [29]</p>	<p>Inclusion criteria: Idiopathic Parkinson's disease according to the UK Parkinson's Disease Society Brain Bank Criteria, stable reaction to anti-Parkinsonian medication, at</p>	<p>Individual physiotherapy sessions. Delivered by a physiotherapist trained in the use of evidence based practice guidelines. Interventions included</p>	<p>1 or 2 sessions per week/ 10 weeks</p>	<p>Patient preference outcome scale; The Parkinson Activity Scale; Mobility domain of the Dutch validated version of</p>

	<p>least one mobility-related activity limitation within core areas of physiotherapy practice in Parkinson's disease (gait, balance, posture and transfers) experienced by the participant as important.</p> <p>Exclusion criteria: Hoehn and Yahr stage 5 during the 'on' period, physiotherapy within 4 months prior to randomisation, severe co-morbidity influencing mobility or life threatening (e.g. cancer), not motivated to participate in physiotherapy, severe cognitive impairment defined by a MMSE score ≤ 24, presence of psychiatric impairments.</p>	<p>Parkinson's disease specific techniques such as cueing, cognitive movement strategies and general techniques such as training of balance, leg strength and physical fitness. The intervention targeted balance, transfers, posture, gait, dependent on the participant's main complaint.</p>		<p>the Parkinson's disease questionnaire.</p>
Stack 2012 [30]	<p>Inclusion criteria: Parkinson's disease as per UK Brain Bank criteria, willing and able to take part in intervention, willing and able to complete outcome measures, score of at least 8/12 on the Middlesex elderly assessment of mental state, Hoehn and Yahr I-IV, self report chair transfers as excessively slow or requiring much effort, assistance or repeated attempts or associated with a previous fall.</p>	<p>Home-based physiotherapy programme focused on chair transfers. Supervised exercises to enhance hip and knee extensor strength and trunk stability and flexibility. Teaching and learning movement strategies for safer and easier standing and sitting. Verbal cueing.</p>	<p>12 sessions/ 4 weeks</p>	<p>PAS chair transfer; Sit-to-stand time; SAS score; SS-180 turn time; Forward reach; UPDRS posture; HR-QOL.</p>

Talakad 2011 [31] (Abstract, published data only)	Eligibility criteria not stated.	Conventional gait training (CGT).	16 sessions/ 4 weeks	Dynamic posturography; UPDRS; Beat-to-beat finger blood pressure.
Exercise trials				
Allen 2010 [32]	Inclusion criteria: Diagnosis of idiopathic Parkinson's disease, able to walk independently (with or without an aid), fallen in the last year or deemed to be at risk of falling, 30-80 years in age, on the same PD medication for the last 2 weeks. Exclusion criteria: significant cognitive impairment (MMSE <24), had another neurological/ musculoskeletal/ cardiopulmonary/ metabolic condition that would interfere with safe conduct of the training or testing protocol.	Progressive lower limb strengthening and balance exercises (targeted leg muscle strength, balance and freezing). Once monthly exercise classes with the remaining exercise sessions at home.	48-72 hours/ 24 weeks	PD falls risk score; Knee extensor strength; Coordinated stability; Sway; Maximum balance range in standing; Alternate step test; Freezing of Gait Questionnaire; Sit to stand time; Fast walking speed; Comfortable walking speed; Short physical performance battery; Falls Efficacy Scale – International; PDQ-39.
Ashburn 2007 [33]	Inclusion criteria: confirmed diagnosis of Parkinson's disease, independently mobile, living at home in the community, experienced more than one fall in the previous 12 months, passed a screening for gross cognitive impairment (Mini Mental State). Exclusion criteria: unable to participate in assessments because of pain, acute medical condition, in receipt of or soon to receive	Personalised home-based exercise and strategy programme. Following assessment, treatment goals were established with participants and exercises from the exercise menu were taught. Participants were visited weekly at home by physiotherapist. 6 levels of exercise progression which comprised of muscle strengthening, range of	42 hours/ 6 weeks	Self reported falls diary; Functional reach; Timed up and go test; Chair stand test; Berg balance test; Euroqol-5d; QoL thermometer; Self assessment Parkinson's disease disability scale.

	treatment	movement, balance training and walking. Strategies of falls prevention and movement initiation and compensation taught by physiotherapist. Participants were asked to complete the exercises daily for max of 1 hour and to keep record. Phoned monthly to encourage exercises.		
Boehm 2011 [34] (Abstract, published and unpublished data)	Inclusion criteria: Idiopathic Parkinson's disease diagnosed by neurologist or movement disorders specialist according to international clinical diagnosis criteria, able to commit to study guidelines for 24 weeks. Exclusion criteria: Score lower than 76 on 3MS (extended MMSE).	Sensory attention focused exercise.	12 weeks	UPDRS I, II & III; Timed up and go; Step length; Step length variability; Gait velocity; Grooved peg-board; 30 second chair stand.
Cerri 1994 [35] (Abstract, published data only)	Inclusion criteria: Parkinson's disease, stage 3 and 4 of Hoehn and Yahr scale, treated with L-dopa for more than 4 years with incomplete control of rigidity and tremor. No exclusion criteria stated.	Individual physical exercise program with neuromuscular facilitation techniques to improve posture, inhibit rigidity and 'conscientize' movements.	15 hours/ 3 weeks	Webster disability Scale; Activity of daily living; L-dopa reduction.
Goodwin 2009 [36]	Inclusion criteria: Diagnosis of idiopathic Parkinson's disease (confirmed by specialist), self-reported history of 2 or more falls in the past year, able to mobilise	Supervised group strength and balance training plus unsupervised home exercises.	10 weeks	Falls Incidence; Number of fallers/recurrent faller; Injuries; Berg balance scale; Timed Up and Go; Fall Efficacy Scale –

	<p>independently with/without a walking aid, resident in Devon, willingness to be randomised and provide written informed consent. Exclusion criteria: needed supervision or assistance from another person to mobilise indoors, significant co-morbidity that affect ability or safety to exercise (e.g. unstable angina, unstable diabetes, significant postural hypotension, severe pain, significant dyskinesia), were unable to follow verbal or written instructions in English.</p>			<p>International; EQ-5D; Household and recreational physical activity (Phone-FITT).</p>
<p>Klassen 2007 [37] (Abstract, published and unpublished data)</p>	<p>Inclusion criteria: Clinical diagnosis of Parkinson's disease, 40-80 years of age, Hoehn and Yahr stages 1-3. Exclusion criteria: medical conditions that limit physical activity, dementia or significant cognitive impairment MMSE < 20, depression or other psychiatric disorder Beck Depression Inventory II score > 20, other neurological conditions.</p>	<p>Education delivered by physiotherapist, occupational therapist, speech language therapist, dietician, clinical psychologist and social worker. Education consisted of active learning methods, action plan development and discussion to complete each session. Report and discussion of action plan success/barriers to success at beginning of each session. Twice weekly session of exercise which consisted of warm up, cool down, flexibility and strengthening</p>	<p>15-30 hours/ 12 weeks</p>	<p>PDQ-8; Stanford Self-Efficacy for managing chronic disease scale; North Western University Disability Scale; Schwab and England ADL Scale; Activities Balance Confidence Scale; Timed Up & Go.</p>

		exercises, posture and balance training, progressive aerobic training and functional task training e.g. sit-to-stand etc.		
Mak 2008 [38]	Inclusion criteria: diagnosed with Parkinson's disease according to Quinn, stable on anti-Parkinson's disease medications without dyskinesia, orthopaedic, arthritic or heart problems, aged between 50-75 years old, perform sit to stand independently, can follow instructions. No exclusion criteria stated.	Conventional mobility and strengthening exercises for flexors and extensors of trunk, hips, knees and ankles followed by sit-to-stand practice.	6 hours/ 4 weeks	Peak horizontal velocity (used in meta-analysis); Peak vertical velocity; Movement time; 3D Kinematics data of sit-to-stand.
Meek 2010 [39] (Abstract, published and unpublished data)	Inclusion criteria: A diagnosis of idiopathic Parkinson's disease, aged 18 years or over, no cognitive, sensory or psychological impairments that may prevent engagement in participation in the study or put the participant at risk (judged by the referring clinician), able to participate in the study for its full duration, able to walk 10m using any aid or assistance required. Exclusion criteria: Participants unable to meet inclusion criteria, or those unwilling to participate, participants with additional	Collaborated with fitness instructors to design a 3-month individualised, progressive exercise program.	12 weeks	Physical Activity Scale for the Elderly; Accelerometer monitored physical activity; 10m walk test; 2 min walk test; Lower limb muscle strength and grip strength; Fatigue severity scale; PDQ-39; Falls.

	impairments resulting in a restriction of mobility, or any contraindications to exercise.			
Sage 2009 [40]	Inclusion criteria: diagnosis of idiopathic Parkinson's disease with no other major medical, physiological or neurological problem, a stable medication schedule, mild to moderate Parkinson's disease defined as a score of less than 35 on UPDRS motor section.	Exercise: lower limb aerobic training, exercise on Biostep semi-recumbent elliptical's in the seated position. The machine was primarily leg driven with arms moving in a coordinated pattern. Intensity maintained by achieving a pace of 50 RPM, a heart rate of 60-75% of age related max and a Borg rate of perceived exertion of below 5. PDSAFEx: Sensory attention focused exercise. Non-aerobic gait exercises focused on body coordination followed by sensory attention exercises utilising latex Thera-bands® attached to arm rests of office chairs. Exercises were completed with eyes closed and cued to the sensory feedback from specific portions of each exercise. Examples of exercises, tandem walking for balance and coordination, side stretches down side of chair for sensory feedback.	18-24 hours/ 10-12 weeks	UPDRS III; Timed Up and Go; Spatiotemporal aspects of gait.
Schenkman 1998 [41]	Inclusion criteria: Parkinson's	Individual exercises to improve	22.5-30	Functional axial rotation;

	disease as diagnosed by a neurologist, Hoehn and Yahr stage 2 or 3, functional axial rotation of 120 degrees or less to either side. Exclusion criteria: Hospitalised within last 3 months, PD drugs changed in last month, other neurological disorders, Folstein MMSE <23.	spinal flexibility and coordinated movement. Standardised programme included a series of exercises divided into 7 graduated stages, from supine to standing. Exercises learned at each stage are continued throughout with progressively higher level activities added. Exercises are incorporated into daily routine at end of formal training sessions.	hours/ 10 weeks	Functional reach; Timed tests; Timed walk; Cervical and lumbar range of motion; Walking velocity.
Schilling 2008 [42]	Inclusion criteria: mild to moderate Parkinson's disease, Hoehn and Yahr stage 1-2.5, ability to walk a 20-foot path, turn and return to the start without use of assistive device. Exclusion criteria: orthostatic hypotension, dementia (MMSE < 24), other significant co-morbidities (i.e. stroke, severe degenerative osteoarthritis), other causes of Parkinsonism such as PSP, vascular PD and multiple system atrophy as determined by board-certified neurologist.	Moderate volume, high-load lower-body resistance training twice weekly. After a warm-up participants performed three sets of 5-8 repetitions for the leg press, seated leg curl, and calf press under direct supervision of a Certified Strength and Conditioning Specialist. Subjects were instructed to lift the weight as fast as possible with good form and to slowly return the weight to the start position. Progression was planned so that when eight repetitions could be completed for all the sets the weight was increased by 5-10%.	2 per week/ 8 weeks	Maximum strength for the lower body; Activities-Specific Balance Confidence; Timed Up and Go; 6 minute Walk Test.
Stozek 2003 [43]	Inclusion criteria: Idiopathic	Sensory reinforcements used	56 hours/	Functional reach test;

	<p>Parkinson's disease diagnosed by a neurologist, disease stage based on the Hoehn and Yahr scale 1.5- beginning of 3, stable pharmacological treatment for at least the last 3 months, age 35-85, no other neurological disease or serious movement disorders, no contraindications for physical exercise, participants written consent to participate in the study.</p>	<p>during all exercises: verbal, visual, auditory, extero- and proprioceptive stimulation. Complex rehabilitation consisted of: relaxation and breathing exercises, exercises increasing the range of movement, functional exercises, exercises for posture, balance, gait, music-dance exercises, mimic exercises of facial muscle and tongue, articulation and voice exercises, group therapy and patient education.</p>	<p>4 weeks</p>	<p>Tinetti's Balance Performance Oriented Mobility Assessment; Static and dynamic balance; Timed Up and Go; 10m walk; Locomotion test; 360° turn.</p>
<p>Taheri 2011 [44]</p>	<p>Inclusion criteria: Idiopathic Parkinson's disease, able to carry out their activities of daily living independently, not part of any sports or physiotherapy treatment while participating in study, Hoehn & Yahr stage III. Exclusion criteria: Secondary drawbacks e.g. heart disease, arthritis, cognitive problems, not participating in experiments regularly.</p>	<p>Physical therapy program: Emphasis on tensional and supple exercises, chosen from Pito de Oto physical therapy and Donaron Rehabilitation centre, 5 min warm-up of walking and exercises, 50 mins of stretching and exercise and 5 min cool-down.</p>	<p>40 sessions/ 10 weeks</p>	<p>Berg balance scale; Tinetti balance scale.</p>
<p>Thaut 1996 [45]</p>	<p>Inclusion criteria: Idiopathic Parkinson's disease with significant gait deficits regarding velocity, stride length and cadence but able to walk</p>	<p>Self paced therapy: Daily walking on a flat surface, stair stepping, and stop-and-go exercises without rhythmic auditory stimulation.</p>	<p>10.5 hours/ 3 weeks</p>	<p>Walk velocity; Stride cadence; Stride length; EMG analysis on leg muscles; Footfall pattern.</p>

	without physical assistance. No exclusion criteria.	Walking was divided equally into walking at normal pace, quick pace and fast pace.		
Treadmill trials				
Cakit 2007 [46]	Inclusion criteria: Parkinson's disease patients who fulfilled the UK Parkinson's Disease Society Brain Bank Criteria, medically stable, able to walk 10 metre distance at least 3 times with or without assistive device, able to provide informed consent. Exclusion criteria: participants who had neurological conditions other than idiopathic Parkinson's disease, scored greater than 3 in Hoehn and Yahr, scored less than 20 in MMSE, postural hypotension, cardiovascular disorders, class C or D exercise risk by the American College of Sports Medicine (ACSM) criteria, musculoskeletal disorders, visual disturbance or vestibular dysfunction limiting locomotion or balance.	Incremental speed-dependent treadmill training. Programme comprised of stretching, range of motion exercise and treadmill training. Maximum tolerated walking speed was determined before the training session. This speed was then halved and used for a 5 min warm-up period. After the warm-up period the belt speed was increased by increments of 0.6km/h every 5 min. When the belt speed was increased to the highest speed at which the participant could walk safely and without stumbling, this maximum-achieved belt speed was maintained for 5 min and then followed by 0.6km/h decrements. The participant maintained the rest of the treadmill session with this speed for 15 min.	30 min sessions/ 8 weeks	Berg Balance Test; Dynamic Gait Index; Falls Efficacy Scale; Walking distance on treadmill; Tolerated maximum speed on treadmill (km/h).
Canning 2008 [47]	Inclusion criteria: clinical diagnosis of idiopathic Parkinson's disease,	Walked on the treadmill holding onto the handle bars for 30-40	9-12 hours/ 6	6 minute walk test to assess walking capacity;

	<p>aged 30-80 years, subjective disturbance of gait and/or a Unified Parkinson's Disease Rating Scale (UPDRS) gait sub score of 1, sedentary, defined as performing less than 2 hours / week of leisure-time physical activity over the prior 3 months, have adapted to their current anti-Parkinsonian medication for at least 2 weeks, be cognitively-intact, have no freezing 'on' medication, Hoehn and Yahr stage 1 or 2. Exclusion criteria: motor fluctuations or dyskinesias which are disabling, require the use of a walking aid, more than one fall in the last 12 months, Mini-Mental State Examination score of <24, exhibit other neurological or musculoskeletal conditions affecting walking, chest pain at rest or during exercise in the last 3 months, or heart attack, angioplasty or heart surgery in the last 6 months.</p>	minutes.	weeks	<p>UPDRS - motor examination; PDQ-39 to assess quality of life; Walking automaticity; velocity of walking 10m while performing a concurrent (cognitive or cognitive + physical) task as expressed as a percentage of the walking velocity of walking 10m without performing the concurrent task; Walking consistency determined as the co-efficients of variation for stride time and stride length recorded during the 6 minute walk test; 7-pt Likert scale to assess fatigue.</p>
Fisher 2008 [27]	<p>Inclusion criteria: Early stage Parkinson's disease, diagnosis of Parkinson's disease within 3 years of study participation, Hoehn and Yahr stage 1 or 2, 18 years or older,</p>	<p>Level of intensity was defined by MET. High intensity exercise greater than 3 METs. Body weight supported (BWS) treadmill training. Goal of each session was</p>	<p>24 sessions/ 8 weeks</p>	<p>UPDRS (Total, I, II and III subscores); Hoehn and Yahr; Functional assessments; Walking test; Sit-to-stand test;</p>

	<p>medical clearance from primary care physician to participate in exercise programme, ability to walk.</p> <p>Exclusion criteria: Medical or physical screening examination showed a score of less than 24 on the MMSE, there were physician determined major medical problems such as cardiac dysfunction that would interfere with participation, they had musculoskeletal impairments or excessive pain in any joint that could limit participation in an exercise programme, had insufficient endurance and stamina to participate in exercise 3 times per week for a 1 hour session.</p>	<p>to reach and maintain a MET >3. Exercise progressed by decreasing BWS (initially 10% of subjects bodyweight) and physical assistance, increasing the treadmill speed and time on the treadmill, with the end goal for each subject to walk on the treadmill continuously for 45 min within the MET range.</p>		<p>Transcranial magnetic stimulation.</p>
<p>Ganesen 2010 [48] (Abstract, published data only)</p>	<p>Inclusion criteria: idiopathic Parkinson's disease, stable doses of dopaminomimetic drugs. No exclusion criteria.</p>	<p>Partial weight supported treadmill gait training with 20% unweighing.</p>	<p>8 hours/ 4 weeks</p>	<p>UPDRS; Dynamic Posturography; Berg Balance Scale; Tinetti performance orientated mobility assessment; Tinetti balance score; Gait score.</p>
<p>Kurtais 2008 [49]</p>	<p>Inclusion criteria: stable antiparkinsonian medication, ability to walk independently, not participated in a rehabilitation program in the previous 3 months.</p>	<p>Gait training on a treadmill,, attaining 70-80% of maximal heart rate. Either speed or incline was gradually increased over time.</p>	<p>12 hours/ 6 weeks</p>	<p>20m walking time; Timed U-turn task; Turning around a chair; Climbing up and down a flight of stairs in participants</p>

	Exclusion criteria: severe cognitive impairments or severe musculoskeletal, cardiopulmonary, neurologic or other system disorders.			preferred speed; Standing on one foot; Standing up from an armless chair; Rate global physical status; Cardiopulmonary fitness levels.
Protas 2005 [50]	Inclusion criteria: Idiopathic Parkinson's disease, postural instability-gait difficulty predominant Parkinson's disease, experiences with freezing episodes, and or history of falls, stable regimen of antiparkinsonian medications, ability to stand and walk with or without assistance, stage 2 or 3 Hoehn and Yahr, scores of moderate or higher on all scales on the Neurobehavioural Cognitive Status Examination (Cognistat). No exclusion criteria.	Gait and step training. Using a harness for safety, the participant walks forward on a treadmill at fastest speed for 5-7 min, backwards at fastest self selected speed for 5-7 min. Then left and right sideways walking at fastest selected speed for 2-3 min each way. Participants then had 5 min rest before starting step training, which consisted of turning on the treadmill suddenly to perturb the participant's standing balance (15-20 forward and backward perturbations, 10-15 left and right perturbations).	24 hours/ 8 weeks	Gait speed; Cadence; Stride length; 5-Step test; Reports of falls; Freezing of gait.
Shankar 2009 [51] (Abstract, published data only)	Inclusion criteria: Moderate Parkinson's disease. No exclusion criteria.	Walking on the treadmill with music. Music was selected based upon participant input and cadence-matched to the participant's preferred walking speed.	8 hours/ 8 weeks	Gait and Balance Scale; UPDRS III; PDQ-39.
Talakad 2011 [31]	Eligibility criteria not stated.	Partial weight supported treadmill	16	Dynamic posturography;

(Abstract, published data only)		training: 20% unweighting.	sessions/ 4 weeks	UPDRS; Beat-to-beat finger blood pressure.
Cueing trials				
Almeida 2012 [52]	Inclusion criteria: Confirmed as having clinically typical Parkinson's disease by at least one movement disorders neurologist. Exclusion criteria: Past history of neurological conditions other than Parkinson's disease, orthopaedic or visual disturbances that severely impaired walking ability, unable to independently walk down an 8 meter GAITRite carpet for a total of 10 trials.	Group 1: Walk down equally spaced transverse lines presented on a 16m carpet. The cues were white lines of tape. Participants asked to walk across the lines, turn and continue back. Spacings were set at 8% greater than the initial step length of any of the groups (70 cm). 30 minute session with mandatory 2 min break every 8 mins, additional rest allowed if necessary but a total of 24 mins walking was required to consider gait session complete. Group 2: Walk on a treadmill presented with equally distributed standardised transverse white lines. Spacings were set at 8% greater than the initial step length of any of the groups (70 cm). 30 minute session with mandatory 2 min break every 8 mins, additional rest allowed if necessary but a total of 24 mins walking was required to consider gait session complete.	18 sessions/ 6 weeks	Step length; UPDRS III; Timed up and go; Gait velocity; Cadence; Double support time; Step time; Step-to-step variability; Step time variability; 30 second chair stand.

de Bruin 2010a [53]	Inclusion criteria: Diagnosis of Parkinson's disease (United Kingdom Brain Bank Criteria), Hoehn and Yahr stage II-III, stable medication regimen, independently mobile without the use of a walking aid, and intact hearing. Exclusion criteria: diagnosis of less than 1 year, undergone deep brain stimulation surgery, experience regular freezing episodes, unable to ambulate independently in the community, presence of neurological disorders or co morbidities likely to affect gait, scoring 24 or less on the MMSE and/or already listening to music.	Walking at a self-selected pace whilst listening to a preloaded music battery on an MP3 player. The music battery was individualised for each participant matching music preferences and the cadence of their preferred walking speed.	18 hours/ 12 weeks	Velocity; Stride time; Stride length; Cadence; Stride time variability; UPDRS (III) score.
de Bruin 2010b [54] (Abstract, published data only)	Inclusion criteria: Parkinson's disease. No exclusion criteria.	Walking whilst listening to an individual music playlist. Playlists closely matched each individual's music preferences and preferred cadence.	3 per week/13 weeks	Spatiotemporal parameters approach; crossing and recovery steps of obstacle crossing were evaluated using a GAITRite mat; Step velocity; Step length.
Haase 2011 [55] (Thesis abstract and unpublished data)	Inclusion criteria: Able to walk independently without assistive devices for at least 14 m at a time no more than 4 times, Hoehn & Yahr 0-2. Exclusion criteria: Severe perceptual deficits, medical complications.	Rhythmic finger tapping exercise: Participants instructed to tap on a metal plate (while seated) to the beat of an external auditory cue from a metronome set to 120% pre-test walking cadence, for three, 1-minute intervals with 30	3 mins/ single session	9-hole peg test; UPDRS III & IV; Berg balance scale; Velocity; Stride length; Cadence.

		seconds of rest in between each interval. Rhythmic arm swing exercise: Participants instructed to swing their arms (while seated) to the beat from a metronome set to 120% pre-test walking cadence, for three, 1-minute intervals with 30 seconds of rest in between each interval.		
Lehman 2005 [56]	Inclusion criteria: participants with gait impairment due to Parkinson's disease, early stage Parkinson's disease. Exclusion criteria: persons with other neurological and/or orthopaedic impairments that could not walk the distances required of the training program were excluded.	Training programme of walking 1800 feet per day with instructions to 'take long steps'. One trip down the 30 foot pathway is a length. Each training set consisted of 20 lengths. Participants completed 3 training sets each day.	5 per week/ 2 weeks	Step length; Velocity; Cadence.
Mak 2008 [38]	Inclusion criteria: diagnosed with Parkinson's disease according to Quinn, stable on anti-Parkinson's disease medications without dyskinesia, orthopaedic, arthritic or heart problems, aged between 50-75 years old, perform sit to stand independently, can follow instructions. No exclusion criteria stated.	Audio-visual cued task-specific training. Received cued sit-to-stand training using Equitest-Balance Master. Visual cue was given on a computer screen with verbal command as auditory cue. Each task lasted 2 min, repeated once with a 30 second rests in between.	4 hours/ 4 weeks	Peak horizontal velocity (used in meta-analysis); Peak vertical velocity; Movement time; 3D Kinematics data of sit-to-stand.

Nieuwboer 2007 [57]	Inclusion criteria: diagnosis of idiopathic Parkinson's disease (defined by the UK Brain Bank Criteria), Hoehn and Yahr stage 2-4, showing mild to severe gait disturbance with score >1 on the UPDRS item 29, stable drug usage, age 18-80 years. Exclusion criteria: undergone deep brain stimulation or stereotactic neurosurgery, had cognitive impairment (MMSE < 24), had disorders interfering with participation in cueing training including neurological (stroke, multiple sclerosis, tumour), cardiopulmonary (chronic obstructive disorders, angina pectoris) and orthopaedic (osteoarthritis, rheumatoid arthritis and back pain) conditions, had predictable and long lasting off periods (score 1 on item 37 and score >2 on item 39 on UPDRS). Had participated in a physiotherapy programme 2 months before starting the trial.	Cueing programme delivered at home by a therapist. A prototype cueing device specifically developed for the study provided 3 rhythmical cueing modalities: 1. auditory (a beep delivered through an ear piece), 2. visual (light flashes delivered through a light-emitting diode attached to a pair of glasses), 3. somatosensory (pulsed vibrations delivered by a miniature cylinder worn under a wristband). Participants tried all cueing modalities in the first week, but trained with their preferred modality. Cued practice was applied during a variety of tasks and aimed to improve step length and walking speed, prevent freezing episodes and improve balance.	4.5 hours/ 3 weeks	Posture and gait score; Gait and balance measures (including 10m test of walking; gait speed; step length; step frequency; functional reach; timed single leg and tandem stance; Freezing of Gait Questionnaire; Timed Up and Go Test); Activity measures (including Nottingham Extended Activities of Daily Living Index; Falls Efficacy Scale); Participation measures (including Parkinson's Disease Questionnaire-39; Carer Strain Index); Falls diary.
Shankar 2008 [58] (Abstract, published and unpublished data)	Inclusion criteria: diagnosis of idiopathic Parkinson's disease as per UK Brain Bank criteria, Hoehn &	Walking whilst listening to a battery of musical pieces. Music was self selected based upon	18 hours/ 12 weeks	Gait and Balance Scale; UPDRS III; Adjusted PDQ-39; Activities-

	Yahr disease stages 2 and 3, stable Parkinson's disease medication for 1 month prior to baseline visit, ability to walk with headphones unaided for 30 minutes three times per week, absence of pre-existing walking to music. Exclusion criteria: presence of dementia (MMSE <26), presence of co-morbidities that affect the ability to walk, hearing deficits.	participant input and cadence-matched to the participant's ideal walking speed.		Specific Balance Confidence Scale.
Thaut 1996 [45]	Inclusion criteria: Idiopathic Parkinson's disease with significant gait deficits regarding velocity, stride length and cadence but able to walk without physical assistance. No exclusion criteria.	Exercised according to a prescribed program using rhythmic auditory stimulation (RAS). The RAS program consisted of walking on a flat surface, stair stepping, and stop-and-go exercises to rhythmically accentuated music at three different tempos. The tempos were labelled 'normal', 'quick' and 'fast'.	10.5 hours/ 3 weeks	Walk velocity; Stride cadence; Stride length; EMG analysis on leg muscles; Footfall pattern.
Dance trials				
Duncan 2012 [59]	Inclusion criteria: Idiopathic Parkinson's disease. No exclusion criteria.	Tango class.	24 hours/ 12 weeks	MDS-UPDRS.
Hackney 2009 [60]	Inclusion criteria: Hoehn and Yahr stages 1-3, at least 40 years of age, could stand for at least 30 min, walk independently 3 or more metres with	Experienced professional ballroom dancer taught progressive tango or waltz/foxtrot lessons for 1 hour twice weekly.	20 hours/ 13 weeks	PDQ-39; UPDRS III; Berg Balance Scale; Timed Up and Go; 6 minute walk test; Freezing of gait

	<p>or without assistive device, diagnosis of idiopathic Parkinson's disease using diagnostic criteria for clinically defined 'definite PD' based upon published standards, participants demonstrated clear benefit from levodopa, cognitively intact. Exclusion criteria: history of neurological deficit other than Parkinson's disease, dementia, another measure of cognitive function and a separate part of the study not reported where all participants were required to perform a subtraction task while walking (all completed with 85% accuracy), considered cognitively intact.</p>	<p>Instructor equally versed in both dances attempted to give all students equal attention. Both genders spent equal time leading and following dance roles. All steps done in closed practice position where participants maintain contact through upper extremities and face one another.</p>		<p>questionnaire; Forward and backward gait; Gait velocity; Stride length; Single support time; Exit questionnaire; Tandem Stance Test (TS); One Leg Stance test (OLS).</p>
Martial Arts trials				
<p>Hackney 2009 [60]</p>	<p>Inclusion criteria: Hoehn and Yahr stages 1-3, at least 40 years of age, could stand for at least 30 min, walk independently 3 or more metres with or without assistive device, diagnosis of idiopathic Parkinson's disease using diagnostic criteria for clinically defined 'definite PD' based upon published standards, participants demonstrated clear benefit from levodopa, cognitively intact.</p>	<p>Received progressive lessons on Tai Chi's first and second circles including 37 postures of the Yang Short Style of Cheng Manching from an experienced instructor.</p>	<p>20 hours/ 13 weeks</p>	<p>PDQ-39; UPDRS III; Berg Balance Scale; Timed Up and Go; 6 minute walk test; Freezing of gait questionnaire; Forward and backward gait; Gait velocity; Stride length; Single support time; Exit questionnaire; Tandem Stance Test (TS); One Leg Stance test (OLS).</p>

	Exclusion criteria: history of neurological deficit other than Parkinson's disease, dementia, another measure of cognitive function and a separate part of the study not reported where all participants were required to perform a subtraction task while walking (all completed with 85% accuracy), considered cognitively intact.			
Marjama-Lyons 2002 [61] (Abstract, published data only)	Inclusion criteria: Levodopa responsive Parkinson's disease, Hoehn and Yahr Stage 1.5-3. No exclusion criteria.	Tai Chi classes.	24 hours/ 12 weeks	UPDRS motor score (part III); Fall frequency form; Balance master Limits of Stability; Global Assessment of Change.
Purchas 2007 [62] (Abstract, published and unpublished data)	Inclusion criteria: maintenance phase of Parkinson's disease. No exclusion criteria.	Tai Chi training.	12 hours/ 12 weeks	Timed Up and Go Test; PDQ-39; UPDRS; Hoehn and Yahr stage; Falls diary.
Schmitz-Hubsch 2006 [63]	Inclusion criteria: participants diagnosed with Parkinson's disease according to the UK Brain Bank Criteria at any stage of the disease with or without motor complications, MMSE >24. Exclusion criteria: previous practical experience with Qigong, recent (<1 month) or planned change of medication, signs of central nervous system disease	Group lesson of Qigong delivered by an experienced teacher. Exercises were carried out standing or in the sitting position adjusted to participants physical abilities. Teacher repeatedly stressed importance of home self exercise.	16 hours/ 24 weeks	UPDRS III; PDQ-39; Montgomery-Asperg Depression Rating Scale; Non-motor symptoms; Self reporting questionnaire.

	other than Parkinson's disease e.g. aphasia or dementia (defined by MMSE <24).			
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