

Exercise and Parkinson's update: are your patients getting the right dose?

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2021

This article was first published in In Touch Spring 2021 edition on 24.03.2021.

Exercise and Parkinson's update: are your patients getting the right dose?

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QAP COMMENT

This article is rich in detailed, clinical suggestions regarding assessment, treatment options and progressions of people with Parkinson's (PwP) and highlights the fact that, in order to deliver clinical excellence, we need to have an in-depth understanding of the patient population we are aiming to serve. In the case of PwP, that includes how we address and improve the physical and mental health of the person we are treating, as well as understanding to what extent their medication and possible comorbidities

impact on them. Triangulating this information will form the basis of our physiotherapy intervention. Working in silos does not serve our Parkinson's patients well, and this article illuminates the necessity of working in tandem with consultants, allied health professionals and specialist support groups.

Early physiotherapy intervention is important to support changes in exercise behaviour and build physical activity into daily routine with individually tailored

exercise programmes that target the specific needs of PwP. Our Physio First Quality status reflects our measured data and outcomes that are key in tracking clinical results, and demonstrates the worth of physiotherapy to internal and external stakeholders, and especially for those practitioners who are considering, or are currently offering, a physiotherapy service to Parkinson's patients.

Reviewed by
Tobias Bremer

LEARNING OUTCOMES

TO SUPPORT PHYSIO FIRST QAP

- 1 Be aware of the updated research into Parkinson's.
- 2 Understand how to adapt assessment for PwP.
- 3 Understand the importance of focused, goal-centred treatment and early intervention.
- 4 Be aware of the benefits of exercise and how to guide adaptations of exercise for the Parkinson's community.
- 5 Understand the complexities and variant forms that make up Parkinson's.
- 6 Understand the role medication plays at various time points in PwP.

A brief update on the research into Parkinson's

Parkinson's is the second most common neurodegenerative disorder (Dorsey *et al* 2018; Dorsey & Bloem 2018). Prevalence of Parkinson's increases with age (Pringsheim *et al* 2014); therefore, with an ageing society, the global prevalence of Parkinson's is estimated to rise to 12 million by 2040 (Parkinson's UK 2019), making Parkinson's the fastest growing neurodegenerative condition (Dorsey *et al* 2018). Historically, Parkinson's was classified as a motor condition with diagnosis based on the cardinal motor symptoms of tremor, bradykinesia, rigidity and postural instability. However, Parkinson's is now recognised as a broader condition with more than 40

symptoms including non-motor symptoms (NMS), which can pre-date the classic motor symptoms by up to between five to 10 years and continue to persist as the condition progresses (Chaudhuri & Naidu 2008). NMS such as depression, anxiety, fatigue, cognitive impairment and apathy are highly prevalent and increase the burden on Parkinson's patients and society (Martinez-Martin *et al* 2012). The financial burden on PwP and their families amounts to more than £16,500 per household a year (Parkinson's UK 2017), with the societal costs of Parkinson's exceeding £20,000 per PwP per annum (Gumber *et al* 2017). A significant proportion of costs are associated with hospitalisation and long-term care. Physiotherapy has a pivotal role to support PwP to remain actively living at

"THE GLOBAL PREVALENCE OF PARKINSON'S IS ESTIMATED TO RISE TO 12 MILLION BY 2040"

(PARKINSON'S UK 2019)

home, which can serve to reduce both the personal and societal financial burden associated with Parkinson's.

The classic Parkinson's primary motor symptoms include: tremor, rigidity, bradykinesia and postural instability. Motor symptoms predispose Parkinson's patients to muscle atrophy and joint stiffness, altering movement biomechanics, leading to movement dysfunction, postural instability and, ultimately, reduced physical capacity. Thus, when combined with NMS, a vicious cycle is initiated promoting inactivity and reduced functional performance. These in turn instigate a fear of movement and falling (Jonasson *et al* 2018) ultimately contributing to social isolation and reduced participation in activity (Hunter *et al* 2019). Gait dysfunction that causes the short, shuffling festinating gait pattern synonymous with Parkinson's is commonly cited as the most debilitating symptom. It often results in stop-start hesitation, initiation failure, and makes it difficult for the individual to change direction, accelerate and decelerate. Owing to its progressive nature and symptom diversity, the management of Parkinson's is complex. No cure currently exists and symptom management is reliant upon medication which targets dopamine imbalance through a variety of different mechanisms. Although medication is beneficial, it serves only to reduce the impact of symptoms, it does not address pathological progression (Ferrazzoli *et al* 2018), and the effects of medication are time-limited with debilitating motor fluctuations and dyskinesias associated with long-term use. Private physiotherapists are ideally placed to assess and treat the broad neuromusculoskeletal Parkinson's symptoms and provide the individualised therapy that can help PwP to maintain their current abilities and enhance their physical capacity.

Best practice in Parkinson's

The complexity and diversity of Parkinson's necessitates a team-based approach, combining the experience of the patient and the input of several healthcare professions (Rajan *et al* 2020). The NICE Guidelines for Parkinson's advocate access to specialist teams, and a Parkinson's specialist physiotherapist is particularly associated with improved health outcomes, cost effectiveness and reduced hospital admissions (Ypinga *et al* 2018). The allied health professional (AHP) competency framework for progressive neurological conditions highlights key competencies for AHPs working with Parkinson's patients, to guide practice. We recognise that Parkinson's often forms a minor part of the physiotherapy caseload, but we maintain that clinicians are able to upskill sufficiently to treat this patient group by accessing a range of excellent resources such as joining the Parkinson's Excellence Exercise Hub, LSVT, PD Warrior and / or other specialist forums. Parkinson's UK, Neurological Academy, Movement Disorders Society, Davis Phinney Foundation and the Michael J Fox foundation are all excellent websites which we would recommend to physiotherapists to help support your practice.

The value of exercise

Exercise is regarded as the new medicine for Parkinson's as it positively impacts on both motor and non-motor symptoms (Radder *et al* 2020). Systematic reviews have demonstrated that exercise is associated with improved strength, gait, balance and function as well as cognition

(Lima *et al* 2013; Cusso *et al* 2016; Lauze *et al* 2016). Emerging research also suggests that high intensity exercise induces neurophysiological changes within the brain promoting neuronal health (Hirsch *et al* 2018), which serves to slow down the rate of decline seen in Parkinson's patients. Exercise, therefore, not only has capacity to lessen the symptom burden of Parkinson's, but also holds the potential to limit the rate of disease progression. As physical activity tends to decline in Parkinson's patients at diagnosis, management intervention, and exercise in particular, needs to be commenced ideally from that point.

KEY MESSAGE ON PARKINSON'S

- The prevalence of Parkinson's is rising
- Parkinson's is a complex condition, with more than 40 motor and non-motor symptoms
- Exercise is beneficial for PwP from diagnosis.

Assessment

Owing to the diversity of symptoms, a person-centered approach is advocated. As with many long-term conditions, assessment for Parkinson's needs to look beyond the impairment and focus on participation and psychosocial well-being. The following section aims to highlight the key adaptations required in assessing patients with Parkinson's and signposting resources to aid in that assessment. For example, supplying the client with a self-assessment form such as Appendix 2 of the European Physiotherapy Guidelines for Parkinson's Disease, and goal planning sheets is advisable prior to the initial assessment as bradyphrenia (slowness of thought) and micrographia (reduction in writing amplitude) can be common symptoms that cause anxiety to the patient when attending clinic. Additionally, tracking ➤

"A PARKINSON'S SPECIALIST PHYSIOTHERAPIST IS PARTICULARLY ASSOCIATED WITH IMPROVED HEALTH OUTCOMES, COST EFFECTIVENESS AND REDUCED HOSPITAL ADMISSIONS"

(YPINGA *et al* 2018)

physical activity data digitally and reviewing the patient conducting functional task via video footage are also recommended methods of assessment and management.

Table 1 defines the key Parkinsonian symptoms and provides an overview of assessment approaches. More in-depth discussion of assessment guidance can be located within the European Physiotherapy guidelines.

SYMPTOM	DEFINITION	ASSESSMENT CONSIDERATIONS
Bradykinesia	Bradykinesia results in slowing of movement, associated with a loss of amplitude and, in time, active range of movement and strength through range becomes compromised.	Observe repetitive movement in upper limb, such as opening and closing of the fist, and repeated hip flexion in sitting. Observe the frequency and amplitude of movement and differences between left and right sides.
Rigidity	Ratchet-like start-and-stop movements through the range of motion of a joint, commonly termed cogwheel rigidity.	Commonly occurs initially in spine progressing to the limbs. Assess passively, comparing left and right sides. Active movement of the ipsilateral limb intensifies rigidity on contralateral side.
Tremor	Slow, rhythmic tremor which typically starts in the upper limb and progresses distally to the lower limb which, with time, becomes bilateral. Parkinson's tremor can also occur in the jaw, chin, mouth, or tongue.	Observed often in the hands. This may not be a significant issue for the patient so treatment should be led by their goals. This symptom increases with stress and tiredness, so can be a good indicator of the general mood of the patient prior to treatment.
Freezing of gait, and festination	An inability to initiate a step, with no apparent cause. Can be exacerbated by stress or distraction. Typical presentation includes reduced spatiotemporal gait parameters with increased cadence to maintain speed. Gait dysfunction also includes problems with acceleration, deceleration and negotiating obstacles.	Assess gait in straight line, and then with turns and obstacles and review impact on spatiotemporal parameters. Assess gait with addition of a dual task, either cognitive, i.e. counting backwards from 100 in 7's, or with a function task, i.e. carrying a tray with cups on it, and assess impact on gait quality.
Dyskinesia	Rapid, random, jerky movement. Involuntary muscle movements, including those similar to chorea, and diminished voluntary movements.	Arises from lack of regulation in the transmission of synthetic dopamine from medication. As the disease progresses people with this element of dysfunction have to make daily choices about whether they want to be slow and stiff or contend with the dyskinesia movements.
Postural instability	An impaired ability to achieve equilibrium which compromises the ability to maintain and change posture.	Checking lateral and up and downward gaze. Assessment of both static and dynamic and balance reaction, in particular step shifting, turning and backwards walking.
Dystonia	Sustained muscle contraction that particularly affects the feet. This is a later stage symptom.	Requires regular assessment to ensure maintenance of muscle length and joint ROM to avoid formation of contracture (Termsarasab <i>et al</i> 2016).

TABLE 1: Key symptoms of Parkinson's and a guide to the assessment

“EXERCISE NOT ONLY HAS CAPACITY TO LESSEN THE SYMPTOM BURDEN OF PARKINSON'S, BUT ALSO HOLDS THE POTENTIAL TO LIMIT THE RATE OF DISEASE PROGRESSION”

History taking

The European Guidelines have a quick reference card for history and physical examination that serves as a great reference for physiotherapy clinics.

Medical information

There is a range of forms of Parkinson's and clarification should be sought on the type the patient is presenting with, i.e. idiopathic, multi system atrophy, progressive supranuclear palsy, or secondary Parkinsonism. The symptom profile and condition trajectory differ considerably between these different types and therefore require different management approaches. In the absence of any diagnostic tests for Parkinson's, it is preferable that diagnosis is made clinically by a specialist Consultant. Many patients will have undergone CT or MRI scans, or had blood tests, but these are commonly undertaken in order to rule out other pathologies such as stroke. A DaT scan allows for visualisation of dopamine transporter levels within the CNS, but this is not a routine test carried out in the UK.

Medication

For Parkinson's patients medication is the mainstay of management. As previously mentioned, it does, however, have a time-limited effect and many people experience end-of-dose deterioration, or wearing off, whereby the window of medication effectiveness reduces over time. It is important to know when patients usually take their medication and their diurnal activity pattern, as careful consideration should be given to whether assessment and treatment should be undertaken during a period when the patient is medically optimized, or when they are in an off-medication phase which might more realistically reflect their abilities. Liaison with the Parkinson's specialist nurse is essential to optimise medication management, and the Parkinson's UK website and European Guidelines (table 2) provide a good overview of medication types and their potential side effects.

LEVODOPA: Main drug preparation used, in isolation or in combination with other Parkinson medication. Levodopa crosses the blood brain barrier, increasing available dopamine within the brain.

GENERIC NAME	BRAND NAME	SIDE EFFECTS
Co-beneldopa	Madopar: controlled release (CR) and dispersible preparations	<ul style="list-style-type: none"> Becomes less effective over time Wearing off phenomenon – effect of drugs wears off before the next dose is due Long-term use associated with development of dyskinesia Impulsive or compulsive behaviour Nausea and / or vomiting Hypotension Anxiety and depression Sleep problems
Co-careldopa	Sinemet Sinemet CR Apodespan PR (prolonged release) Caramet CR Lecado MR (modified release) Duodopa (intestinal administration)	

DOPAMINE AGONISTS: These drugs mimic the way dopamine works to reduce symptoms. Typically prescribed early and may be prescribed in combination with Levodopa or other Parkinson's medication.

Pramipexole	Mirapexin (including PR Version) Pipexus Glepark Oprymea Zentiva	<ul style="list-style-type: none"> Sleepiness Fainting Impulsive and compulsive behaviours Hallucinations Delusions Hypotension Nausea and vomiting Constipation Anxiety and depression Headaches
Ropineroles	Adartel Ralnea (PR) Requip (including PR Version) Spiroco XL (PR) Ipinnia XL (PR) Ropiner XL (PR) Ropilynz (PR)	
Rotigotone	Neupro (skin patch)	
Apomorphine	Apo-go Daception Both drugs – pen injection or continuous infusion pump	

MAO-B INHIBITORS: MAO-B enzymes break down dopamine. Therefore this class of drugs inhibits the action of this enzyme, therefore increasing the amount of dopamine available for use. This drug can be used independently and / or in combination with other Parkinson's medication. Taking MAO-B inhibitors may reduce the dose and frequency of taking Levodopa. Early use: used to delay taking Levodopa. Later use: minimise motor fluctuation.

Rasagiline	Azilect	<p>As for Levodopa above. In addition:</p> <ul style="list-style-type: none"> Dyskinesia Dry mouth Constipation Headaches Urgent need to pass urine Indigestion Aching joints Flu-like symptoms <p>NB: Cannot be taken with all types of anti-depressant due to impact on Bp</p>
Selegiline	Eldepryl Zelapar	
Safinamide	Xadago	

COMT INHIBITORS: These drugs block COMT enzymes which break down Levodopa in the brain, resulting in more Levodopa being available for use and for longer. These drugs are used alongside Levodopa not in isolation. Commonly used for people experiencing wearing off. Taking COMT inhibitors may reduce the dose and frequency of taking Levodopa.

Entacapone	Comtess	<p>May colour urine (redish / brown) Diarrhoea Tolcapone – potential liver damage, requires regular blood tests Worsening of Levodopa side effects</p> <ul style="list-style-type: none"> Sleeping problems Loss of appetite Dizziness / fainting Falls Hallucinations Chest pains Confusions
Co-careldopa and entacapone	Stelevo Sastravi Stanvek	
Tolcapone	Tasmar	
Opicapone	Ongentys	

TABLE 2: Adapted from Drug Treatments for Parkinson's produced by Parkinson's UK

Cognition

Up to half of PwP have, from the point of diagnosis, some form of cognitive impairment (Williams-Gray *et al* 2013). This can take the form of impaired executive functioning or reasoning, problem solving, lack of working memory and poor action planning. Due to the insidious nature of Parkinson's, these symptoms are initially easily masked. Dual task interference is common (Rochester *et al* 2014) and manifests in the deterioration of one or both tasks a patient undertakes simultaneously, i.e. walking and talking (Plummer *et al* 2013). Dual task interference leads to gait variability, postural instability (Rochester *et al* 2014), and is associated with an increased risk of falls (Heinzel *et al* 2016). To establish the impact of cognitive load on functional tasks it is therefore worth considering combining gait assessment with a cognitive task, e.g. ask the patient to count backwards from 100 in increments of seven.

Falls

Every year, more than half of the population of Parkinson's patients will experience a fall (Paul *et al* 2014), and a large proportion (50–86%) of that group will fall recurrently (Allen *et al* 2013). The risk of falls and fractures rises steadily from the age of 40 (Pelicioni *et al* 2019). The cause of falls in PwP is often multifactorial, however orthostatic hypotension, a common NMS, when combined with effects of medication, can be a principal cause of falls and this may require further medical intervention to alleviate the falls risk.

Outcome measures

Hefford *et al* (2011) stated that “Outcome measures should be: relevant to patients' values and perceived needs; measuring aspects of health and function that are relevant to the treatment offered; have sound psychometric properties; be quick and easy to complete and score”.

In addition, outcome measures should also provide clinically meaningful information that is useful to the clinician for decision making regarding patient

care. Therefore, outcome measurement should be selected in relation to the patient's needs and goals. Owing to the diversity of symptoms that a patient with Parkinson's may present with, a number of measures might be required. The European Guidelines provide an evidence based list of measures which are validated for Parkinson's. Table 3 provides an overview of key clinical measures used by Parkinson's specialists across the UK who are members of the Parkinson's Excellence Network Exercise Hub. Dr Ramaswamy OBE has produced an excellent course entitled *Parkinson's Outcome Measures Case Study* that is available on Physiopedia that illustrates commonly used measures, and provides guidance on the speed and clarity required to elicit accurate and repeatable outcomes in patients with Parkinson's.

Key treatment focus areas

As with any other patient, treatment for Parkinson's patients needs to be individualised and driven by their symptom profile, as well as their needs and goals. The primary motor symptoms that occur in Parkinson's, i.e. bradykinesia, rigidity, tremor, postural instability, will negatively impact on active range of movement which will, over time, result in compromised strength and altered biomechanics of movement that will lead to movement dysfunction, postural instability and balance dysfunction. In light of this potential outcome for the patient with Parkinson's, some of the following are key areas in which to focus treatment delivery.

AXIAL MOBILITY

People with Parkinson's will, over time, become increasing kyphotic with reduction in segmental selectivity and control. The loss of spinal rotation negatively impacts movement biomechanics especially during gait, as well as in functional tasks. Treatments that focus on trunk elongation, flexibility, proprioception and segmental isolation are recommended and can encompass manual techniques, as well as adjuncts such as exercise and taping.

"OUTCOME MEASUREMENT SHOULD BE SELECTED IN RELATION TO THE PATIENT'S NEEDS AND GOALS"

ASSESSMENT DOMAIN	MEASUREMENT TOOL
Strength	Timed sit to stand Number of sit to stands in 30 seconds
Balance	MiniBESTest BESTest TUAG mTUAG (manual) Tinetti Berg balance scale Functional reach
Gait	10MWT Functional gait assessment Tinetti TUAG 6MWT
Falls	Activities specific balance confidence scale (ABC) Four square step test
Dual tasking	cTUAG (cognitive) MMSE

TABLE 3: Key clinical measures used by Parkinson's specialists in the UK

SHOULDER GIRDLE AND JOINT MOBILITY

Shoulder issues can be early indications of Parkinson's that often pre-date other typical motor symptoms. Loss of arm swing precipitates a number of neuromuscular problems, including shoulder impingement, but also affects trunk rotation and reduces lateral weight transference during gait which impacts gait biomechanics in the lower limb. Focus should be on addressing loss of range, promoting range of movement, and incorporating amplitude into functional tasks when walking.

STRENGTH

There is a lack of consensus regarding whether muscle weakness is a primary or secondary symptom of Parkinson's. However, there is agreement that PwP demonstrate significant lower muscle strength when compared to age matched controls (Roeder *et al* 2015). Treatment for strength should focus on the key stability muscles of the hip, knee and pelvis. Addressing power, by building

in a speed component to strength training, is especially valuable in helping to manage the effects of bradykinesia. Careful consideration should be given to specificity of training as, while gym-based equipment will promote muscle hypertrophy, this approach may not translate to functional benefit.

BALANCE

Creative exercises that combine the activity of the upper and lower limbs can increase cognitive demand and aim to challenge balance and be progressive in nature. While part practice may initially be beneficial to hone technique and precision, motor planning and execution are problematic in Parkinson's patients, so random practice is recommended. In balance exercise it is advocated to build in large amplitude movements for upper limb combined with spinal rotation, such as step standing with upper limb swing.

GAIT

Treatment of gait should address pace, rhythm, variability, asymmetry and postural control (Lord *et al* 2014; Morris *et al* 2017). Videoing patients' walking is both a valuable outcome tool and one that is powerful in encouraging behavioural change as it can motivate and educate patients with Parkinson's with regard to their gait dysfunction. Those with altered gait rhythm, or freezing, may benefit from visual, auditory or somatosensory cueing via spatial (lines on the floor) or temporal (a metronomic beat) feedback to facilitate maintenance of gait rhythm, in particular initiation. Visual cues can take the form of markers on the floor, targets for stepping in and on to, laser pointer beams and embedded light beams from frames, sticks or shoes, all of which aim to improve step and stride length. Sound cues can be helpful and are most commonly used by encouraging the patient to step to a regular metronome style beat or highly rhythmical music

delivered through ear or chest clip on devices. Auditory cues are optimised when set at 5-10% above normal baseline cadence (Nieuwboer *et al* 2007).

Cueing methods are an effective treatment for patients with festinating or freezing (FOG) episodes but it is worth noting that, over time, there might be a tendency to habituate, or that disease progression may decrease the value of this approach. Also, while any of these methods will have some degree of success, as with all clinical practice it is essential to establish with your patient what treatment methods works best for them (Muthukrishnan *et al* 2019).

KEY MESSAGE ON TREATMENT

- Early intervention is important (as noted in the NICE guidelines)
- Be creative in treatment approaches, use your treatment tool box. Manual therapy may have its place to improve joint motion dynamic prior to applying k-tape to improve movement proprioception prior to adopting a strength programme
- Use outcome measures as treatments to motivate patients to improve their scores.

Exercise prescription

The evidence is clear that exercise is beneficial for PwP (Ellis & Rochester 2018). Despite this, many PwP do not achieve the recommended amount or intensity of exercise, with a significant proportion demonstrating high levels of sedentary behaviour (Lord *et al* 2013). Systematic reviews suggest that exercise is beneficial both for improving gait, strength, aerobic capacity and balance, as well as for non-motor symptoms such as cognition and fatigue. What is undetermined within the literature, however, is the optimum type and dosage of exercise.

Similar to prescribing medication, exercise prescription needs careful consideration and, while it may be contextualised by their Parkinson’s

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symptoms, exercise should be guided by the needs of the individual, their personal goals and what they enjoy. Owing to the diversity of symptoms, any one type of exercise will not be effective and so a multimodal approach is required. Non-motor symptoms such as apathy and fatigue may require prescription of smaller bouts of exercise, known as exercise snacking that aims to develop endurance and self-efficacy with exercise. Whereas postural hypotension and autonomic dysfunction, which are common in PwP (Mol *et al* 2018), may require a graded approach to prescription to ensure safety. Further, people over the age of 65 typically present with two or more chronic conditions (Kingston *et al* 2018), which can add further complexity to building an exercise programme for Parkinson’s patients in this age group. Synopsis from the literature would indicate that exercises should include the components that address

strength, balance, flexibility, endurance, amplitude, functionality and cognition (table 4).

The FITT principles can be used to guide prescription (table 5), while also considering the principles of specificity, overload, reversibility and progression. Specificity is key so exercise prescription should be relevant and appropriate to the patient’s needs and goals. If patients report a short shuffling gait with tendency for initiation, failure to stop or start, and hesitation when walking somewhere busy or crowded such as a garden centre, then consideration needs to be given to ensuring exercise prescription is progressive in nature, with part practice, before progressing to block and random practice of movement sequences. Progression is typically associated with duration, intensity and frequency of exercise but adding a cognitive challenge or a goal orientated task should also be considered. ➡

EXERCISE TYPE	CONSIDERATIONS
Strength	Focus on the muscles of the hip, knee and ankle regions to promote stability. Using own body weight, resistance bands or gym based equipment. Specificity of training and overload principles need consideration, consider combined movements and muscle groups, theming of prescription, e.g. forward lunge, abducting the shoulders as they step forwards to promote shoulder flexor stretch, spinal extension, and amplitude of movement.
Balance	Specificity of training is key. Balance most commonly challenged by changing direction, with acceleration and deceleration, and shifting from one movement pattern to another. Dynamic balance training is required for those in early to mid-stages.
Endurance	Build up gradually to moderate intensity of 10-13 on rated perceived exertion (RPE) scale to working at high intensity of 15-17. Consider circuit based approach to sustain heart rate levels when exercising as appropriate, e.g. combining upper limb movements with step up to increase aerobic intensity.
Flexibility	Focus on spine, hip, knee shoulder and ankle ROM. Reduced range often associated with muscle tightness. If no contraindications, consider range of modalities used to promote muscle lengthening and flexibility.
Amplitude	People with Parkinson’s movements are small, noted early in the condition with a loss of UL arm swing. Exercise feedback should focus patient’s minds of the size of their movement. Amplitude exercise can be incorporated into a variety of exercises.

TABLE 4: The Parkinson’s exercise framework: developed by professionals from the Parkinson’s Excellence Network, this is an overview of exercise options for goal setting optimum movement, strength and balance gains in PwP

Parkinson's patients should be supported, within these prescription principles, to embed exercise within their everyday lifestyles. The Activity Wheel used in conjunction with the Parkinson's exercise framework, will help to guide both the physiotherapist and the patient in identifying exercises that ensure they address individual need.

The three key Parkinson's specific, internationally recognised exercise approaches are PDWarrior, Parkinson's Wellness Recovery (PWR) and LSVTBig, all of which have a common emphasis on amplitude of movement, intensity and frequency of exercise.

PDWarrior was developed in Australia, and has proved popular in the UK among professionals and PwP. This neuroactive programme is offered via classes, several of which are run in the

LSVTBig has the most substantive evidence but is not routinely practised in its purest form in the UK. Uptake is limited as LSVTBig is delivered 1:1 five days a week for four weeks, which is a considerable commitment for the therapist and patient.

Parkinson's groups in the UK are now linking up with specialists in sports such as boxing and golf. Dance is widely encouraged with specific programmes developed by the organisations such as the Royal Ballet. Yoga, Pilates and tai chi all offer classes and training in techniques especially for PwP, and Nordic Walking groups are now up-skilling to manage this population in their settings. A new charity has been launched recently by individuals with Parkinson's who are involved in team sports (www.sportparkinsons.com) in order to link PwP with specialist sports

F = frequency	Aim to promote daily physical activity, with working up to prescribing moderate exercise five times a week, or up to 150mins of moderate intensity exercise. Consider use of self-monitoring through activity trackers, or activity diaries to involve patients with monitoring progress. See exercise framework for further detail.
I = intensity	Higher intensity is associated with potential for neuro-restoration; however gradual approach is likely to be required. Consider interval training, circuits to assist in building up capacity. Be mindful of postural hypotension, both pre and post exercise, as well as co-existing morbidities.
T = type	Exercise will vary owing to the diversity of symptoms experienced. Prescription must be individualised as no two people with Parkinson's have the same symptom profile. Be creative with prescription, so that the exercises within a programme serve more than one function. Be mindful of potential cognitive dysfunction and keep exercise simple, with brief clear instructions.
T = time	This will be driven by the patient. Initially consideration may be given to 'exercise snacking' that builds towards exercising for 30-45 minute sessions.

TABLE 5: The FITT principles

UK, and through its PDWarrior app, and is aimed at driving neuroplasticity through high-intensity Parkinson's specific exercises. Normally run over a 10-week period, it includes eight core moves that target key Parkinson's symptoms.

PWR is an American programme with a functional amplitude focus that incorporates four basic moves to target key Parkinson's symptoms, with emphasis on large amplitude, high effort, antigravity extension, weight shifting, axial mobility and transitional movements.

groups in the UK. The Parkinson's UK website also has a postcode based search engine to help link people to locally offered exercise programmes. Knowing where to find local sports and activity providers that have appropriate

"SPECIFICITY IS KEY SO EXERCISE PRESCRIPTION SHOULD BE RELEVANT AND APPROPRIATE TO THE PATIENT'S NEEDS AND GOALS"

programmes for your Parkinson's patients is key to ensuring that exercise signposting can be linked to providers with the correct skills to manage this condition.

Settings

Quantitative studies (Ellis *et al* 2013) and qualitative reviews (Hunter *et al* 2019; Newitt *et al* 2015) both highlight that PwP experience many barriers to exercise participation. These can include environmental, interpersonal and intrapersonal, all of which need to be considered when prescribing exercise programmes. For those patients who are sedentary or exercise novices, it is preferable, initially, to offer 1:1 supervised exercise in order to develop their self-confidence with exercise. Prescribing exercise alongside targeted education and behaviour change interventions may encourage long-term adherence to exercise that continues after the patient no longer requires physiotherapy, and this can be supported by referral to community based exercise providers via the Parkinson's UK search tool, as previously described. Participation in group exercise options has the additional merit of offering socialisation, the opportunity for camaraderie and shared experience and so have wider health and wellbeing

"KNOWING WHERE TO FIND LOCAL SPORTS AND ACTIVITY PROVIDERS THAT HAVE PROGRAMMES FOR PWP IS KEY TO ENSURING THAT YOUR EXERCISE SIGNPOSTING CAN BE LINKED TO PROVIDERS WITH THE CORRECT SKILLS TO MANAGE THIS CONDITION"

benefits that can encourage PwP to continue with exercise and activity programmes.

KEY MESSAGE ON EXERCISE

- Exercise is as important as medication
- Exercise should be daily
- Exercise programmes should incorporate strength, balance, aerobic, flexibility, amplitude and be function based.
- PwP should be supported to exercise at moderate to high intensities

Conclusions

Parkinson's is the fastest growing neurological condition (Dorsey *et al* 2018). Assessment and treatment needs to be adapted to accommodate the wide range of motor and non-motor symptoms seen in Parkinson's. People with Parkinson's present with a unique combination of neuromusculoskeletal symptoms which require a range of different therapeutic approaches to effectively manage. However, exercise prescription is regarded as the most positive approach to achieve disease medication for this population (Mak *et al* 2017). Exercise intervention should be commenced from the point of diagnosis with regular patient-centred sessions that progress to up to five sessions a week of moderate to high-intensity activity.

About the authors

Beccy Oliver has specialised in Parkinson's therapy and exercise since, as an inpatient, she participated in her local Parkinson's UK branch exercise class in 2010. She is now an independent physiotherapist, specialising in neurology at Thorpe Physiotherapy in the Surrey area. In 2015, Beccy, together with Bhanu Ramaswamy OBE, pioneered the Exercise Hub with the aim of collaborating with professionals across the UK to raise the standards of research based exercise prescription. The Hub currently has more than 200 members, and warmly welcomes newcomers. For more details please email excellence@Parkinsonsuk.org

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Julie Jones is a Senior Lecturer in Physiotherapy at Robert Gordon University, Aberdeen, and is a Chief Scientist Office and Parkinson's UK Clinical Academic Fellow. Julie was awarded a Clinical Fellowship in 2019 to undertake a three-year programme of research into exercise for people with Parkinson's. She is a member of the Parkinson's UK Strategic Advisory Board in Scotland and is the Chair of the lottery funded Parkinson's Active project. Julie continues to work clinically and remains actively involved in undergraduate and postgraduate teaching.

Further Resources

Drug Treatments for Parkinson's produced by Parkinson's UK: www.parkinsons.org.uk (search drug treatment)

Parkinson's Excellence Network: www.parkinsons.org.uk (professional / your network)

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