Physiotherapy and exercise for progressive neurological conditions

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Delegates have access to a wide variety of comprehensive guidance material. If Delegates require further information on access or planning matters, they are to call the TAPS line for advice.

The Research Team are unable to ensure that the information listed below provides an accurate & up-to-date snapshot of these matters

Research questions:

What is considered best practice for the frequency and duration of physiotherapy and exercise physiology for progressive neurological conditions?

Are there any contraindications for use of a delegated care model for these supports with this population (e.g. using therapy assistants)?

What are the risks and contraindications of physiotherapy and exercise physiology based on disease progression with these populations (i.e. is there a time when hands on therapy should not be provided as risks outweigh benefits)?

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1. Contents

2. Summary

This paper considers the use of physiotherapy and exercise interventions for people with progressive neurological conditions including amyotrophic lateral sclerosis (ALS) and motor neuron disease (MND), Parkinson's disease (PD), multiple sclerosis (MS), and muscular dystrophy (MD). This paper focusses on evidence of optimal frequency and duration of physiotherapy and exercise interventions, risks associated with interventions, differing care for early or late stages of progression and the use of therapy assistants through a delegated care model.

No studies were found that address the role of therapy assistants in the delivery of physiotherapy or exercise interventions for people with progressive neurological conditions. Some evidence suggests that the use of therapy assistants in acute hospital settings and general community settings is safe and effective. This evidence is uncertain and further research is required.

There is limited evidence regarding optimal dosage of physiotherapy and exercise interventions for people with progressive neurological conditions. Clinical practice guidelines for PD and MS provided recommendations for frequency and duration of physiotherapy and exercise interventions. However, it is likely that these recommendations are based primarily on clinical judgement rather than published evidence. One 2023 systematic review was able to determine that at least twice weekly sessions of more than 40 minutes is an effective dose of exercise intervention for the improvement of balance in MS (Corrini et al, 2023). No other studies could provide evidence-based dosage recommendations.

Where evidence is not clear, guidelines generally recommend that type, frequency, duration and intensity of physiotherapy or exercise interventions should be determined individually based on the needs and preferences of the person receiving treatment.

Despite some issues with the proper reporting of adverse events in experimental studies, exercise interventions for people with progressive neurological conditions are generally believed to be safe, provided that standard safety precautions are observed.

There is little evidence regarding safety and effectiveness of physiotherapy and exercise interventions for people at late stages of progressive neurological conditions. Most research focusses on people with mild to moderate symptom severity.

3. Previous TAPIB research

Other relevant TAPIB research papers include:

- RES 322 Manual therapy to address neuromusculoskeletal function
- RES 321 Osteopathy
- RES 318 Exercise physiology and stroke
- RES 289 Lokomat Therapy

- RES 264 Chiropractic
- RES 233 Virtual reality as a support tool
- RES 191 Massage Therapy as a Treatment for Multiple Sclerosis

4. Therapy assistants

Therapy assistants are

> support staff who complete clinical and non-clinical tasks under the supervision and delegation of an allied health professional. Clinical tasks include any direct therapeutic interventions provided to patients such as exercise therapy and education, while non-clinical tasks may include administration duties (eg, completing paperwork for equipment hire), maintenance of equipment and cleaning the clinical environment. Because allied health assistants cannot perform clinical tasks that involve diagnosing or assessing patient health conditions, allied health professionals must perform a comprehensive assessment of the patient and prescribe appropriate therapy prior to delegating the allied health assistant to perform any clinical tasks. (Snowdon et al, 2024, p.2).

In a survey of 232 UK-based physiotherapists, 81% of respondents indicated that they at least sometimes delegate the supervision of prescribed exercises to therapy assistants (Sarigiovannis et al, 2022). The authors also found that delegation of clinical tasks to therapy assistants was more likely in less complex cases where there is a straightforward treatment plan. There is a perception that increased reliance on therapy assistants may compromise the quality or safety of the intervention (Snowdon et al, 2024). However, existing evidence suggests that physiotherapy or exercise interventions delivered by a therapy assistant are likely safe (Lau et al, 2024; Snowdon et al, 2020).

No studies were found that address the role of therapy assistants in the delivery of physiotherapy or exercise interventions for people with progressive neurological conditions. Where there is minimal research to date, there is a growing interest in the role of therapy assistants in completing clinical physiotherapy tasks (Snowdon et al, 2024; Sarigiovannis et al, 2023). Current research mostly considers the addition of therapy assistants to usual care rather than a model where physiotherapy or exercise interventions are primarily delivered by a therapy assistant (Snowdon et al, 2024; Lau et al, 2024; Snowdon et al, 2020). Some evidence points to the efficacy and safety of physiotherapy or exercise interventions delivered by therapy assistants. Additional supervised exercise sessions may improve outcomes regardless of whether it is delivered by a physiotherapist or therapy assistant (Snowdon et al, 2024; Lau et al, 2024; Baumann et al, 2023a-b; Sarigiovannis et al, 2023; Sarigiovannis et al, 2022; Sarigiovannis et al, 2021). Much of the research is based in a hospital setting and the roles of physiotherapist and therapy assistant are frequently poorly reported, so results may not generalise across all models of therapy assistance or patient cohorts (Sarigiovannis et al, 2021; Snowdon et al, 2020).

5. Amyotrophic lateral sclerosis / motor neuron disease

5.1 Frequency and duration

We did not find any reviews able to determine optimal frequency or duration of exercise or physiotherapy interventions for people with ALS/MND. One review (Zhou et al, 2022) showed inconsistent evidence that more intensive exercise training could slow the decline in functional capacity. However, the authors do not specify what they mean by 'intensive'.

A 2023 meta-analysis including 17 studies was unable to determine optimal exercise dosage due to the variability of intervention: "frequency ranged from 2×/week to 3×/day, up to 7 days/week, with repetitions of sets ranging from 20 to 25, intensity ranging from 30 to 60% of a patient's maximum value, and treatment duration ranging from 2 weeks to 2 years" (Donohue et al, 2023, p.19). Meng et al (2020) and Papadopolou et al (2024) were similarly unable to determine the most effective frequency, intensity, type, timing or duration of exercise-based interventions.

5.2 Risks

Researchers report some reluctance to prescribe exercise for people with ALS/MND due to possibility that exercise might lead to fatigue and faster progression of symptoms (MND Australia, 2021). However, recent reviews have found no serious adverse events in studies of exercise or physiotherapy intervention for people with ALS/MND (Papadopolou et al, 2024; Donohue et al, 2023; Meng et al, 2020). Researchers suggest that physiotherapy or exercise-based interventions are likely safe for people with ALS/MND.

5.3 Stage of progression

Minimal evidence is available for the efficacy of physiotherapy or exercise programs for people with more advanced ALS/MND. Donahue et al (2023) find some low certainty evidence that exercise programs are beneficial in early stages of disease progression. However, all of the studies included in their review explore exercise intervention only on those with low to moderate symptom severity.

Ireland's *Guidelines for the physiotherapy management of Motor Neuron Disease* (O'Callaghan, 2014), suggests physiotherapy treatment plans differentiate early, middle and late stages of progression. During the late stage, strategies to maintain function and manage symptoms may include:

- a stretching program
- active and passive range of movement exercises
- the use of assistive technology such as motomed or tilt table.

While evidence is presented for the efficacy of exercise at the early stages of MND, recommendations for strategies at the middle and late stages are based on clinical judgment of the authors.

6. Parkinson's Disease

6.1 Frequency and duration

There is no consensus on optimal frequency or duration of physiotherapy or exercise interventions for people with Parkinson's disease. Reviews report average frequency and duration of interventions used in studies but are unable to determine best practice timing (Ernst et al, 2024; El Hayek et al, 2023; Osborne et al, 2022; Grimes et al, 2019; NICE, 2017; Keus et al, 2014).

El Hayek et al (2023) reviewed 46 studies to determine most effective types, timing, frequency, duration, and outcomes of physiotherapy and exercise for people with Parkinson's disease. They found no significant difference between interventions and comparisons for frequency, duration or number of sessions.

A 2024 Cochrane review of studies on exercise intervention for people with Parkinson's disease was unable to draw conclusions regarding the optimal frequency of exercise intervention (Ernst et al ,2024). The authors observed a beneficial effect on functional mobility and balance in studies lasting longer than 12 weeks. However, they did not observe a significant effect of intervention duration on other outcomes.

Of four clinical practice guidelines that recommend the use of physiotherapy, exercise or physical activity for people with Parkinson's disease, only one provides recommendations regarding frequency and duration of activity (Osborne et al, 2022; Grimes et al, 2019; NICE, 2017; Keus et al, 2014). The *European Physiotherapy Guideline for Parkinson's Disease* (Keus et al, 2014) includes recommendations for minimum treatment period for seven physiotherapy modalities (refer to Table 1). However, the Guideline Development Group (GDG) responsible for the recommendations also note:

> Evidence-based information on the optimal number of sessions a week, session time and length of a treatment period are unavailable. These decisions will depend on the treatment goal, the selected intervention, the potential of the [person with Parkinson's disease] and the response to the treatment. GDG recommendations for minimum treatment period, frequency and session duration for each intervention category provided in this chapter are based on the averages of controlled clinical trials (CCTs) supportive to the 'for' recommendations (Keus et al, 2014, p.64)

Further, the GDG suggests that the optimal treatment period, duration and intensity will most likely never be determined due to the varied fitness levels, functional capacity and preferences of people with Parkinson's disease (Keus et al, 2014, p.72). This judgement is implicitly supported by the most recent clinical guideline from the American Physical Therapy

Association (Osborne et al, 2022). Osborne et al review 11 physiotherapy interventions and concludes there is still insufficient evidence to determine optimal dosing for any of the reviewed interventions.

Table 1 Minimum recommended treatment period for physiotherapy interventions (source: Keus et al, 2014)

Note: This table contains recommended minimum treatment periods from the *European Physiotherapy Guideline for Parkinson's Disease*. These recommendations are not the optimal dosage, but rather the average treatment period of studies that found beneficial effects of the intervention.

Intervention	Minutes	Per week	Weeks
Conventional physiotherapy	45	3	8
Treadmill training	30	3	4
Dance	60	2	10
Tai chi	60	2	24
Trigger point massage	45	2	8
Cueing	30	3	3
Complex motor sequences	30	3	3

6.2 Risks

Ernst et al (2024) reviewed 154 controlled studies of exercise interventions for people with Parkinson's disease. They found only 85 studies reported on presence or absence of adverse events. Falls were reported in 18 studies and pain in 10 studies. The authors note "although our review pointed out the difficulties in synthesizing the evidence on the comparative safety of different types of physical exercise, our results are consistent with previous research suggesting that, in general, physical exercise seems to be relatively safe" (p.64)

Osborne et al (2022) reviewed risks reported in studies of aerobic exercise, resistance training, balance training, flexibility training, external cueing, community-based exercise, gait training, task specific training, and a behaviour change approach. They note that there is minor risk if standard safety procedures are in place. People prescribed exercise should be screened for heart issues or other health concerns that would preclude moderate to high intensity exercise. If intensity and duration of exercise is increased, it should be done gradually to prevent injury. Minor musculoskeletal injuries were reported in studies of aerobic exercise, but these resolved. Falls and other adverse effects were reported in some studies, though no study

reported a more significant rate of adverse effects in the intervention group compared to the control group.

6.3 Stage of progression

Li et al (2023) suggest that exercise interventions are beneficial for people at advanced stages of Parkinson's disease to maintain function and health. However, this suggestion was not based on the results of their review, which found no evidence that exercise could limit progression of symptoms for people at advanced stages.

Other reviews have also been unable to determine whether exercise interventions are effective or safe for people at advanced at stages of Parkinson's progression (stages 4 or 5 of the Hoehn & Yahr scale). Ernst et al (2024) reviewed 154 studies and found most studies included participants at stages 1 – 3. No studies included participants at stage 5, while only 17 studies included participants at stage 4. Therefore, the authors note that their results may not apply to people at advanced stages of Parkinson's disease progression.

For most physiotherapy interventions reviewed by Osborne et al (2022), studies supporting the intervention focussed on mostly those with mild to moderate symptoms covering Hoehn & Yahr stages 1 to 3. Studies investigating external cueing and resistance, balance and flexibility training included participants at stages 1 to 4. None of the recommendations made by Osborne et al are relevant to people showing advanced stage 5 symptoms.

7. Multiple Sclerosis

7.1 Frequency and duration

A 2019 systematic review of clinical practice guidelines for exercise interventions for people with Multiple Sclerosis found consistent dosage recommendations for aerobic and resistance training:

> The literature we summarized consistently indicated that moderate-intensity aerobic training should be performed 2 to 3 days per week in 10- to 40-minute bouts. By achieving these guidelines, people with MS can potentially improve their cardiovascular fitness, mobility and symptoms of fatigue and depression. This should be complemented by 2 to 3 days of weekly resistance training, from which anticipated benefits could include: improved strength, balance, mobility, performance of activities of daily living, and symptoms of fatigue (Kim et al, 2019, p.9).

These recommendations may be based on a combination of experimental evidence and clinical judgement. However, considering the difficulty of deriving optimal dosage levels from the current evidence, it is likely that the recommendations in Kim et al represent a professional consensus rather than an evidence-based conclusion (Taul-Madsen et al, 2021; Edwards & Pilutti, 2017).

Corrini et al (2023) reviewed 20 randomised controlled trials looking at the effect of balance training programs for people with Multiple Sclerosis. They found high quality evidence that physiotherapy targeting balance has a moderate effect on improving balance as measured by the Berg Balance Scale. In addition, their meta-analysis was able to show that sessions lasting 40 minutes or longer produced a significant and clinically meaningful improvement in balance scores, while sessions lasting under 40 minutes did not produce statistically significant results. The authors concluded that:

> intense treatments lasting at least 40 [minutes] were associated with a better and more clinically meaningful improvement, and greater results can be reached when rehabilitation is provided over a short period (duration) and for a few sessions per week (frequency) (Corrini et al, 2023, p.20).

7.2 Risks

Learmonth et al (2023) searched for information on relapse and adverse events after exercise interventions for people with Multiple Sclerosis. They reviewed 40 randomised controlled trials including 1780 participants. The authors found no significant difference in adverse events between exercise intervention and comparison groups. The analysis

> did not reveal any significant variability in risk of exercise training across the potentially important factors of exercise type, delivery style (e.g. supervised, independent or remotely supervised), participant disability level or the prescription of exercise consistent with minimal exercise guidelines for persons with MS (Learmonth, 2023, p.1624).

While exercise interventions are generally considered safe for people with Multiple Sclerosis, safety precautions and modifications may be required depending on the needs of the individual. A 2019 systematic review of guidelines produced the following advice:

> An exercise prescription for people with MS should promote a safe and individualized exercise regimen. Thus, before prescribing an exercise routine, MS specific symptoms/characteristics (i.e., fatigue and heat sensitivity) should be identified and discussed, and the exercise prescription should include appropriate modifications. For example, individuals with high heat sensitivity should exercise in a cool environment, and a cooling fan should be readily available for the person during the exercise sessions. When individuals experience symptom exacerbation, either daily variation in symptoms or relapse, the exercise program may require modification or be temporarily discontinued until the symptoms are stable. Risk of falling should be considered for individuals with MS, and individuals with high risk of falls should perform both aerobic and strength exercises in a seated position (e.g., recumbent bike, weight machines) and under supervision (Kim et al, 2019, p.6)

7.3 Stage of progression

Learmonth et al (2023) did not find any significant difference in risk or safety of exercise interventions between levels of disability. However, it should also be noted that participants with advanced stages of MS were minimally represented in the studies reviewed. Of 40 randomised controlled trials, only 3 were focussed on people with severe symptoms of Multiple Sclerosis. In fact, most evidence for the efficacy of exercise intervention for people with Multiple Sclerosis lacks generalisability for people with severe symptoms (Corrini et al, 2023; Taul-Madsen et al, 2021; Kim et al, 2019; Edwards & Pilutti, 2017).

Two systematic reviews have examined the effectiveness of physiotherapy or exercise interventions in people with Multiple Sclerosis (Binshalan et al, 2022; Edwards & Pilutti, 2017). A 2017 review found limited and very low certainty evidence that exercise interventions could improve fitness, function, balance, fatigue, mood and quality of life (Edwards & Pilutti, 2017). The authors also suggest exercise interventions are safe for people with severe symptoms. More recently, Binshalan et al (2022) found low quality evidence that robot assisted gait therapy may be effective at improving walking speed and endurance in people with severe symptoms of Multiple Sclerosis. The authors speculate on possible reasons robot assisted gait therapy may be more effective than other modes of physiotherapy or exercise intervention:

> Appropriate PT intervention programs must be tailored to the patient's abilities with sufficient stimulus to push present competence to produce effect [49]. Therefore, it possible that RAGT is less demanding for severely disabled pwMS, who might not be able to complete other forms of PT effectively (p.13).

8. Muscular dystrophy

8.1 Frequency and duration

Hammer et al (2022) is the most recent systematic review of physiotherapy or exercise interventions for people with muscular dystrophy. They reviewed 12 studies with 282 participants and found exercise intervention may improve strength and endurance for people with MD. No conclusions regarding frequency, duration or intensity were possible with the available evidence.

A 2019 Cochrane review of exercise training in muscle disease (including MD), notes:

> The most effective dose of exercise for people with muscle diseases is currently unknown, making it difficult to prescribe exercise in this population. This is reflected in the large variation in the frequency, duration and intensity of exercise prescribed (Voet et al, 2019, p.42).

8.2 Risks

The most recent review of physiotherapy or exercise interventions for MD noted that none of the studies included in the review adequately reported on adverse events. However, the authors noted that "intensive eccentric muscle exercise, where the muscle is both activated and lengthened, in addition to high-resistance exercise, may exacerbate muscle damage and should be avoided" (Hammer et al, 2022, p.2).

Voet et al (2019) report no evidence of safety concerns in appropriately structured exercise programmes, though they also note that "included studies were small and the evidence was largely low or low certainty; therefore, we can make no definitive statements regarding safety" (p.42).

8.3 Stage of progression

No studies were able to discriminate benefits or risks of exercise based on severity of symptoms or stage of progression.

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