Sustaining Cognition and Improving Movement With Weight Training Exercises in a 78-Year-Old With DLB: A Case Report and Literature Review

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Abstract

Dementia with Lewy bodies (DLB) is the second most common neurodegenerative dementia, often with a worse prognosis than Alzheimer's disease, including faster cognitive decline, shorter life expectancy, and higher rates of institutionalization. Despite its significance, no specific treatments exist due to limited research. This case involves a 78-year-old man diagnosed with DLB who presented with bradykinesia, vivid visual hallucinations, muscle stiffness, gait difficulties, REM sleep behavior disorder (RBD), and cognitive decline. He was prescribed Melatonin, Clonazepam, Donepezil, Quetiapine, Pitavastatin, and Levodopa/ benserazide. His initial scores were Mini-Mental State Examination (MMSE) 25/30, Montreal Cognitive Assessment (MoCA) 17/30, and Time Up and Go (TUG) 47 seconds. He participated in a structured rehabilitation program, including strength training (focusing on quadriceps, hamstrings, hip adductors/adductors/abductors, and core muscle) five days per week. After three years, his TUG improved to 17.58 seconds, MMSE score remained relatively stable at 27/30, MoCA score was 15/30, with no new neuropsychiatric symptoms appearing. However, six months after access to facilities was restricted and frequency of exercise was reduced to 2-3 days per week, functional decline accelerated despite increased Levodopa/ benserazide dosage. Ultimately, he became unable to walk. This case underscores the potential advantages of structured physical exercise and cognitive stimulation therapy in enhancing motor function and preserving cognitive stability in individuals with DLB. A multidisciplinary approach may improve long-term outcomes. Many studies have demonstrated the positive impact of exercise and weight training on Alzheimer's dementia, similar strategies may be valuable for other dementia, including DLB.

Keywords: dementia with Lewy bodies, structured physical exercise, cognitive stimulation therapy, multidisciplinary approach

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Introduction

Dementia with Lewy bodies (DLB) is the 7second most common type of dementia, following Alzheimer's disease, and it makes up about 5-10% of all dementia cases. However, it is often under-recognized and misdiagnosed (Chin et al., 2019). Public awareness of this disease remains low, even among healthcare professionals. The impact of the disease on both caregivers and patients is not widely recognized. There are currently no FDA-approved medications specifically for the treatment of DLB (Capouch et al., 2018, p. 256). A study on dementia in Thailand found that DLB accounts for approximately 6% of all dementia cases, which is lower than the prevalence reported globally. This reflects a similar challenge in diagnosis, as DLB shares overlapping symptoms with other conditions such as Alzheimer's disease (AD) and Parkinson's disease (PD). Although functional and molecular imaging can enhance diagnostic accuracy, these techniques are not yet widely used in Thailand yet (Dharmasaroja et al., 2021). This progressive neurodegenerative disorder is marked by the unusual buildup of protein deposits known as Lewy bodies in neurons across the brain. These deposits impact areas that are crucial for cognition, behavior, movement, and autonomic functions. The DLB Consortium established revised consensus criteria in 2017 (McKeith et al., 2017) to help diagnose DLB, clearly differentiating between clinical features and diagnostic biomarkers. According to these criteria the key requirement for diagnosing DLB is a noticeable decline in cognitive abilities that disrupts normal social or work life. Unlike Alzheimer's, early DLB often shows significant issues with attention, executive function, and visuospatial skills instead of memory loss, although memory problems usually start to appear as the disease advances.

Literature Review

The Four Core Features

Diagnosis of probable DLB requires progressive cognitive decline and at least two of the following core clinical features, while possible DLB requires one (Armstrong, 2021; McKeith et al., 2017):

1. Fluctuating Cognition: This refers to noticeable ups and downs in attention and alertness. These fluctuations appear as moments of confusion, incoherence, or changes in consciousness that can vary significantly from day to day or even within the same day. This can be especially challenging for caregivers, who witness significant shifts in the patient's cognitive abilities
2. Recurrent Visual Hallucinations: These hallucinations are usually vivid and detailed, often involving people or animals. They occur in more than 70% of patients with DLB and often appear early in the disease. Unlike hallucinations seen in other conditions, those in DLB tend to be complex, persistent, and can provoke a range of emotional reactions from the patients.
3. REM Sleep Behavior Disorder (RBD): This condition involves acting out dreams during REM sleep because the usual muscle paralysis doesn't happen. Recent studies suggest that RBD often appears before other key symptoms, especially in men, and could be an early warning sign of DLB. Research indicates that RBD can show up years or even decades before a formal DLB diagnosis.
4. Parkinsonism: This includes motor symptoms that resemble those found in Parkinson's disease, such as slowed movement (bradykinesia), stiffness (rigidity), and resting

tremors. While the parkinsonian symptoms in DLB might not be as severe as those in Parkinson's disease, they still play a significant role in affecting daily functioning.

Effective Treatment in DLB

Managing DLB involves treating symptoms based on their presentation. Treatment decisions must carefully balance therapeutic benefits and potential side effects, as DLB patients are particularly sensitive to certain medications, especially antipsychotic (Armstrong, 2021; McKeith et al., 2017).

1. Cognitive symptom:
   First-line pharmacologic treatment for cognitive impairment in DLB includes cholinesterase inhibitors (CHEIs) like rivastigmine and donepezil, which improve cognition and daily function while slowing deterioration. Memantine, though less established, is well-tolerated and may benefit cognition and neuropsychiatric symptoms, either alone or alongside CHEIs.
2. Neuropsychiatric Symptoms:
   Managing behavioral and psychiatric symptoms in DLB can be quite tricky, especially because patients often have a heightened sensitivity to antipsychotic medications. CHEIs are a great option to consider first, as they can effectively address issues like apathy, hallucinations, and delusions. Antipsychotics should be avoided unless necessary, with low-dose quetiapine and clozapine recommended, or alternatives like pimavanserin preferred. Selective Serotonin Reuptake Inhibitors (SSRIs) and Serotonin-norepinephrine reuptake inhibitors (SNRIs) may help with depression and anxiety, though data are limited. Nonpharmacological approaches, including environmental modifications, music therapy, cognitive training, and caregiver education, are recommended as first-line interventions.
3. REM Sleep Behavior Disorder (RBD):
   Treatment options for RBD in DLB include clonazepam, which is effective but requires caution due to cognitive side effects. Melatonin is a safer option, while memantine might provide some advantages
4. Motor Symptoms:
   For Parkinsonian features in DLB, treatment options include Levodopa/Carbidopa: Improves motor function but offers less benefit than in Parkinson’s disease and may worsen psychiatric symptoms or cause confusion.
   Zonisamide: A potential adjunct for managing motor symptoms.
5. Autonomic Dysfunction:
   Treatment approaches for common autonomic symptoms include:
   Orthostatic Hypotension: Midodrine, fludrocortisone, or droxidopa may be beneficial.
   Constipation: Management with stool softeners and laxatives.
   Sialorrhea (Excessive Drooling): Botulinum toxin injections or glycopyrrolate may provide relief.
6. Urinary Dysfunction:
   Mirabegron, a β3-adrenoceptor agonist lacking typical anticholinergic side effects, may help manage urinary urgency and frequency while minimizing cognitive side effects.

Exercise Interventions for Dementia With Lewy Bodies

Exercise has been shown to provide significant benefits for individuals with dementia, including improvements in physical function and potential cognitive and behavioral

enhancements. Evidence supports the efficacy of supervised multi-modal exercise programs in enhancing strength, balance, mobility, and walking endurance in individuals with mild cognitive impairment or dementia. These findings highlight the importance of structured exercise interventions as a key component of dementia care to promote functional independence and overall well-being (Lam et al., 2018; Li et al., 2019).

A thorough systematic review (Inskip et al., 2016) highlights a significant issue: they found only five studies—comprising one uncontrolled trial, one randomized controlled trial, and three case reports—that evaluated a mere 16 participants with DLB. Exercise interventions were varied and included verbal cueing with movement, motor training, stationary cycling, large amplitude bodyweight exercise, high intensity functional exercises and light leisure activities (control group, n = 2). The duration of sessions ranged from 1 to 180 mins, frequency ranged from once only to 5 times/week, and total program intervention ranged from 1 session to 12 wks. The intensity was not reported in three studies, while the cycling intervention reported 50–75% of heart rate maximum, and Telenius and colleagues set a target of performing a maximum of 12 repetitions of given weighted or body weight exercises (Inskip et al., 2016, p. 10).

The most reported outcomes were related to physical function measures. Habitual gait speed changes were reported in 15 participants across four studies (n = 2 participants in a control group). Habitual walking speed of exercise participants (n = 13) increased by 0.18 m/s on average (95% CI -0.02, 0.38m/s) Standing function was reported in six participants across two case reports and one Randomized Controlled Trial (RCT). In one study, a participant showed improvement in single chair stand function using a customized rating scale. For the 30-second chair stand test, exercise group participants (n = 3) performed a mean of 3 more stands (range 2-4) compared to the control group (range 0-1 stands) after training For functional assessment Basic Activities of Daily Living (ADLs) and Instrumental Activities of Daily Living (IADLs) were assessed in six participants across two case reports and one RCT by Telenius et al. (with two control participants). The change in the Barthel Index was inconclusive due to incomplete data.

Cognitive, psychiatric, quality of life, and physiological outcomes were assessed, but only 2 of 5 studies reported neuropsychiatric outcomes (5 participants in total, n = 2 control), limiting group analysis. One study found a single participant improved on the Color Trail Test (57.5% and 56.7%), Parkinson's Disease-Cognitive Rating Scale (PD-CRS) (+15 points), and Unified Parkinson's Disease Rating Scale Part I (UPDRS-I) mood/cognition scores (+15/16 points). Another study reported MMSE, Neuropsychiatric Inventory (NPI), Cornell Scale for Depression in Dementia, and Quality of Life in Late-Stage Dementia Scale (QUALID) outcomes, but MMSE data were incomplete, and other measures showed mixed or non-significant changes.

The case study (Dawley, 2015) used Parkinson-specific interventions, primarily Lee Silverman Voice Treatment (LSVT) BIG (signifying big movements), a program designed to enhance movement amplitudes in people with Parkinson's disease (PD). The program consisted of maximum daily exercises, task-specific training, and functional activities. Due to insurance and medical conflicts, the patient could not fully adhere to the program. The patient had a tentative diagnosis of DLB with a differential diagnosis of PD, and it was assumed that similar physical therapy interventions could be applied. Under the supervision of a certified physical therapist, he participated in twice-weekly sessions over three months, completing a total of eight sessions. Outcome measures showed significant improvement in gait speed,

classifying him as a safe community ambulator, and his TUG test improved to the "unimpaired" category. However, it is important to note that the diagnosis of DLB had not been confirmed and remained a differential diagnosis in this case.

This glaring gap in the available evidence poses considerable challenges for clinicians who are trying to create exercise prescriptions grounded in solid evidence for this specific group.

Case Presentation

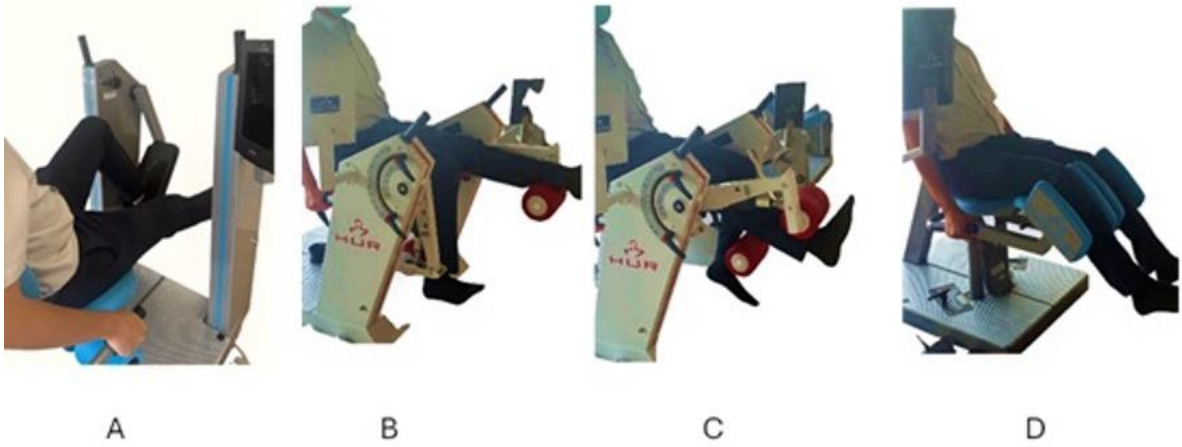
A 78-year-old right-handed man came in with symptoms like bradykinesia, vivid visual hallucinations, muscle stiffness, trouble walking, RBD, and some cognitive decline. After a thorough evaluation, a neurologist diagnosed him with DLB and prescribed a range of medications including Melatonin, Clonazepam, donepezil, Quetiapine, Pitavastatin, and levodopa 200/ benserazide 50 (Madopar 250). Initially in September 2020, his scores were MMSE 25/30, MoCA 17/30, and he took 47 seconds on the TUG test.

Methodology

To help with his condition, he started treatment at the Smart Medical Wellness Gym. The Smart Medical Wellness Gym at the Institute of Geriatric Medicine offers exercise programs specifically designed for older adults. Developed by physicians, sports scientists, and movement scientists, these programs incorporate specialized equipment tailored to meet the needs of the elderly, ensuring safe and effective physical activity, focusing on weight training. Based on the clinical records, in December 2020, he engaged in a structured exercise program five days per week, with each session lasting approximately 1 to 1.5 hours. Strength training was performed using pneumatic (air resistance) machines targeting the quadriceps, hamstrings, hip adductors/abductors, and core muscles, incorporating exercises such as leg press, leg curl, abduction–adduction, and core strengthening for both abdominal and back muscles. Each session also included 15–30 minutes of cardiovascular exercise using a Cybercycle. Then the day's program ended with a karaoke singing session. This program continued for two years, with an annual assessment to track progress.

Figure 1

The Example of Exercise, "A Leg Press", "B & C Leg Curl" and "D Abduction and Adduction"



Note. He received an exercise the same position 15 times for each set, completing 3 sets in total.

Table 1

The Protocol of the Strength Training and Cardio

Type of exercise		Resistance/ Distance
Strength training	Abdomen	9 (kg)
	Back	10 (kg)
	Pull down	6 (kg)
	Abduction/adduction	6.5 (kg)
	Leg extension	1.4 (kg)
	Leg curl	8 (kg)
	Leg press	23 (kg)
	Rhomboid	3 (kg)
Cardio training	Cybercycle	1-2 (km)

Table 2

Changes in Interventions

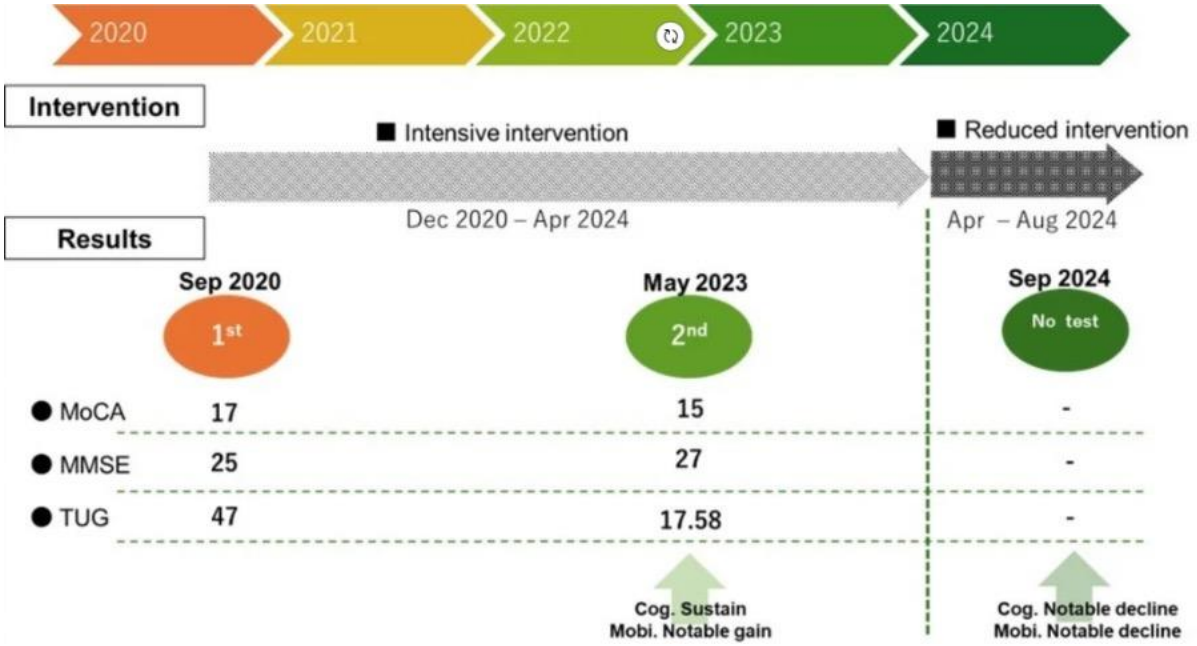
	Intensive Intervention Period	Reduced Intervention Period
Period	Dec 2020 – Apr 2024	Apr 2024 – Aug 2024
Year of assessment	Sep 2020/ May 2023	No test (mobility notable decline)
Strength training time	90 – 120 mins/day (5 days/wk.)	90 – 120 mins/day (2-3 days/wk.)
Cardio time (Cybercycle)	15 – 30 min/day (3 days/wk.)	15 min/day (0 – 1 days/wk.)
Other therapy	Karaoke 15-30 mins/day (5 days/wk.)	Music therapy (2 times/mo.)
		Brain stimulation by OT (2-3 days/wk.)

Source. Clinical data record

Result

The assessment in May 2023 showed improvement, with a TUG time of 17.6 seconds, an MMSE score of 27/30, and a MoCA score of 15/30. Remarkably, he was able to walk independently without a cane or wheelchair. However, six months later, he started to cut back on his exercise routine, reducing it to 2-3 days a week due to access to facilities was limited for several reasons, including inconvenient transportation to the facility. But he kept up with cognitive stimulation through occupational therapy twice a week. In the last assessment in November 2024, He struggles to walk on his own. The neurologist has increased his dosage of Madopar, but unfortunately, it hasn't been effective for him.

Figure 2
Timeline of Intervention and Results



Discussion

Exercise has been recognized as a potential adjunctive therapy for managing symptoms in DLB, though specific research is limited. A review by Inskip M. et al. highlights that exercise studies in Parkinson's disease and dementia often exclude DLB participants, resulting in a scarcity of evidence for this population. However, recent pilot studies suggest that exercise interventions can improve functional independence, cognition, and physical function in DLB patients (Inskip et al., 2016).

The Promoting Independence in Lewy Body Dementia through Exercise (PRIDE) trial showed that high-intensity progressive resistance training and balance exercises were not only well-received but also effective in enhancing functional independence and cognitive abilities in people with DLB. This research offers valuable insights into how exercise programs can be designed specifically for those dealing with DLB (Inskip et al., 2022). Patients engage in resistance exercise three times a week for a whole year. This routine can boost balance, strengthen muscles, reduce the risk of falls, and enhance mobility, tackling the parkinsonian symptoms often seen in DLB. Ultimately, it helps improve the overall quality of life for patients.

In this patient, there wasn't much decline in cognitive function. This is probably due to a combination of cognitive stimulation and exercise, as it was discovered that exercise has been linked to improved cognitive function in other neurodegenerative conditions (Du et al., 2018; Groot et al., 2016). This suggests potential benefits for DLB patients experiencing cognitive fluctuations and impairments.

Conclusion and Recommendation

Strengths of the Study

This case report provides a detailed, long-term observation of a patient with Dementia with Lewy Bodies (DLB), offering insights into symptom progression and the effects of combined pharmacological treatment, exercise, and cognitive stimulation. The multidisciplinary approach, including a specialized exercise program for older adults, highlights potential benefits in managing DLB. Use of standardized assessments like MMSE, MoCA, and the Timed Up and Go (TUG) test allows objective tracking of cognitive and physical functions. The report also reflects real-world challenges, such as reduced access to facilities affecting functional decline. By documenting improvements following consistent intervention, it supports growing evidence that exercise may benefit DLB patients. Importantly, this report addresses a gap in the literature by providing data on exercise in DLB, a group often excluded from larger dementia and Parkinson's studies, thus contributing valuable information for future research.

Limitations of the Study

There are several limitations to this case study. First, one sample of DLB patient limits the generalizability of the findings, as only a few DLB cases receive treatment at the institute. Consequently, the results may not be fully applicable to other DLB patients. Second, the absence of a control group makes it difficult to determine whether the observed improvements are due to the exercise intervention or other factors. Lastly, the lack of blinding may introduce detection bias, potentially leading to an overestimation of treatment effects.

Conclusion and Recommendation

Exercise shows great potential as a beneficial therapy for managing DLB symptoms. However, further research is needed to fully understand its benefits and the most effective implementation strategies. By addressing current challenges and bridging knowledge gaps, future studies can provide the solid evidence necessary to develop tailored exercise guidelines for DLB patients.

In the meantime, healthcare professionals should approach exercise interventions with caution, emphasizing personalized treatment plans, a multidisciplinary team approach, and ongoing evaluations to maximize benefits while prioritizing patient safety.

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