The Case of
PARKINSON'S DISEASE
with OHM SERIES

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RECOVERY OF PARKINSON'S DISEASE PATIENT
Using OHM Plantar Pressure System and Gaming Rehab Module

Parkinson's disease is a progressive neurodegenerative disorder marked by damage to the nerve cells within the basal ganglia, a key region responsible for motor control. This affects normal movement and leads to common symptoms such as resting tremors, slowness, muscle rigidity, and impaired balance. Some individuals may also experience cognitive changes, including memory and thinking difficulties. Physical rehabilitation is essential as it focuses on enhancing movement, balance, and flexibility. Targeted therpaies help reduce stiffness and improve stability and mobility, supporting both safety and independence. Rehabilitation can slow down the loss of function, leading to a better quality of life. This case highlights the importance of a holistic treatment approach that includes advanced technology to increase patient engagement and achieve better outcomes.

Stooped posture
Masked Face
Hand tremor
Shuffling, short stepped gait

SUMMARY

A **62-year-old Female** with middle stage Parkinson's disease. Initial assessment with the **OHM Plantar Pressure Analysis** revealed altered weight distribution, reduced mobility and impairments in both balance and gait. This detailed data enabled the creation of a customized protocol. **Game-based Rehabilitation** and **Live Biofeedback** were used to engage the patient, build strength, and improve overall functional independence.

HEALTH STATUS:

Patient is a 62 year old retired teacher. She complains of increased slowness in everyday activities, left hand tremor and imbalance while walking since last year.

HISTORY OF PRESENT ILLNESS:

She experienced a minor fall (3 years ago) after tripping and fell on an outstretched right hand, leading to wrist pain. She saw her family doctor regarding this injury, but also complained of some recent trouble with balance. She was referred to a neurologist and was diagnosed with early stage Parkinson's Disease. She then received a referral for physiotherapy.

Session 1: Week 1

SUBJECTIVE ASSESSMENT:

She reports that she has become heavily reliant on medications, which provide only temporary relief. Over the past year, she has experienced significant difficulty initiating movement, along with increased stiffness and slowness. She frequently experiences episodes of freezing, especially when walking through narrow spaces, and feels an increased fear of falling when attempting to turn. She also reports tremors in her left hand, which impact her ability to perform daily tasks effectively.
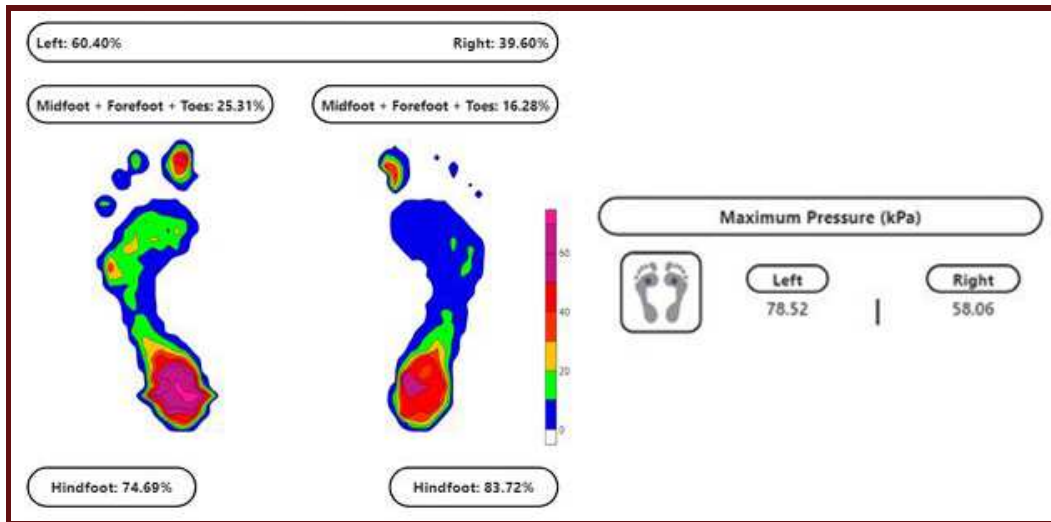
OBJECTIVE ASSESSMENT:

- **Observation:** Slightly masked face, resting pill rolling tremor on left side with reduced handwriting size.
- **Posture:** Mild kyphosis with forward head.
- **Active ROM:** Reduced trunk extension, bilateral shoulder flexion, hip extension and ankle dorsiflexion.
- **Strength:** Lower limbs 3+/5 and upper limbs 4/5.
- **Neurological:** Moderate rigidity in upper and lower limbs, decreased proprioception and kinesthesia in bilateral lower limbs.
- **Balance:** Berg Balance Scale (BBS) score: 35/56 suggestive of fall risk.
- **Functional Mobility:** Increased Timed Up and Go (TUG) with dual task score: 15 secs.
- **Gait:** Reduced arm swing, stride length with freezing and hesitation during turns.

OHM PLANTAR PRESSURE ANALYSIS:

A. Bipedal Stance Test:

- Increased weight bearing on right side as compared to left.
- Altered forefoot and hindfoot weight distribution with more loading posteriorly.
- Maximum pressure is within normal range bilaterally.
- These changes have occurred due to instability, rigidity and stooped posture.

Left: 60.40% Right: 39.60%

Midfoot + Forefoot + Toes: 25.31% Midfoot + Forefoot + Toes: 16.28%

Maximum Pressure (kPa)

Left 78.52 | Right 58.06

Hindfoot: 74.69% Hindfoot: 83.72%

B. Stabilometry Test:

- **Eyes Open:** Centre of Pressure (COP) position is shifted towards the left with normal Sway Distance and Sway Velocity values.
- **Eyes Closed:** Centre of Pressure (COP) scribble moves more anteriorly and towards the left indicating uneven weight distribution, proprioceptive deficits and Bradykinesia.

| Metrics	Eyes Open			Eyes Closed		
	Left	Right	Both	Left	Right	Both
Sway Distance (mm)	.	.	223.66	.	.	266.15
Sway Velocity (mm/s)	.	.	11.44	.	.	13.53

C. Dynamic Test:

• **Centre of Pressure (COP) Tracking (Left):**

  - In the hindfoot, the line shows some deviation suggestive of instability.
  - There is a medial loading pattern, indicating dynamic fall of the arch.
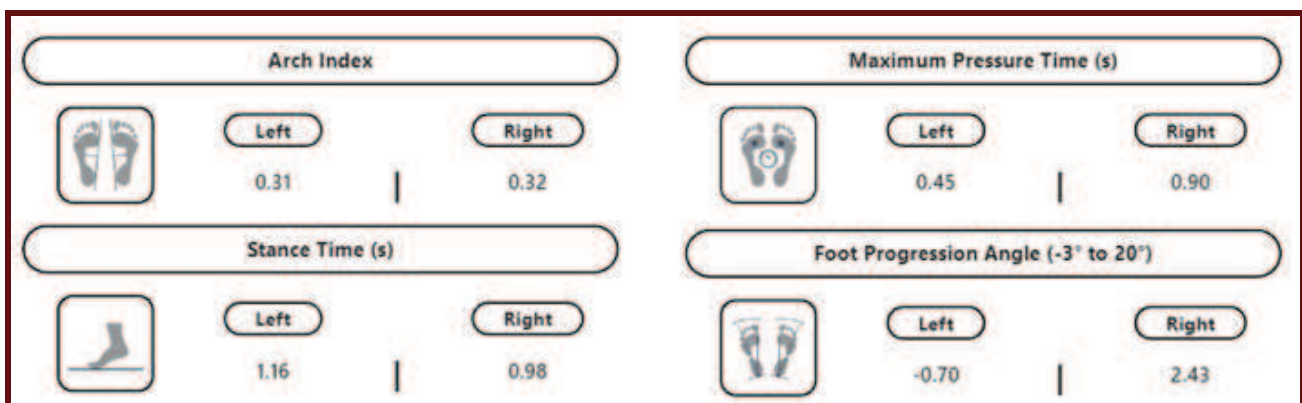 - Pressure distribution shows more loading on heel and big toe.

• **Centre of Pressure (COP) Tracking (Right):**

  - More marked medial loading pattern (straight path) suggestive of dynamic arch collapse.
  - There is loading on heel, lateral midfoot and big toe.
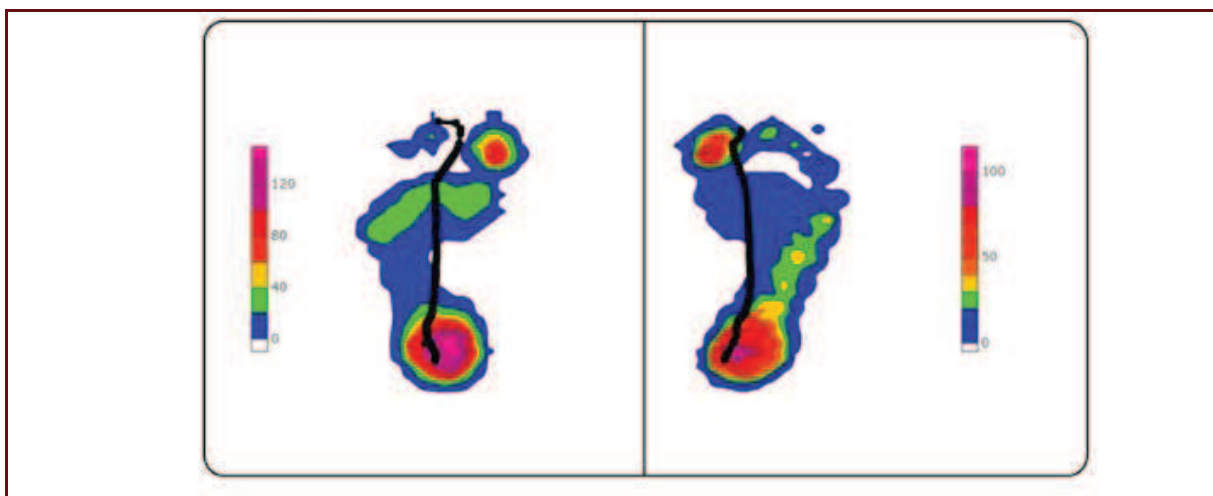
Parameters:

• Bilaterally high Arch Index values indicate excessive foot pronation on both sides.
• Increased stance time (L>R) and maximum pressure time (R>L).
• Foot progression angles suggestive of slight in-toeing.
• These area result of asymmetrical weight distribution, muscle rigidity, balance and postural compensations, bradykinesia and altered neuromuscular control.

Arch Index		Maximum Pressure Time (s)	
Left	Right	Left	Right
0.31	0.32	0.45	0.90

| Stance Time (s)		Foot Progression Angle (-3° to 20°)	
Left	Right	Left	Right
1.16	0.98	-0.70	2.43

Pressure Time Curve:

- **Left:**
  - Higher hindfoot pressures as compared to forefoot with uneven loading due to impaired forward weight transfer, reduced mobility and postural instability.
  - Prolonged heel strike and mistance inefficient push-off as a result of bradykinesia, poor muscle activation timing and reduced propulsion power.

- **Right:**
  - High pressures on hindfoot with uneven loading due to asymmetric gait pattern and compensations.
  - Prolonged heel strike and midstance with unimpactful push off phase because of impaired motor control.
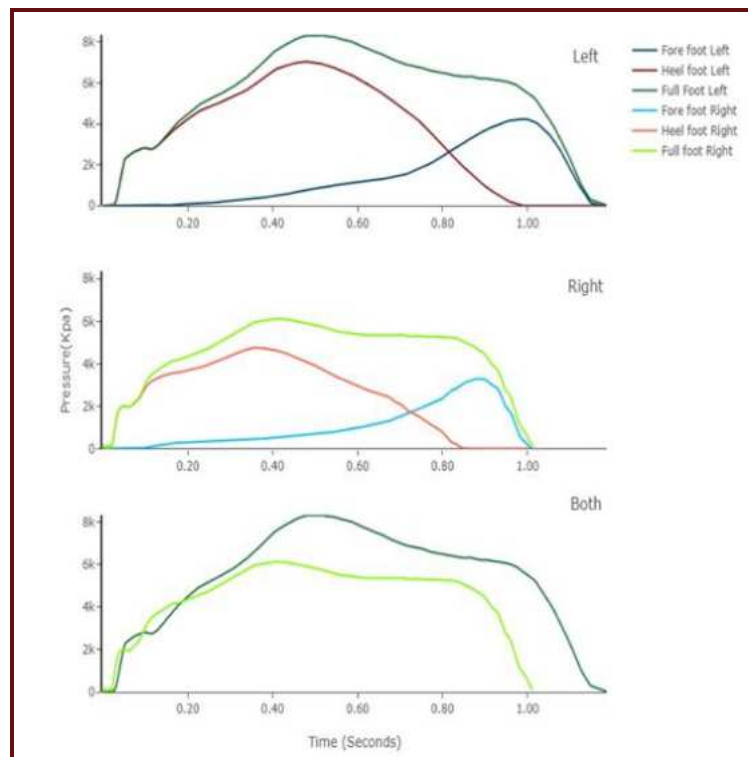
D. Advanced Test: Reach Outs:

This test was used to visualize dynamic pressure change and Centre of Pressure (COP) movement while performing reach outs in standing

- **Reaching on the Right Side:** There is a normal to and fro movement from the center to the right side with proper weight distribution.
- **Reaching on the Left Side:** Centre of Pressure (COP) excessively shifts to the left with no return to the center and there is increased weight bearing on the left side consequently.
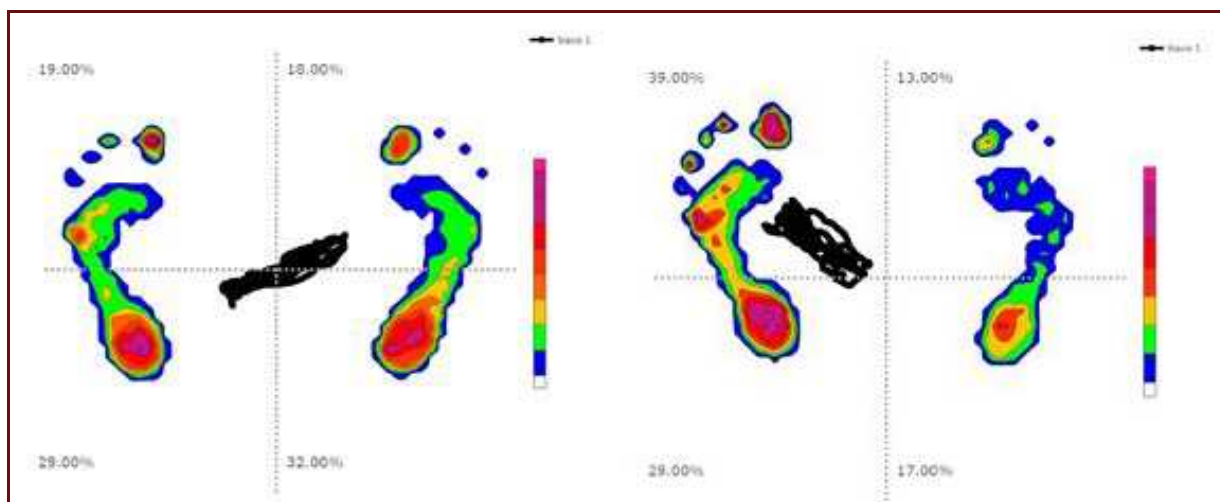
GOALS & INTERVENTIONS:

1. Patient Education:

- Energy conservation techniques and recommended home modifications were explained to the patient and her family to promote safety and adherence to her home exercise program.
- Additionally, she was guided on self-management strategies, including maintaining a diary to track "off" times and the re-emergence of symptoms.
- She was encouraged to perform daily activities and hobbies within limits.

2. Enhancing Strength:

- Kitchen sink exercises (heel and toe raises, mini squats, spot marching, side leg raises, hip extension, sit to stand) along with grip strengthening for adequate strength of anti gravity muscles and full functioning of the wrist.
- Low intensity (60% of 1 RM) with 3 sets of 10 repetitions for 3 times/week.
- This along with balance and gait training will aid in fall prevention.

3. Improve Balance:

- Exercises like narrow base standing, tandem standing, single leg standing, turning with variations like eyes closed, perturbations and then progressing to balance board.
- 2 to 3 sets of 5 to 10 repetitions with 10 - 20 secs hold.
- **ReGo:** Shapes Circle and Square games for visual cueing while training weight distribution in all directions and improving stability.

  https://www.instagram.com/reel/C5i2SO-o2nT/?utm_-source=ig_web_copy_link&igsh=MzRlODBiNWFlZA==

- **Live Visualization:** Real time biofeedback helped with correcting movement pattern during reaching activities.

  https://drive.google.com/file/d/1Kr088nkcJ-NccVjA5CmGadYl-jVNp-s9k/view?usp=sharing

4. Gait Training:
- Visual (bright stripes for foot placement) and auditory cueing with metronome beats at 60 bpm to improve parameters like walking speed, cadence and stride length. This also addresses her fear of fall while navigating outside.
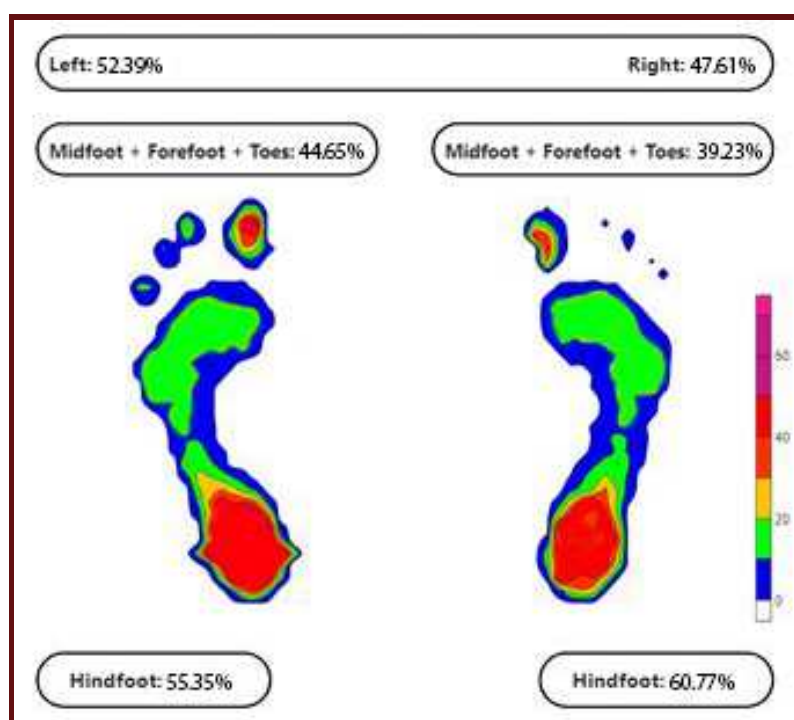- Target of 300 to 500m for 4 days/week.

5. Restoring Mobility:
- Combination of static and dynamic stretches for shoulder, spine, hip and ankles.
- 3 sets of 20 secs for 3 times/week.

SESSION 14: Week 10

A. Bipedal Stance Test:
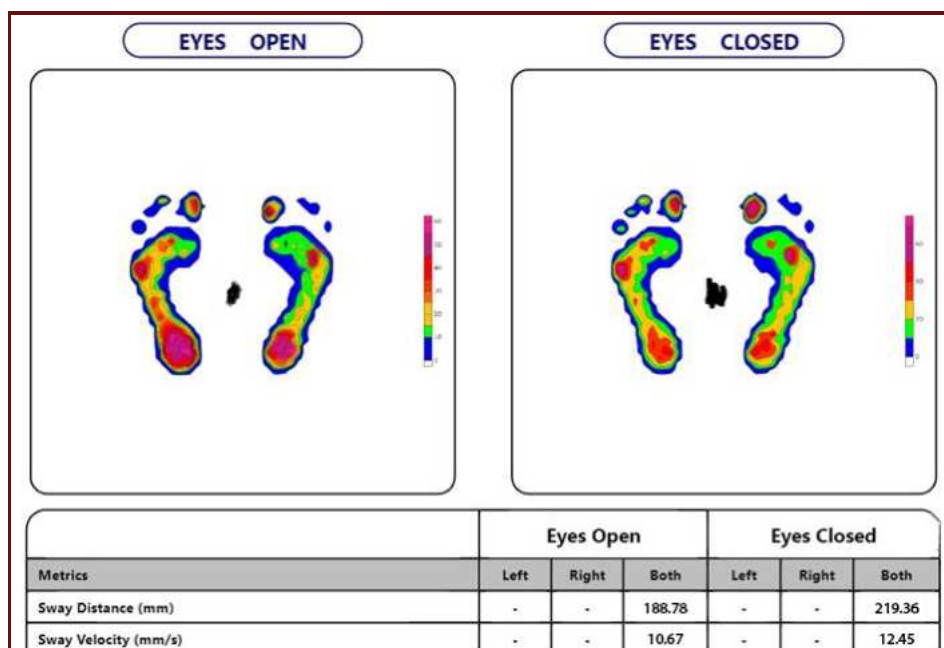- Equal weight bearing on both sides with normal loading of forefoot and hindfoot as compared to previous values.

B. Stabilometry Test:

- Centre of Pressure (COP) scribble is more central with decrease in area suggestive of better postural control.

| Metrics	Eyes Open			Eyes Closed		
	Left	Right	Both	Left	Right	Both
Sway Distance (mm)	-	-	188.78	-	-	219.36
Sway Velocity (mm/s)	-	-	10.67	-	-	12.45

C. Dynamic Test:

- **Centre of Pressure (COP) Tracking (Left):**
  - The path shows lesser deviations with a more uniform curve, indicating improved control. There is improved pressure distribution on both forefoot and hindfoot.

- **Centre of Pressure (COP) Tracking (Right):**
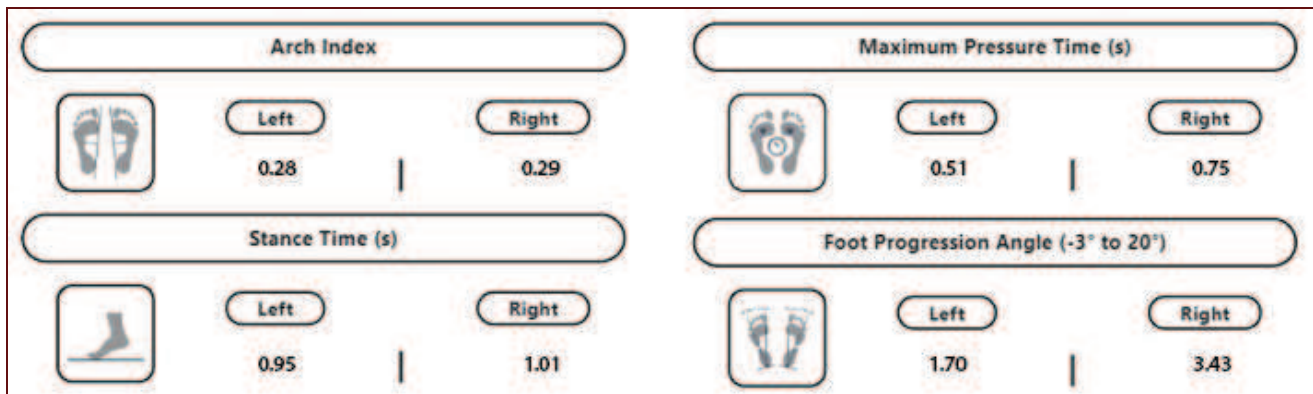 - There is improved pressure distribution on the great toe, forefoot and heel.
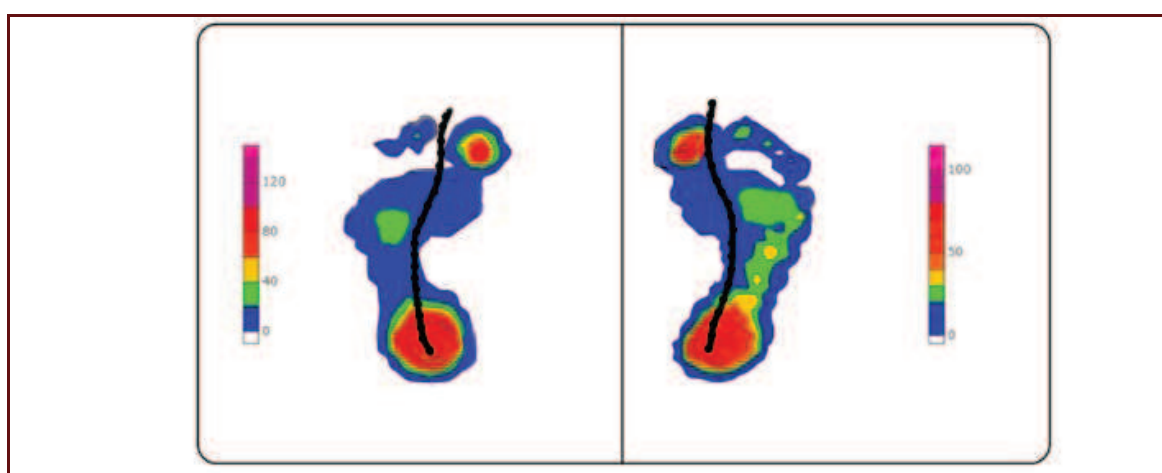
Parameters:

- Reduction in Arch Index values bilaterally indicative of improved arch function.
- Improved stance time and maximum pressure time bilaterally suggestive of a more even gait pattern.
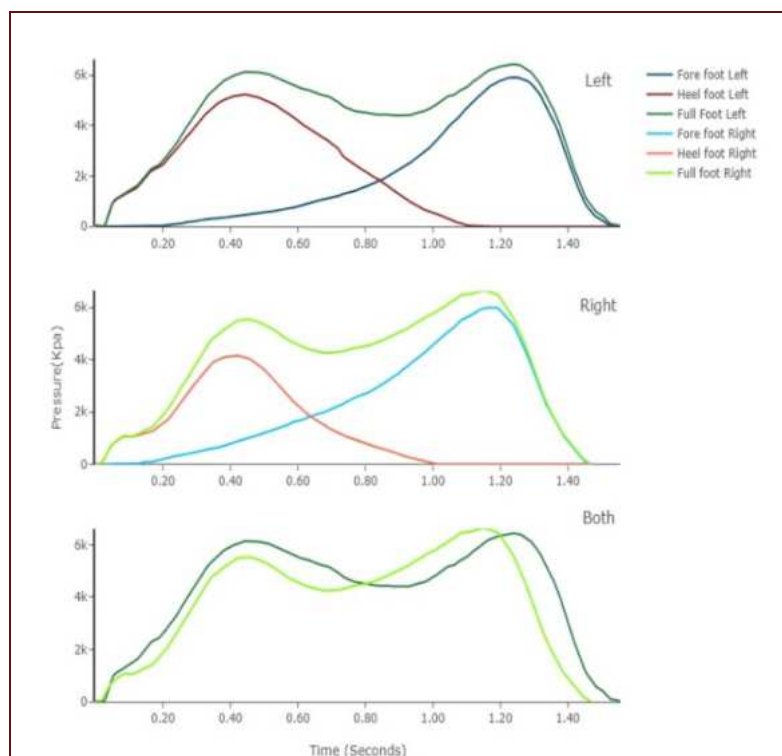
Arch Index			Maximum Pressure Time (s)		
	Left	Right		Left	Right
	0.28	0.29		0.51	0.75

Stance Time (s)			Foot Progression Angle (-3° to 20°)		
	Left	Right		Left	Right
	0.95	1.01		1.70	3.43

Pressure Time Curve:

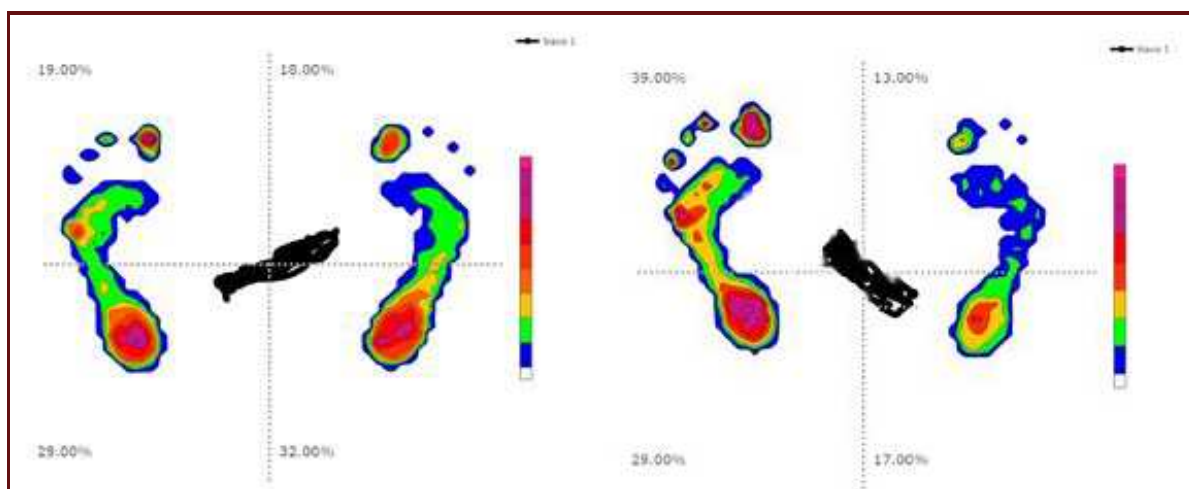All curves indicate better pressure distribution on forefoot and hindfoot suggestive of a more symmetric gait.

D. Advanced Test: Reach Outs:

Better Centre of Pressure (COP) movement during reach outs on the right side as compared to the previous test.

OUTCOME

- **Reduced Symptoms:** Notable decrease in hand tremors, improved speed during movements and activities, and increase in handwriting size.
- **Improved Weight Distribution:** Achieved equal weight distribution bilaterally, with normal pressure distribution across forefoot and hindfoot.
- **Increased Strength and Balance:** Improved scores on the Berg Balance Scale (42/56) and Timed Up and Go test (10.8 seconds).
- **Improved Balance:** Better Single Leg Stance (SLS) time (25 secs) of indicating better balance.
- **Improved Gait:** Symmetrical gait with coordinated arm swing, enhanced stride length and speed, smooth turning, and reduced episodes of freezing.

CONCLUSION:

This case study demonstrates the combined impact of the **OHM Plantar Pressure System** and **ReGo Rehabilitation** in managing Parkinson's disease. OHM's precise analysis enabled a tailored treatment plan, while ReGo's interactive, game-based exercises boosted engagement and corrected movement patterns through real-time biofeedback.

Over 10 weeks, the patient achieved balanced weight distribution, improved gait, and reduced freezing episodes, highlighting the effectiveness of integrating advanced technology with dynamic rehabilitation for enhanced recovery and independence.