Amplitude-Focused FUNctional Exercise for Individuals with Parkinson Disease.

Interdisciplinary and Community Applications

Becky G. Farley PT, MS, PhD
CEO/Founder, Parkinson Wellness Recovery
Physiology Associate, University of Arizona
Tucson, AZ
PWR! – Evolution of LSVT® BIG

PWR!

• Amplitude training as a PD-specific functional framework for comprehensive research-based programming.
• 4 Foundational movements – building blocks of function - (UP/ROCK/TWIST/STEP)
• 5 Positions (prone/supine/all4’s/sitting, standing)
• May be implemented across ALL levels of disease severity
• Is not a standardized protocol
• Is patient centered protocol and frequency/duration is determined by therapist to produce optimal long-term outcomes.
• Can be offered by therapists or fitness professionals in 1:1 or group settings.
• A framework that is adaptable, can be integrated with other neuroplasticity-principled approaches or techniques
• A framework that is continually updated as new research or approaches emerge.

LSVT® BIG

• Amplitude training as a single approach
• 7 movement exercises – driven by LOUD protocol
• 2 Positions (sitting/standing)
• Protocol is not adaptable across disease severity.
• Is a standardized protocol.
• Protocol requires frequency of 4x/week for 4 weeks min. duration.
• Is ONLY available 1:1 by certified PT’s/OT’s
• A protocol that is prescribed, that may NOT be integrated with other neuroplasticity-principled approaches
• A protocol that has not been updated with new exercise or learning research.
A 501(c)(3) nonprofit founded in 2010 by Dr. Becky Farley

PWR! Vision
Communities where individuals with Parkinson disease have access to "Exercise as Medicine."

PWR! Mission
To translate cutting edge research on exercise and brain change into real world programming TODAY that holds promise to slow disease progression, improve symptoms, restore function, and increase longevity and quality of life.
Model Community Center for Individuals with Parkinson disease
Tucson, AZ

Implementing “Exercise as Medicine”
Basic Science Rationale for Exercise as Medicine

Animal models with PD show response to exercise
Brain changes identified vary with disease severity

- **Preclinical Phase**
  - Neuroprotection

- **Early/Moderate Phase**
  - Neurorepair

- **Late Phase**
  - Adaptation
Human Clinical Science Rationale for Exercise as Medicine

Brain changes Identified humans with early PD

Noisy circuits are silenced.

MORE DA Receptors.

Greater Recruitment of DA system


PWR!® Parkinson Wellness Recovery
Evidenced-based Recommendations for Exercise as a Physical Therapy Approach for PWP

Adapted from EU Physiotherapy Evidenced-based Guidelines 2014 2nd Annual Allied MDS Allied Health Professional Summer School in Torres Vedras, Portugal

At DX, PWP are already below norms for HC. Begin EXERCISE/Physical Therapy AT DX!
# Changes in Ambulatory Activity in People with PD Over One Year

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline</th>
<th>One year</th>
<th>Magnitude of Change (% change / Effect size#)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean (SD) [95% confidence interval]</td>
<td>Mean (SD) [95% confidence interval]</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>67.06 (8.75) [64.01-70.11]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years with PD</td>
<td>4.44 (4.24) [2.97-5.91]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hoehn and Yahr Stage (median)</td>
<td>2.0 (1-3)</td>
<td>2.0 (1.5-3)</td>
<td></td>
</tr>
<tr>
<td>LEDD (mg)</td>
<td>303.03 (294.38) [197.77-408.29]</td>
<td>423.49 (359.66) [296.13-550.84]</td>
<td>28 / 0.37</td>
</tr>
<tr>
<td>Steps*</td>
<td>10,261.15 (4332) [8625-11,645]</td>
<td>9159.44 (3534) [7887-10,325]</td>
<td>-12 / 0.28</td>
</tr>
<tr>
<td>Moderate intensity minutes*</td>
<td>22.5 (24.2) [13.7-30.4]</td>
<td>16.1 (18.7) [9.2-22.1]</td>
<td>-40 / 0.30</td>
</tr>
<tr>
<td>MDS-UPDRS Motor subsection</td>
<td>28.18 (8.56) [25.15-31.22]</td>
<td>28.52 (11.71) [24.36-32.67]</td>
<td>-1 / 0.03</td>
</tr>
<tr>
<td>MDS-UPDRS Item 3.10 (median)</td>
<td>1 (0-2)</td>
<td>1 (0-2)</td>
<td></td>
</tr>
<tr>
<td>6 minute walk (meters)</td>
<td>480.52 (135.61) [432.43-528.60]</td>
<td>495.96 (154.60) [440.23-551.71]</td>
<td>3 / 0.11</td>
</tr>
<tr>
<td>Maximal Gait Speed (meters/sec)</td>
<td>1.77 (.50) [1.56-1.95]</td>
<td>1.74 (.53) [1.60-1.96]</td>
<td>-2 / 0.06</td>
</tr>
</tbody>
</table>

Begins with loss of vigorous steps!

![Parkinson's Disease Foundation Logo]

Cavanaugh JT, Ellis T, Earhart GM et al. *JNPT*; 2012:36:51
Decreased activity, anxiety, depression are not only symptoms of PD but also may act to potentiate the underlying degeneration.

- **Prodegenerative Catalysts**
- Compromised systems are highly vulnerable to bouts of inactivity/stress/illness
- Takes longer to recover, and may not return to baseline without an “intervention”

**Bottom Line:**
Optimize sleep/diet/stress/health/lifestyle
Regular Consults/Tune ups to “use it or lose it”
Participants with high self-efficacy were more than twice as likely to engage in regular exercise than those with low self-efficacy.

Efficacy = One’s belief in ability to succeed…..plays a major role in how one approaches goals, tasks, & challenges.
What we can do to optimize physical capacity!

- Be a COACH for LIFE.
- Provide regular tune-ups/goal setting, assessments
- Train in use of FITBIT or PEDOMETER
- Stress Reduction
- Build Social Support

Recommendations
- Tai Chi
- Music/Drumming/Dance
- Sports/recreation
- Hobbies
- Exercise Buddies
- Laughter/Humor
- Mindfulness
- Meditation/Yoga

Exercise in a Community Setting
Evidenced-based Recommendations for Exercise as a Physical Therapy Approach for PWP

Exericse4BrainChange Essentials

Neuroprotection
Optimize Brain Health

Neuroplasticity
Optimize Brain Repair and adaptation

Optimize Physical Capacity

Progressive Aerobic Training

Skill Acquisition
• Learning Principled Practice
• Large Amplitude bigger/faster movements

Prevent Inactivity
• Promote general exercise, lifestyle, sleep, stress management, nutrition
Aerobic Training and PD-specific Skill Acquisition

Essential components for optimal brain change. May work in synergy in PWP!!!
Progressive Aerobic Exercise
More than Cardio??? Why??

Treadmill; Cycling; Whole body agility

Improves Motor Function in PWP
Gait speed, stride, symptoms, balance, LE/UE function, ease of movement
Ahlskog^1^ Je. Neurology 2011;77:288-294

Improves Cognitive/Emotional Function in PWP
Improved language function
Improved executive function
Improves Mood/QoL

Frenkel-Toledo; Pohl; Miyai, Cakit; Herman; Kurtais; Fisher; Alberts
et al., NeuroCase; Tabak R, Aquije G, Fisher B JNPT 2013
Aerobic plus PD-specific skill learning

Pole Walking Benefits

• Whole body activation
• Forced-use arm swing
• Cues posture
• Retrains stride length, gait symmetry and walking speed
• Provides for stretching
• Reduces fear and pain of PD
• Increases endurance
Aerobic Training and PD-specific Skill Acquisition
Essential components for optimal brain change. May work in synergy in PWP!!!

**Aerobic Training**
- Metabolically prepares the neural substrates to “work” efficiently/fast
- Promotes brain health and brain/muscle interactions
- Turns on attentional/working memory systems
- Increases motor output

**Neural Priming**

**Learning**

**PD-specific Skill Acquisition**
- Promotes structural restoration and reorganization.
- Underlies long term behavioral changes.
- Automaticity

“Ready” to move & learn!

bigger and faster FUNCTION

PWR!Moves®

**PWR! Parkinson Wellness Recovery**
PD-Specific Skill Acquisition

Amplitude-Focused Functional Exercise

Basic 4 PWR!Moves™
Building Blocks for FUNCTION

WHY?
PWR!Moves™ at a Glance

PWR!Up → Posture

PWR!Rock → Weight Shift

PWR!Twist → Trunk Rotation

PWR!Step → Transition

Low Floor | Prone

Low Floor | Supine

High Floor | All 4's

Sitting

Standing
**PD-Specific Target – Bradykinesia**

Dopamine loss/disease progression correlates most strongly with severity of bradykinesia.

- **Speed/amplitude dysregulation**
- **Big movements are slow; Fast movements are small**
- **Train the scaling of muscle activation for bigger and faster movements that require the greatest amount of acceleration/power.**

**Why? Amplitude-Focused Exercise**

`Start at DX! Use it or lose it./Use it and Improve it.`

© 2014 NeuroFit Networks | Parkinson Wellness Recovery
Why Amplitude-focused FUNctional Exercise as a Foundation to a PD-specific Exercise Program.

Bradykinesia interferes most with habitual, (overlearned) everyday movements. Dressing, walking, in/out bed, sit to stand

Increase carryover and adaptability of amplitude-training across disease severity.

Make FUNction Exercise™
ACTIVATE

↑

MOTOR OUTPUT

Target HIGH EFFORT for large amplitude whole body movements.
The training of amplitude is more than just increasing motor output!

"how it feels" to perform optimal function

Teach self-monitoring "what to pay attention to"

Require self-correction of small/slow movements.
Amplitude-focused FUNctional exercise training can be instructed across disciplines, settings, tasks, function, ADL, lifestyle, and be integrated into any research-based approach (treadmill, cueing, pole walking, turning, agility, spinal flexibility, etc).
Make FUNction Exercise.
Target Multiple Aspects of Function and Mobility

Amplitude Focused FUNctional Training
PWR!Moves

- Lifestyle
- Agility/Transfers/Turning
- Aerobics
- Strength
- Flexibility
- Balance
- ADL/Function
- Reach/Grasp Activities
- Gait

Social, Sports, Hobbies, Recreation

Endurance Activity
Dance, Boxing

Tai Chi

Yoga/Chi Qong

Social, Sports, Hobbies, Recreation
**PWR!Moves**

*Singular focus on FUNction as exercise*

- **PWR!UP**
- **PWR!ROCK**
- **PWR!TWIST**
- **PWR!STEP**
Neuroplasticity Practice Essentials for Optimal Learning and FUNction!!!
A reasonable goal when prescribing PD medications is to maximize patients’ capabilities to engage in physical activities and potentially achieve the best level of physical fitness possible.

Over the last 2 decades, very conservative symptomatic medical treatment has often been advised, “saving” the best PD treatments for later and arbitrarily limited dosage.

Clinicians must facilitate exercise by appropriate aggressive use of PD drugs.

There is no compelling evidence that medication responses can be saved for years later, and similarly there is no good evidence that low doses convey some beneficial effect in the long term.

Rather, this approach may translate into lost opportunities.
Evidence that annual intensive bouts of functional exercise may reduce the need for medication overtime in human PD (improve sleep, decrease dyskinesias)

Differences statistically different ($p < 0.0001$)

![Graph showing Unified PD Rating Scale III](image)

- **IRT (n = 25)**
- **CONTROL (n = 25)**

Effectiveness of Intensive Inpatient Rehabilitation Treatment on Disease Progression in Parkinsonian Patients: A Randomized Controlled Trial With 1-Year Follow-up.
Giuseppe Frazzitta, MD et al. *Neurorehabi Neural Repair*, Aug 15, 2011
PWR!Moves™ at a Glance

PWR!Up - Posture

PWR!Rock - Weight Shift

PWR!Twist - Trunk Rotation

PWR!Step - Transition

Low Floor | Prone
Low Floor | Supine
High Floor | All 4's
Sitting
Standing
PD-Specific Exercise

- **Rigidity** – reduced spinal flexibility and posture *(PREPARE)*
  - High effort for large amplitude sustained active stretch and awareness

- **Bradykinesia** – slow/small everyday movement *(ACTIVATE)*
  - High effort for large amplitude repetitive whole body movements

- **Incoordination/Balance** *(FLOW)*
  - Link movement/action sequences *(Agility)*
Bradykinesia is generalized across motor systems (speech, reaching, gait, fine-motor, respiration) – so integrate amplitude training across multiple systems….

involving voice/speaking, hands, breathing, eyes
**PWR!Boosts**

- **B In**
  - INHALE through nose/mouth, expand chest DEEPLY.

- **B Ex**
  - EXHALE through OPEN mouth, air out VIGOROUSLY.

- **H Open**
  - Open Hands
    - In Air
    - Weight Bearing

- **H Flick**
  - Finger Flicks

- **B Lips**
  - EXHALE through PURSED LIPS.

- **B Sss**
  - Letter “S” Sound
  - “SSSHHHH” Sound

- **H Twist**
  - Forearm Twist

- **H Taps**
  - Finger Taps
    - Alternate

- **V Sound**
  - Sustain and emphasize vowel sounds.

- **V Sequence**
  - FORWARD/BACKWARD

- **V Instruct**
  - Verbalize Instruction

- **V Affirm**
  - Say Affirmations!

- **E Hands**
  - Fully engage your eyes with your hands.

- **E Ahead**
  - Keep your eyes looking ahead.

- **E Close**
  - Close your eyes.

- **E Coord**
  - Alternate eyes between targets.
Time for new Paradigms!!!

Neuroplasticity
Principled

Early Intervention

Optimal Meds

Intermittent intensive bouts for LIFE!

Forced use

Continuous Access

THE END!

PARKINSON EXERCISE REVOLUTION !!!
PWR!Moves™
Make FUNction Exercise!™
As developed by Becky Farley, PhD, MS, PT
A PWR!Guide to a Parkinson-Specific Exercise Program
Work Harder/Do More Move BIGGER and FASTER EVERY Day!