EXERCISE IMPROVES QUALITY OF LIFE OF PARKINSON DISEASE PATIENTS: A GUIDE FOR VOLUNTEERS AT PARKINSON WELLNESS RECOVERY GYM

By

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Physiology

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Exercise improves quality of life of Parkinson Disease patients: A guide for volunteers at Parkinson Wellness Recovery Gym

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ABSTRACT

Parkinson disease (PD) is the second most common neurodegenerative disease in the United States. It affects approximately one million individuals in the United States, with sixty thousand new diagnoses each year. An estimated loss of 60% of the dopaminergic neurons of the substantia nigra pars compacta occurs, causing a substantial dopamine (DA) deficiency in the basal ganglia. Motor issues result, including resting tremor, rigidity, bradykinesia, and postural instability. Current treatments for PD include pharmaceuticals and neurosurgical procedures. However, extensive evidence demonstrates that exercise may slow progression of the disease and improve gait, mobility, balance, flexibility, mood, and overall quality of life of PD patients.

The Parkinson Wellness Recovery (PWR!) Gym of Tucson, AZ offers neuroplasticity-principled exercise classes for those diagnosed with PD. In order to assess the benefits and importance of exercise to gym members, a survey was conducted in November 2013, and the experience of one gym attendee was reported in a letter. The author’s experience as a volunteer at the facility was also documented. People with PD can improve their lives by exercising for brain change, and volunteers at PWR! Gym can gain memorable life experiences by working with such amazing, resilient people.
INTRODUCTION

To PD Patients, caregivers, doctors, therapists and interested parties,\(^1\)

A little over two years ago, I was diagnosed with Parkinson disease (and in retrospect it was apparent 4 years earlier)… and not much was forthcoming from the medical community in working with the disease itself: no known causes, no known cures. Just ‘take the meds’ and workout to slow the decline.

When one is used to being proactive and solving problems, that isn’t a useful avenue as a philosophical outlook, even if it is somewhat accurate.

The meds are the meds; not much one can do about that by us patients. However, this is not true on the exercise front. That is something we as patients have full control over. The major drawback there is that the usual ‘pumping iron’ doesn’t address Parkinson’s, and it doesn’t take long to find out that the local trained gym staff pool is pretty shallow and devoid of specific knowledge that was in any way helpful.

Then I discovered I was fortunate and blessed to live in Tucson, AZ! Tucson is the home of PWR! Gym, founded by Dr. Becky Farley, the creator of PWR! Moves… A guide to the Parkinson-specific, both home and gym, exercise program. The programs at the gym are not only useful as a workout in and of themselves, but as importantly, develop life skills that are useful in everyday life.

Until these are a problem, they are taken for granted; when they become a problem it can be a true crisis:

\(^1\)The following is a letter written by a client of Parkinson Wellness Recovery (PWR!) Gym of Tucson, AZ.
Getting in and out of bed  Getting in and out of a car

Getting in and out of a chair  Getting up off the ground

Maneuvering around obstacles  And so forth

PWR! Gym addresses these issues and others, and does so through continuing research, with a dedicated staff of employees and volunteers. Tucson is known in the Parkinson medical community as the center of cutting edge programs, thanks to PWR! Gym.

Typically class members meet at the gym three times a week for an hour’s workout. Class size is a manageable 8-12 participants each time. Each session is both a review of learned skills and an introduction of additional skill sets. It is this dedication to constant program improvement and staff attitude that keeps workouts productive and fresh... an enticement to always making the workouts a priority. It doesn’t take long to place a high value on the results of gym attendance. What is learned at the gym can be implemented and practiced at home. And missing a workout or two is like missing a significant life experience; an experience that gives both hope and control.

Another unique feature of the gym program is the staffing of volunteers. Each class has the expert instructor/coach, plus a 2-3 person volunteer staff. Having them there is huge. The volunteer staff makes lots of personal instruction and attention possible.

That staff consists mostly of university students who are pre-med; in other words, they are competent, interested and professional, and I might add, pleasant and attentive. The gym experience and result would not be nearly as complete without them. We are blessed that the program provides for their inclusion. We are also blessed that quality students are available and use their time to serve. It is easy to tell that they care.
To sum up, having a Parkinson-specific gym so near is a Godsend, and the cutting edge program with trained staff and volunteers is well beyond expectations, giving the Parkinson gym member participants skill sets, motivation and positive expectations.

W.W.
Background of Parkinson Disease

Approximately sixty thousand people in the United States are diagnosed with Parkinson disease (PD) each year (Parkinson’s Disease Foundation, 2014). With one million adults currently affected, 3% over the age of 65 and up to 5% over the age of 85, it is now the second most common neurodegenerative disease (Bogdanov et al., 2008; Farley, 2004; Alves et al., 2008).

Causes of PD

Genetic and non-genetic causes have been hypothesized. Evidence suggests mutations in the following are linked to familial forms of PD: α-synuclein, a synaptic and nuclear protein involved in the maintenance of synaptic vesicle pools; parkin, which functions as an ubiquitin ligase; leucine-rich repeat kinase 2 (LRRK2), mutations in which are the most common cause of inherited PD; and ubiquitin carboxy-terminal hydrolase-L1 (UCH-L1) (Stern et al., 2010; Biskup et al., 2008). These genetic abnormalities are associated with protein aggregation, such as the accumulation of Lewy bodies in the brain, mitochondrial dysfunction, and oxidative damage, which are believed to contribute to the pathophysiology of the disease (Biskup et al., 2008; Bogdanov et al., 2008). Nevertheless, the mechanisms remain unclear. Non-genetic risk factors, such as smoking and exposure to pesticides, are consistent with a lower and higher risk, respectively, of disease (Alves et al., 2008). Ultimately, the vast majority of PD cases have unknown causes, leading to the term *idiopathic* Parkinson disease. Despite the elusiveness of the causes, the basal ganglia pathophysiology of PD is well-documented.

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2 The modern trend is to refer to the disease as “Parkinson,” rather than “Parkinson’s” disease. This is because the discoverer, Dr. James Parkinson, did not actually have the disease.
Voluntary movement is initiated by the cerebral cortex and modified by areas of the brain including the cerebellum, thalamus, cortex, and basal ganglia through intricate feedback mechanisms (Trail et al., 2008). Embedded within the cerebral hemispheres, the basal ganglia is composed of large gray matter structures: the caudate and putamen, which are collectively called the striatum, globus pallidus (interna and externa), subthalamic nucleus, and the substantia nigra (pars compacta and pars reticulata) (Purves et al., 2012; refer to Figure 1 below).

![Figure 1. A representation of the basal ganglia and associated structures.](Institute of Neurosciences, 2014)

The cortex signals to the striatum via two pathways: the direct and indirect. The direct pathway promotes movement, whereas the indirect suppresses or prevents it. Both pathways work through circuitry that involves both facilitation and inhibition, using glutamate and GABA,
respectively. This ultimately leads to an effect on the supplementary motor area (SMA), as displayed in Figure 2 below:

![Figure 2](image)

*Figure 2. Circuitry within the basal ganglia, including excitatory and inhibitory pathways. (Brown University, 2014)*

Neurons in the substantia nigra pars compacta produce dopamine (DA). This additional neurotransmitter binds to D1 receptors in the globus pallidus interna and substantia nigra pars reticulata to excite the direct pathway; it also acts on the globus pallidus externa via D2 receptors to inhibit the indirect pathway (Fuglevand, 2013). Thus, DA modulates the timing and tone of movement through its influence on the two motor pathways (Farley, 2004).

PD is manifested by a loss of approximately 60% of the dopaminergic neurons in the substantia nigra pars compacta, leading to a substantial DA deficiency in the basal ganglia (Trail *et al.*, 2008). An imbalance results, with an overactivation of the indirect pathway and decreased activation of the direct pathway (Fisher *et al.*, 2013; Strausfeld and Hirth, 2013). Motor and non-motor symptoms ensue, including the four cardinal motor symptoms of tremor at rest, rigidity,
bradykinesia, and postural instability, as well as hypokinesia, festination, depression or anxiety, cognitive impairment, olfactory dysfunction, and autonomic and sleep disturbances (Farley, 2004; Chaudhuri and Naidu, 2008; Alves et al., 2008). However, only two of the four cardinal motor symptoms need be present for the clinical diagnosis of PD. Therefore, accuracy issues of diagnosis may arise.

According to Bogdanov et al. (2008), a study conducted two decades ago found only 76% accuracy in the clinical diagnosis of PD due to the difficulty of assessing patients in the early stages of the disease. Alves et al. (2008) went further to add that the clinical diagnosis is changed in over one-third of patients who were initially diagnosed with PD. Misdiagnosis is relatively common, with PD most frequently mistaken for essential tremor (ET).

**Symptoms of PD**

**Resting Tremor**

A resting tremor is most often the first symptom observed in the beginning stages of PD. Resting refers to its presence while the patient is static, or at rest, for it may decrease or cease upon movement of the body segment involved. The location is usually the hands, although tremor of the lower extremities and mouth have been observed (Trail et al., 2008).

In the beginning stages of PD, the patient may be misdiagnosed with ET. However, ET differs in its timing, as compared to tremor due to PD (Mayo Clinic, 2014). Patients with ET will experience a worsening of their symptom with movement, especially in the hands, whereas patients with PD experience the reverse, getting better with movement.
Rigidity

Both the extremities and the trunk may be rigid and resistant to passive, externally-imposed movement due to increased muscle tone (Trail et al., 2008). A phenomenon, termed “cogwheel rigidity,” is felt when the PD patients’ joints are moved by clinicians. Also, patients may experience dystonia, or sustained muscle contractions, that causes cramping and pain.

Bradykinesia

Bradykinesia is slowness of movement. It is a symptom seen in many movement disorders but is characterized as one of the cardinal features of PD. Although the term is used to describe speed of movement, it is used in conjunction with akinesia and hypokinesia, which are reduced spontaneity and smaller movements, respectively (Berardelli et al., 2001). Micrographia, or smaller handwriting, hypophonia, or reduced voice volume, and hypomimia, or reduced facial expression, are examples of akinetic and hypokinetic issues and may be manifested by the PD patient (Trail et al., 2008).

Postural Instability

The fourth of the cardinal motor symptoms, postural instability normally occurs in those with more severe PD and is a result of rigidity and bradykinesia. The patient will have shuffling of gait as well as a stooped appearance. Due to the position of the body and forward propulsion, ‘festination’ may arise, defined as the patient taking small, quick steps. Also, freezing of gait may occur, whereby the PD patient has a sudden episode of an inability to move his or her legs. Both contribute to the increased risk of falling (Trail et al., 2008).
Current Treatment

Pharmaceuticals

DA cannot cross the blood-brain barrier and so, cannot be given to PD patients directly. Nonetheless, DA precursors and DA agonists may be given. Of the available treatments, the most effective medical therapy is an orally-administered combination of levodopa and carbidopa (Mayo Clinic, 2014). As levodopa crosses the blood-brain barrier, it is converted to DA and works to improve motor symptoms of PD. Carbidopa acts to prevent levodopa’s premature conversion to DA, while also reducing its side effects of nausea and vomiting (MedicineNet, 2014). Eventually, with disease progression, the beneficial effects of levodopa decrease in duration. Also, prolonged use of levodopa is associated with the development of dyskinesias (Abbruzzese et al., 2012).

Neurosurgical Interventions

Researchers Miller and DeLong noticed hyperactivity in the subthalamic nuclei (STN) of non-human primates exhibiting parkinsonian motor symptoms after treatment with the toxin, 1-methyl-4-phenyl-1, 2, 3, 6-tetrahydropyridine (MPTP) (Kocabicak et al., 2012). Similarly, Bergman and associates discovered that lesions to the hyperactive STN improved motor symptoms in the non-human primates (Kocabicak et al., 2012). Due to these results and the role of the STN in the indirect pathway, with excitatory projections onto the globus pallidus interna and substantia nigra pars reticulata that lead to inhibition of movement, the STN became the target of deep brain stimulation (DBS) for MPTP-induced parkinsonian symptoms in animals.

Clinically, DBS is the implantation of an electrical lead in the brain, a neurostimulator in the upper chest, and an extension wire that connects the neurostimulator to the lead. Current is
delivered to the electrode via the extension, allowing regulation of impulses sent to the STN (Mayo Clinic, 2014; MedlinePlus, 2014). Electrical stimulation of the STN would seem to excite the indirect pathway; however, the mechanism proposed was that the presynaptic terminals of projection neurons of the globus pallidus externa are stimulated, thereby inhibiting the STN and the indirect pathway through the “modulation of brain rhythms” (Fuglevand, 2013; Karas et al., 2013).

The 1990s had several studies showing favorable results of DBS in PD patients. The neurosurgical procedure resulted in improved bradykinesia and rigidity, alleviated tremor, and reduced levodopa usage, with benefits lasting for more than five years after the procedure (Kocabicak et al., 2012; Abbruzzese et al., 2012). Today, DBS is a “well-accepted approach to managing PD in patients with inadequate control of symptoms or with significant side effects from levodopa” (Karas et al., 2013). Despite the benefits of DBS, disease progression still occurs. However, there is now considerable evidence that demonstrates that exercise, in addition to the aforementioned therapies, may slow progression of PD and improve gait, mobility, balance, flexibility, mood, and overall quality of life of PD patients.
THE BENEFITS OF EXERCISE

Animal Studies

Prior belief on exercise for patients diagnosed with PD was that it was to be avoided, and heavy reliance was on levodopa and dopamine agonists, as well as deep brain stimulation. Yet, relatively recent investigations using animal models of PD reveal the beneficial effects of exercise on brain health, including, but not limited to, neuroprotection, neurorestoration, and neuroplasticity (Hirsch and Farley, 2009).

The most common animal models of PD are the MPTP-lesioned mouse and the 6-hydroxydopamine (6-OHDA)-lesioned rat, which both exhibit substantial nigral loss of dopaminergic cells. Neuroprotective effects have been observed when exercise is performed before, during, or immediately after toxin administration; these effects include an increase of neurotrophic factors and a downregulation of the dopamine transporter (DAT). Neurorestorative effects have been observed when exercise is forced after completion of toxin-induced cell death; effects include reduced DAT expression, reduced DA clearance, restoration of D2 receptors, and increased release of DA (Petzinger et al., 2013). Exercise has also been documented to improve the overall health of the brain via angiogenesis, altered blood-brain barrier permeability, increased blood flow and capillary density, and increased number of synaptic connections, as well as favorable immune system responses (Farley et al., 2008; Petzinger et al., 2013). Therefore, these studies suggest that early exercise intervention may slow or halt the progression of PD in humans.
Human Studies

Goodwin et al. (2008) performed a meta-analysis of studies involving a target population of people with PD and the effects of some form of physical activity intervention. It was demonstrated that exercise-based interventions benefited PD patients in the areas of physical functioning, health-related quality of life (HRQOL), leg strength, balance, and gait speed. Studies were comparable, since they had the same target population and similar protocol and outcomes, which were assessed three times after the end of the intervention period. Of the possible interventions, treadmill training has proven effective.

Treadmill

Fisher et al. (2013) studied the outcomes of intensive treadmill exercise on D2 receptor binding potential (BP) in patients with early and unmedicated PD, using positron emission tomography (PET) imaging and a radioligand with high affinity for D2 receptors. Previous studies have revealed an increase in striatal D2 receptors and mRNA in vitro after intensive training in animals; an increase in D2 receptor availability, therefore, would be demonstrated by increased BP on in vivo imaging in humans. In the 2013 investigation, four patients with PD and two healthy controls were assessed. Two PD subjects and both healthy controls participated in intensive treadmill exercise, while the other two PD subjects did not. Training included three 1-hour sessions/week for 8 weeks, with speeds progressively increasing. PET imaging and postural control analysis, via turning performance, were conducted at baseline and upon training completion.

PD subjects who trained showed increases of 81% and 98% in BP, whereas PD subjects who did not exercise showed either no change or a decrease of 23% in BP. Data from the healthy
controls was limited, but a trend showed a minimal increase of 9% in BP; this implied that the effect of exercise on BP is PD-specific. Trained PD subjects demonstrated improved postural control upon turning performance analysis, whereas untrained PD subjects had minimal change. Fisher et al. (2013) hypothesized that exercise may attenuate the inhibition of the basal ganglia-thalamic-cortical loop by leading to a greater availability of D2 receptors when DA levels are low, in order to increase DA signaling in the indirect pathway, thereby improving postural control.

*The BIG Approach*

Amplitude-specific training targets the symptoms resulting from inadequate muscle activation, perhaps by the retraining of “normal-amplitude” use. Also, cognitive load, or the mental processing required to perform a task, is reduced with focus solely on amplitude. The BIG approach encompasses “multiple repetitions of 12 daily maximal whole-body bigness tasks” with high intensity and effort (Farley et al., 2008). Training occurs for 1-hour sessions 4 days/week for 4 weeks. Furthermore, patients are pushed to transfer BIG intensity and effort to everyday tasks performed by the patient, such as getting out of bed.

BIG training significantly improved short term trunk rotation, stride length, and gait and reaching velocity. In addition, training allowed patients to maintain the improved gait velocity and stride length, as well as enhanced quality of life. Results indicate the importance of exercise as a “legitimate therapeutic option immediately upon diagnosis – when there is the most potential for blocking the bilateral progression of the disease [sic]” (Farley et al., 2008).

Despite the growing body of evidence in support of exercise as an additional treatment for the management of PD, patients diagnosed with PD generally have a reduction in physical
activity, and only a small 12-15% are encouraged by their healthcare providers to exercise. Many factors may be responsible for this dismal statistic, but understanding how to increase awareness in both patients and physicians is critical to the advancement of community-based programs and early intervention (Hirsch and Farley, 2009). The Parkinson Wellness Recovery (PWR!) Gym is paving the way to changing the treatment of PD, with the goal of using exercise to improve the symptoms and quality of life of PD patients.
PWR! GYM OF TUCSON, ARIZONA

Background

Dr. Becky Farley’s PWR! Gym opened its doors to the Tucson community in 2012. Her neuroplasticity-principled exercise program was developed based on the vast amount of research that showed the benefits of exercise, especially treadmill and intensive amplitude-specific approaches. The program is implemented in all classes offered by the gym, with focus on cardio and the “Basic 4 PWR! Moves.” These Moves are performed by gym members with high intensity and amplitude, modeled after the BIG approach, and can be practiced in multiple positions to prepare the patients for everyday obstacles they may face with PD (Figure 3).

![Diagram of Basic 4 PWR! Moves](image)

*Figure 3. Basic 4 PWR! Moves can be performed in different positions and for multiple purposes. (Farley, 2014)*

The first of the Basic 4 is the PWR! Up. For example, while standing, the patient stands with feet under the hips and arms by his or her side. Then, he or she squats while bringing the
arms straight forward. The final component of the sequence is to PWR! Up by standing straight up and extending the arms wide out to the sides, with hands open and fingers extended.

PWR! Rock is next and requires the patient to transfer his or her weight from one leg to the next by bending one knee at a time. A Reach is added to the movement, so that the performer will reach to the side, up, or down.

PWR! Twist is the third of the Basic 4 Moves. It calls for the patient to stand in a wide stance with knees bent and arms out in a “T” position. Then, he or she twists from the core while also turning the head.

The final Move is the PWR! Step. This is done front, side, and back, both left and right, with good posture and open arms and hands.

The Moves Classes

On Monday, Wednesday, and Friday, four separate Moves classes are offered: Moves I, two Moves II, and Moves III. Moves III is offered earlier in the morning and is geared towards those with less severe PD, or those who are morning larks. Although the classes change often, the structure remains relatively stable. The instructor begins with a warm-up; this may be walking, with all in the class forming a circle and walking counterclockwise, or a group performance of the Basic 4 PWR! Moves. Then, the class is split up: half goes to cardio training, and the other half continues with the instructor in the center of the gym or at stations with volunteers. This occurs for twenty minutes, after which the halves switch and continue with their new exercise for another twenty minutes.

The type of cardio training is left to the preference of the gym member. He or she may choose from the elliptical, the bike, or the treadmill. Center work with the instructor may be floor
work with yoga mats, seated exercises, or gait training with various obstacles, including cones, colored dots to step over or onto, and hoops to weave around. Station work with the volunteers varies day-to-day and member-to-member, but the emphasis is on practicing movements that will improve the members’ daily living.

To conclude the Moves classes, members are usually seated in a large circle for a group discussion. The instructor reviews the exercises performed and their benefits, as well as gives advice on what to practice at home or what to focus on while not at the gym. Then, the class PWR!s Up together, and members are ready for the rest of their day.

How does exercise and PWR! Gym make members feel? Why do they keep coming back, instead of going to a non-PD gym? To address these questions, a voluntary survey was conducted November 2013 on members of PWR! Gym.

The Survey

Flyers and an email with background information and link to the survey were created by the author and distributed by the PWR! Gym manager (Appendix A). Twenty-four members participated in the first portion of the survey, with sixteen males and eight females (Appendix B). Sixteen members participated in a second portion of the survey (Appendix C).

Background information was acquired and reported as follows: all but one participant were diagnosed with PD after the age of 50; original symptoms, which prompted the subjects to visit a neurologist, included upper extremity tremor, balance issues, slow movement, falling, and rigidity; and essential tremor was the most common misdiagnosis, among 21% of participants. Before their diagnosis 20% reported that, in a typical week, they did not regularly exercise, 4% exercised 1 day/week, 63% exercised 2-4 days/week, and 13% were physically active 5-7
days/week (Figure 4). After diagnosis, 67% and 29% exercise 2-4 days/week and 5-7 days/week, respectively (Figure 5).

Figure 4. Pre-PD diagnosis exercise habits. (PWR! Survey (Part I), 2013)

Figure 5. Post-PD diagnosis exercise habits. (PWR! Survey (Part I), 2013)
After exercising at PWR! Gym specifically, a majority of participants reported improvements in their symptoms, function, pain, mood, balance, strength, flexibility, and gait/walking (Figure 6). Furthermore, all answered that exercise was moderately to extremely important to them and that they would recommend PWR! Gym to a friend or relative diagnosed with PD (Figures 7 and 8).

*Figure 6.* Perceived quality of life improvements due to PWR! classes (PWR! Survey (Part II), 2013)
Figure 7. Importance of exercise to the PWR! Gym members. (PWR! Survey (Part II), 2013)

Figure 8. 100% of PWR! Gym members would recommend PWR! Gym. (PWR! Survey (Part II), 2013)
In summary, the outcome of all of the data together supports the findings of previous studies on the benefits of exercise for PD patients. Members observed improvements in their balance, gait, flexibility, and quality of life, which reinforced suggestions in the literature that exercise is a necessity to acquire such results.

These data are subjective but display the benefits of attending a PD-specific fitness center. When members perceive improvements in their symptoms and overall quality of life, and when exercise becomes an essential part of their lives, they are beating their disease. Instead of allowing PD to consume their happiness and hinder their movements, the PWR! Gym attendees are using exercise to fight back together. The neuroplasticity-principled exercise program created by Dr. Farley provides these PD patients the techniques necessary to slow the progression of PD and improve overall quality of life. PWR! Gym provides the camaraderie and motivation that are the keys to success.
VOLUNTEERING

There are numerous reasons that people volunteer. From earning credit, to challenging oneself, to giving back, to building a resume, the list goes on and reflects the personal and professional motivations of the volunteer (Ellis, 2014). As stated by the Actions Without Borders website:

Part of finding the right volunteer opportunity is being honest about what you hope to learn and accomplish. If in the process of meeting your personal and professional goals, you are also serving as an effective volunteer, helping to meet the goals of your particular volunteer project or role, and/or helping to move an organization’s mission forward, it’s a win-win situation (Actions Without Borders, 2014).

When I began my volunteer career at PWR! Gym in May 2013, my initial plan was to put the experience on my application to medical school. I sought to meet my professional goal. Yet, after the application process, I kept returning to PWR! Gym week after week. It was the feeling I had and continue to have when working with the people of the gym. The following short story documents one of my most meaningful experiences at PWR! Gym:

Every Monday morning, I volunteer in the Moves classes. My morning commences with the 9 am Moves III session, which combines cardio training with station work to improve balance, gait, stretch, and strength. B.P. is an attendee. His eagerness to begin is publicized by the way he makes a beeline from the entrance to the gym to the vibration machine for warm-up; his confidence remains high throughout the twenty minutes he spends on the treadmill; and his enthusiasm is steady, despite some unsteadiness balancing on the BOSU ball. However, B.P.’s positive attitude deflates when he comes upon the “baseball” station. He terms his right arm
“useless,” and proceeds to declare “I stink,” as he grabs a miniature beanbag and attempts to pitch it at the trampoline against the wall. When his gaze turns to the floor, and he breathes a heavy sigh of disappointment, with the beanbag like lead in his hand, it is time for me to intervene.

Every exercise we do at PWR! Gym has the word “power” (PWR!) attached to it. So, I instruct B.P. to take a large PWR! Step with his left foot. Then, I coach him to PWR! Twist from his core and extend his arm slightly. Finally, I direct him to follow through with that arm and release the beanbag with elongated fingers. B.P.’s morale at the baseball station improves to the point of equaling his outlook at the other stations by the end of class. Week after week, B.P. and I devise strategies and rehearse coaching cues given by A.D., Exercise Specialist and Instructor; week after week, B.P. sees his right arm becoming useful and says, “I’m feeling pretty good!”

As I work with B.P. on the same exercise, I see small improvements each week. I grasp that change need not be swift. Gradual progress is more meaningful; it requires that B.P. and I establish teamwork, dependability, and a connection. PWR! Gym provides the instruction and environment necessary for these qualities, so that every single member may pitch many strikeouts, like B.P.

I continue to volunteer at Parkinson Wellness Recovery (PWR!) Gym because of the relationships I have made, with members, instructors, and other volunteers, and the personal growth I have experienced. Working at PWR! involves instructing members on how to perform certain movements and cuing them on how to perform them better; but, when you work with the same people every week, you learn their history, strengths, weaknesses, concerns, passions. You discover what makes them tick. No longer are they defined by their Parkinson disease; they are individuals who define themselves through their experiences, actions and resilience.
Through connections made with PWR! members, I recently encountered a change within myself. Prior to 2014, my life always went in the direction I chose. However, in my final semester at the University of Arizona, the situation was out of my control. The outcome was not my desired outcome, and I let it get the best of me for some time. But when I thought about the PWR! Gym members, my outlook on my situation changed. These wonderful people had PD, and that was out of their control. Yet, they showed their strength, waking up and coming to the gym to fight their disease. This huge obstacle was diminishing in size because they were not allowing it to take control.

The PWR! Gym members’ spirit and toughness serve to inspire me. They rely on me to deliver instructions on proper body placement during the PWR! Moves, and I rely on them to show me the bigger picture of life.

As a volunteer, there are skills and knowledge you will acquire and practice, including:

- A basic understanding of PD
- Patience
- Care and courtesy
- Communication
- Positivity and delivery of words of encouragement, and
- Commitment.

Volunteering will change your life and create opportunities for personal growth.
CONCLUSION

Exercise advances brain health, increases synaptic and circuitry strength, and improves motor and cognitive behavior, mood, motivation, and overall quality of life of PD patients. When used in addition to pharmaceuticals and neurosurgical techniques, the results are astounding. However, exercise is rarely prescribed by diagnosing physicians, and those diagnosed have a tendency to reduce their physical activity. The issue remains in community outreach and awareness.

The Parkinson Wellness Recovery (PWR!) Gym of Tucson, AZ is paving the way towards a new approach to treating PD, slowing its progression, and ultimately, improving quality of life for patients with PD, with Dr. Becky Farley’s neuroplasticity-principled exercise program. PWR! Gym is the only facility of its kind in the United States. Lives are changed and opportunities created for both gym members and volunteers. Hopefully, with further research, education, and outreach, more organizations like PWR! will appear so that people with PD can exercise for brain change.
REFERENCES


Goodwin VA, Richards SH, Taylor RS, Taylor AH, Campbell JL. (2008). The Effectiveness of Exercise Interventions for People with Parkinson’s Disease: A Systematic Review and


Parkinson’s Disease Foundation. (2014). *Statistics on Parkinson’s.* Retrieved online from


PWR! Survey: PD and Exercise (Part I). (2013). For full survey, see Appendix B.

PWR! Survey: PD and Exercise (Part II). (2013). For full survey, see Appendix C.


APPENDIX A

Instructions from Flyers and Emails Distributed by the PWR! Gym Manager

Hello, PWR! Gym members! My name is Audrey Roberts. I am a volunteer for the Moves classes on Mondays and a senior Physiology/Neuroscience and Cognitive Science major at UA. I am conducting research for my Honors thesis and would greatly appreciate your assistance! Please go to the links listed below, and complete 2 ten-question surveys on exercise and PD by **Friday, November 15**. Responses will remain anonymous. This is strictly for a research paper and the interest of PWR! Gym. Thank you for your help, and continue to Exercise4BrainChange™!

Part I

(Link removed)

Part II

(Link removed)
APPENDIX B

PWR! Survey: PD and Exercise (Part I)

1. What is your gender?
   - Female
   - Male

2. What were your original symptoms that prompted you to visit a physician?
   
3. Was your original diagnosis PD?
   - Yes
   - No

4. If not, what was your original diagnosis?
   
5. At what age were you diagnosed with PD?
   - Before 50
   - After 50

6. In a typical week, how often did you exercise before your diagnosis?
   - I didn't regularly exercise
   - Once a week
   - 2 to 4 days a week
   - 5 to 7 days a week

7. At the time of your diagnosis, was exercise discussed with you?
   - Yes
   - No
8. Has your neurologist ever discussed exercise with you?
- Yes
- No

9. Did your neurologist prescribe exercise for PD?
- Yes
- No

10. In a typical week, how many days do you exercise?
- I don't regularly exercise
- Once a week
- 2 to 4 days a week
- 5 to 7 days a week
APPENDIX C

PWR! Survey: PD and Exercise (Part II)

1. Which PWR! class do you attend?
   - [ ] Circuit I
   - [ ] Circuit II
   - [ ] HIIT
   - [ ] Moves I
   - [ ] Moves II
   - [ ] Moves III

2. Do you exercise outside of PWR! Gym/in addition to your class at PWR! Gym?
   - [ ] Yes
   - [ ] No

3. Do you feel your PWR! class improves your:
   - [ ] Yes                   [ ] No
     Symptoms?
   - [ ] Yes                   [ ] No
     Function?
   - [ ] Yes                   [ ] No
     Pain?
   - [ ] Yes                   [ ] No
     Mood?
   - [ ] Yes                   [ ] No
     Balance?
   - [ ] Yes                   [ ] No
     Strength?
   - [ ] Yes                   [ ] No
     Flexibility?
   - [ ] Yes                   [ ] No
     Gait/walking?

4. How do you feel about the frequency (# of days per week) of PWR! classes?
   - [ ] Too frequent
   - [ ] Just right
   - [ ] Not frequent enough
5. How do you feel about the length of PWR! classes?
   - Too short
   - Just right
   - Too long

6. How do you feel about the size of PWR! classes?
   - Too few
   - Just right
   - Too many

7. How hard do you feel you work during PWR! class?
   - 1 (not at all)
   - 2
   - 3 (somewhat)
   - 4
   - 5 (all I can give)

8. How important is exercise to you?
   - Extremely important
   - Very important
   - Moderately important
   - Slightly important
   - Not at all important

9. What additional classes and/or services would you be interested in paying for?
   - Yoga
   - Stretch
   - Meditation
   - Balance
   - 1:1 personal training
   - Pilates
   - Partner dancing
   - None
10. Would you recommend PWR! Gym to a friend/family member diagnosed with PD?

- [ ] Yes
- [ ] No