Integrative Medicine and Health Therapy for Parkinson Disease

Mary-Frances E. Hall, BS; Frank C. Church, PhD

Parkinson disease (PD) is the second most common neurodegenerative disorder with approximately 60,000 newly diagnosed patients yearly in the United States. PD is traditionally described as a motor system condition, although numerous nonmotor symptoms exist, and typically manifest within elderly patients. The hallmark pathogenesis of PD is the loss of dopaminergic neurons within the substantia nigra region. This leads to a traditional treatment goal of dopamine replacement. We outline an integrative medicine and health strategy for PD that utilizes not only traditional but also nontraditional therapeutic approaches. This strategy supports the neuronal microenvironment and restorative health of both the brain and the body.

Key words: anti-inflammatory, antioxidants, complementary and alternative medicine (CAM), exercise, integrative medicine, over-the-counter (OTC), Parkinson disease

A small region of the midbrain, called the substantia nigra, is responsible for making the all-important neurotransmitter dopamine. Parkinson disease (PD) arises when the dopaminergic neuronal cells in the pars compacta region of the substantia nigra die, unable to make enough dopamine to meet the body’s need. It takes an approximately 50% loss of these cells for the first symptoms to appear in PD, which typically results in a progressive decline in motor function.1,5

The cause of this neuronal cell death is yet to be fully understood. However, much research has provided evidence that the cause of PD resides in the cumulative effects of advanced age, genetic mutations, immunologic dysfunction, mitochondrial dysfunction, neuroinflammation, and oxidative stress.6-11 An additional key pathogenic event that also contributes to PD is the aggregation of the extracellular protein α-synuclein into Lewy bodies within neuronal cells.

PD typically affects people older than 60 years, and there are more than 1 million people with PD (PwP) in the United States. The symptoms of PD develop gradually over several years, which often make the disease difficult for clinicians to diagnose. PD is traditionally described as a motor system disorder that results from the loss of dopamine-producing brain cells. PD has 4 cardinal symptoms: rigidity (stiffness of the limbs and trunk); bradykinesia (slowness of movement); postural instability (impaired balance and coordination); and tremor (trembling in hands, arms, legs, jaw, and face).5 Importantly, in addition to these common manifestations, there are numerous nonmotor symptoms in PD that are typically not as easily visualized as the motor symptoms.5,12-15 Examples of these nonmotor PD symptoms include depression, psychosis, urinary problems, constipation, and sleep disruptions.

Currently, there are several traditional medical approaches used to treat PD. These pharmaceutical treatments are aimed at both replacing the depleted dopamine and sustaining the remaining levels of dopamine in the PwP. Unfortunately, there are no proven traditional medical approaches that are either neuroprotective or neuroregenerative. Thus, PD remains a progressive neurodegenerative disorder. There is a growing trend, though, within the PD community to use complementary and alternative medicine (CAM) therapy, which includes botanical substances and over-the-counter (OTC) compounds, to treat PD and mitigate the issue of finding additional therapies that are neuroprotective or neuroregenerative.14-18

The goals of this article are (i) to describe an integrative medicine strategy that combines traditional and nontraditional medical approaches as a novel treatment approach for PwP, and (ii) to present a brief case study that utilizes an integrative medicine strategy to treat PD. The integrative medicine strategy for PD outlined in this article is

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based on the published work (in animal model systems and human studies) that focuses on selective and specific CAM substances. This integrative medicine plan includes lifestyle changes that have been shown to either improve quality of life (QOL) or slow disease progression. This article begins by defining CAM and integrative medicine. This is followed by a literature review supporting the individual components of the integrative medicine plan, and a case study overviewing a patient who currently utilizes an integrative medicine approach to treat his PD.

CAM AND INTEGRATIVE MEDICINE AND HEALTH

Defining CAM
CAM refers to medical products and techniques not typically seen in the usual state of Western medical practice.\textsuperscript{19-21} Breaking down this concept and looking at the “complementary” and “alternative” aspects, complementary medicine is defined as nonconventional medical practice when used side by side with traditional Western medicine. Alternative medicine follows the nonconventional therapeutic path as well but in the absence of traditional Western medicine inclusion. Alternative medicine has typically been derived from long-existing and well-studied medical systems deep-rooted in healing practices from China, India, and Africa. Thus, the most common CAM techniques have been in use for thousands of years within ancient medical practices and include methods such as acupuncture, massage, yoga, mindfulness, and botanical compounds for therapy. The National Center for CAM provides 5 categories to broadly describe CAM (with representative components for each of the 5 categories) (Figure 1).

Defining integrative medicine and health
Integrative medicine is the practice combining both traditional and nontraditional medicine practices together (Figure 2).\textsuperscript{20} A PwP may be relatively physically healthy, but he or she is also tasked with the mental and emotional burden of living with a progressive neurological disorder. Acknowledging that each PwP has differing rates of disease progression and expresses various manifestations of motor and nonmotor symptoms, there are some common treatment themes that can potentially benefit all PwP. The rest of the article focuses on a description/discussion of common treatment themes interwoven within the features of an integrative medicine and health treatment plan for PD (Figure 2).

INTEGRATIVE MEDICINE AND HEALTH THERAPY TO TREAT PD

Conventional medical approach
An essential feature for all PwP is the loss of dopamine-producing neurons in the midbrain substantia nigra pars compacta.\textsuperscript{1,2} As such, the most straightforward and traditional treatment strategy for a PwP is the replacement of the dopamine that the substantia nigra region is no longer producing. Therapy is accomplished through the utilization of either a precursor to dopamine (carbidopa/levodopa) or a mimic of dopamine (dopamine agonist).

The first conventional medical therapy, levodopa together with carbidopa, has historically been the most effective treatment option for the presenting motor symptoms of PD.\textsuperscript{22} Carbidopa is a peripheral decarboxylase inhibitor that increases the uptake of levodopa in the central nervous system. Levodopa is then converted to

![Figure 1](image-url)

Figure 1. Complementary and alternative medicine is subdivided into 5 categories and shown are examples from each category.
dopamine by the dopaminergic neurons. With time, carbidopa/levodopa use is associated with issues of “wearing off” (motor fluctuation) and dyskinesia. However, we refer the reader to Ahlskog and Espay and Lang, both of whom extensively defended and endorsed the use of carbidopa/levodopa.

The second conventional medical therapy dopamine agonists are “mimics” of dopamine that pass through the blood-brain barrier to interact with target receptors. Dopamine agonists provide symptomatic benefit and delay the development of dyskinesia compared with carbidopa/levodopa. Dopamine agonists are not without their side effects, though, which can include compulsive gambling, hypersexuality, and other impulse behavior disorders, sudden-onset sleep, hallucinations, and edema.

There are several different classes of compounds that stabilize the actual daily amount of dopamine synthesized by a PwP. Monoamine oxidase B (MAO-B) is an enzyme that destroys dopamine; thus, MAO-B inhibitors help prevent the destruction of endogenous dopamine in the brain. The most common severe side effects of MAO-B inhibitors include constipation, nausea, lightheadedness, confusion, and hallucinations. Catechol-O-methyl transferase (COMT) inhibitors prolong the half-life of levodopa by blocking its metabolism. COMT inhibitors are used primarily to help with the problem of the “wearing-off” phenomenon associated with levodopa. Both MAO-B inhibitors and COMT inhibitors have some ability to reduce the motor symptoms of PD.

Nonconventional medical approach
The CAM and OTC strategy is based on each substance possessing 1 or more than 1 property from the following criteria that we have developed:

Does the compound counteract one of the proposed causes of PD as described in the introduction?
Does the compound augment one of the biological mechanisms that could contribute to slowing progression of PD?
Does the substance contribute to overall brain metabolism/health?
Does the compound penetrate the blood-brain barrier?
Is there any published information on the substance in animal model systems or in human clinical trials?
Are the compounds easy to take orally and relatively inexpensive?

Note there are many compounds that could be used in a CAM/OTC scheme for treating PD. However, the following substances are the ones that we have selected as meeting aspects of the proposed criteria in addition to a variety of roles in brain health. Therefore, we feel they are ideal components for a focused CAM/OTC strategy for treating PD. Next, is a brief description of each of the selected CAM/OTC compounds (also see Table 1).

Taurine
Taurine is an amino sulfonic compound (many erroneously use the term “amino acid”), and it is considered to be a conditionally essential nutrient. We do not use taurine in the assembly of proteins from genes; however, it participates in several physiological systems. Good sources of dietary taurine are animal and fish proteins. Taurine has many proposed physiological functions that range from neurotransmitter to cell antioxidant and from anti-inflammatory to sports performance. In addition to these positive benefits, it was shown in mouse PD models that taurine protected dopaminergic neurons through inhibition of microglial M1 polarization. Taurine also helps the
trans-Resveratrol

Resveratrol is an antioxidant that crosses the blood-brain barrier. Because of this ability, resveratrol could potentially act to reduce both free radical damage and inflammation in PD. If you decide to purchase this compound, the biologically active form is trans-resveratrol. In a mouse model of PD, resveratrol treatment resulted in a decrease in oxidative stress and an improvement in behavior patterns. These in vivo results suggest that resveratrol could be a potent compound for neurodegenerative disorders.

N-Acetyl-cysteine

N-Acetyl-cysteine (NAC) is one of the building blocks for the all-important antioxidant substance glutathione (GSH). GSH is a powerful reagent that helps cells fight against oxidative stress. Looking at its biological action, the delivery of NAC into a cell allows for intracellular generation of GSH. The presence of intracellular GSH bestows upon a cell the enormous advantage of resistance to potentially toxic oxidative agents. In contrast, extracellular GSH has a difficult path into the cell and is likely to be oxidized, rendering it useless and unable to play an advantageous role. In addition to this biological action, NAC crosses the blood-brain barrier and does offer some antioxidative protection through this mechanism.

Katz et al. showed that NAC reduced oxidative stress, and they measured increased levels of GSH and cysteine, both of which were dependent on the dosage level of NAC. Monti et al. showed that NAC increased dopamine transport binding. Furthermore, following a 3-month treatment strategy with NAC, there was a measurable positive effect on disease progression as measured by UPDRS scores. The conclusions of these articles support the feasibility of using oral NAC as a CAM therapy for treatment of PD.

### Table 1: A Selective CAM/OTC Supplementation Strategy for Parkinson Disease

<table>
<thead>
<tr>
<th>Compound (CAM Natural Product or OTC)</th>
<th>Amount Taken and Frequency</th>
<th>Suggested Role in Treating PD or in Helping the Brain</th>
<th>Brand and Source of Compound (URL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N-Acetyl-cysteine (NAC)</td>
<td>600 mg capsules × 3 daily</td>
<td>Building block to glutathione</td>
<td>NOW Supplements, Amazon.com (<a href="https://amzn.to/2muxRpP">https://amzn.to/2muxRpP</a>)</td>
</tr>
<tr>
<td>trans-Resveratrol</td>
<td>200 mg capsule daily</td>
<td>Antioxidant and anti-inflammatory</td>
<td>NOW Supplements, Amazon.com (<a href="https://amzn.to/2kubPSQ">https://amzn.to/2kubPSQ</a>)</td>
</tr>
<tr>
<td>Taurine</td>
<td>500 mg capsule × 2 daily</td>
<td>Neuroprotective and supports brain/nerve health</td>
<td>NOW Supplements, Amazon.com (<a href="https://amzn.to/2morcx">https://amzn.to/2morcx</a>)</td>
</tr>
<tr>
<td>Magnesium l-threonate (Magtein)</td>
<td>2000 mg daily in 4 capsules</td>
<td>Neuroprotective and supports brain/nerve health</td>
<td>Double Wood Supplements, Amazon.com (<a href="https://amzn.to/3a1ah7i">https://amzn.to/3a1ah7i</a>)</td>
</tr>
<tr>
<td>Curcumin</td>
<td>500 mg capsule daily</td>
<td>Antioxidant and anti-inflammatory</td>
<td>Jarrow Formulas, Amazon.com (<a href="https://amzn.to/36HMHN0">https://amzn.to/36HMHN0</a>)</td>
</tr>
<tr>
<td>α-Lipoic acid</td>
<td>600 mg capsule daily</td>
<td>Antioxidant and supports CNS</td>
<td>Superior Labs, Amazon.com (<a href="https://amzn.to/2RLVQws">https://amzn.to/2RLVQws</a>)</td>
</tr>
<tr>
<td>Acetyl-L-carnitine</td>
<td>500 mg capsule daily</td>
<td>Antiaging and supports brain metabolism</td>
<td>Double Wood Supplements, Amazon.com (<a href="https://amzn.to/2t0Gyvz">https://amzn.to/2t0Gyvz</a>)</td>
</tr>
<tr>
<td>Vitamin D₃</td>
<td>5000 IU capsule daily</td>
<td>Supports immune system and CNS</td>
<td>NOW Supplements, Amazon.com (<a href="https://amzn.to/2m6DdaI">https://amzn.to/2m6DdaI</a>)</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>500 mg tablet daily</td>
<td>Antioxidant and supports CNS</td>
<td>NOW Supplements, Vitacost (<a href="https://bit.ly/2mGyFjP">https://bit.ly/2mGyFjP</a>)</td>
</tr>
<tr>
<td>Probiotic complex; 20 strains of probiotic bacteria</td>
<td>1 capsule daily (25 billion CFU)</td>
<td>“Friendly” bacteria for a healthy GI tract</td>
<td>NewRhythm, Amazon.com (<a href="https://amzn.to/2kN69UV">https://amzn.to/2kN69UV</a>)</td>
</tr>
<tr>
<td>Ashwagandha</td>
<td>1300 mg daily in 2 capsules</td>
<td>Anti-inflammatory, reduces stress and helps cognition</td>
<td>NutriRise, Amazon.com (<a href="https://amzn.to/2lZzlYR">https://amzn.to/2lZzlYR</a>)</td>
</tr>
</tbody>
</table>

Abbreviations: CAM, complementary and alternative medicine; CFU, colony-forming unit; CNS, central nervous system; GI, gastrointestinal; OTC, over-the-counter; PD, Parkinson’s disease.

*Note that these views and opinions expressed here are of the authors. Content presented here is not meant as medical advice. Definitely consult with your physician before taking any type of supplements. The CAM/OTC strategy discussed here does not replace established medicinal treatment of PD.*
**Vitamin D_3**

Vitamin D_3 is one of the 4 fat-soluble vitamins. In technicality, the human body has the ability to synthesize vitamin D_3 on its own, blurring the line on whether it is truly a vitamin or rather a hormone. Sunlight is the acting force that converts the precursor, 7-dehydrocholesterol, into the final vitamin D_3 compound. Vitamin D_3 helps increase intestinal absorption of calcium, magnesium, and phosphate, and it has a key role in maintaining bone health. In 2013, Ding et al. found that PwP frequently were deficient in vitamin D_3. Furthermore, Peterson et al. reported that cognitive impairment in PD was improved following treatment with vitamin D_3.

**Vitamin B_1 (thiamine HCl)**

A reduction in vitamin B_1 has been linked to cognitive decline in neurodegenerative disorders. In neuronal cells, the effect of vitamin B_1 was shown to occur through an interaction with cytoskeletal proteins. Furthermore, a neuroprotective role has been postulated for vitamin B_1. There are a large number of PwP who daily take a high-dose thiamine regimen of up to 4 g/d of vitamin B_1 (as thiamine HCl). However, each person should slowly titrate up to this amount (since motor symptoms may get worse depending on the dose and the person). The recommendation here is 100 mg/d of vitamin B_1 (8333% of the daily requirement) and titrate up individually over several weeks to months as desired.

**Magnesium l-threonate (Magtein)**

Magnesium is an essential nutrient for the body. Magnesium helps regulate muscle and nerve function, maintain blood pressure, and aid in bone health and formation. It has also been long appreciated that magnesium has a neuroprotective role. Magnesium l-threonate has the ability to cross the blood-brain barrier, and it was shown in a mouse model of PD that magnesium l-threonate was neuroprotective and blocked further dopaminergic neuron loss.

**Curcumin**

Turmeric (*Curcuma longa*) has a long history within Southeast Asian cultures as a food spice in addition to acting as a key component in treating a broad spectrum of human disorders through the practice of Ayurveda medicine. Curcumin is a polyphenolic substance that gives turmeric its golden color and biologically it has strong antioxidative, anticancer, and anti-inflammatory actions. Curcumin downregulates mitogen-activated protein kinase (MAPK) and blocks the action of nuclear factor kappa-light-chain-enhancer of activated B cells (NF-κB). Curcumin has been safely used in several human clinical trials. Finally, curcumin has been shown to be neuroprotective in rodent models of PD.

**α-Lipoic acid**

α-Lipoic acid (ALA) is essential for cell growth, mitochondrial activity, and coordination of fuel metabolism. ALA is synthesized in both plants and animals; however, its production in humans is low. Broccoli, spinach, tomatoes, peas, brown rice, potatoes, and red meat are especially rich in ALA. Highlighting 2 of the many earlier studies with ALA, Stoll et al. showed that memory improved when old rodents were given ALA, but this did not happen in younger animals. Hagen et al. found that cells from the aged animals were more susceptible to oxidative insult than young cells. However, this age-related increase in oxidative vulnerability is reversed by exogenously added ALA after its reduction to an antioxidant in the mitochondria. Phillipson nicely updated the known properties of ALA in neuronal tissue and how beneficial supplementation with it could help manage the biology of advanced aging either in the absence or presence of PD. Note that ALA may lower thyroid hormone; thus, PwP with hypothyroidism should avoid taking ALA.

**Acetyl-l-carnitine**

l-Carnitine can be produced from the amino acids methionine and lysine and is considered both a nutrient and a supplement. l-Carnitine has an essential function in facilitating the production of energy due to the role it plays in generating energy through the transportation of fatty acids in mitochondria. Furthermore, the acetylated form of l-carnitine (acyetyl-l-carnitine [ALC]) seems especially beneficial for the brain. As mentioned earlier for ALA, ALC partially restored mitochondrial function in aged but not young rat cells. Furthermore, ALC partially reversed both memory and learning defects found in aged rat brains but not in young rat brains. Several studies suggest that combining ALA and ALC could reverse the age-linked decline in the brain and potentially be neuroprotective in the progression of PD.

**Vitamin C**

A deficiency in vitamin C is not linked to development of PD. Oxidative stress can be a prominent feature in the etiology of PD, and reduced vitamin C was detected from oxidative stress in PwP compared with controls. As a known antioxidant, vitamin C may reduce the damaging oxidative microenvironment in PD.

**Probiotic complex**

The gut-brain axis is a communication hub (or bidirectional signaling site) between the gastrointestinal tract and the brain, and the gut microbiota can trigger the interaction. Our gut microbiota produce many substances (including neurotransmitters). The implication for PD is that the gut microbiota-gut-brain axis is somehow different/altered and generates either pathological signals.
or toxic substances that promote neuroinflammation, which helps promote PD progression. One study found that PwP who took a probiotic supplement for 12 weeks, when compared with the placebo, had significantly reduced MDS-UPDRS rating scores, reduced levels of the inflammation marker C-reactive protein, and increased levels of GSH in the blood plasma level.77

Ashwagandha
Ashwagandha (Withania somnifera) is a herb commonly used in Ayurvedic medicine to improve overall health.78 This medicinal herb is reported to be anti-inflammatory and has positive benefits working to reduce anxiety, reduce stress, and possibly boost cognition. Ashwagandha was shown clinically to reduce stress and improve QOL.79 In the Indian Ayurvedic system of medicine, Ashwagandha is used in all stages of PD.80

Using the CAM/OTC substances
It is important to realize that conventional dopaminergic-directed therapy helps replace the missing dopamine yet has no impact on disease progression. Therefore, we feel that it is logical to explore adding other nontraditional substances that could help preserve the remaining dopaminergic neurons. As referenced earlier, each individual compound has been studied in PwP or tested in experimental models of PD. There is no available research study on using an extensive nonconventional daily therapeutic approach to treat PD. Should one slowly begin through the introduction of just a few of these substances? Or introduce all of them at once? One goal here is to challenge everyone to think “outside the box” of conventional therapy. We envision a synergistic relationship combining conventional and nonconventional strategies with exercise and a mind-body approach to treating PD.

Exercise and mind-body approach

Exercise and PD
Exercise is activity that requires physical effort and is carried out especially to sustain or improve health and fitness. Exercise can benefit most people, but it is especially crucial to anyone with PD.

Exercise has been shown to be neuroprotective in PD. The benefit from exercise has been demonstrated in mouse models and in humans alike. One study analyzed the effect of treadmill exercise on mice with nigrostriatal dopaminergic neuronal damage (a simulator for the lack of dopaminergic neurons in PD patients). After 30 days, the neuronal-damaged mice had reached normal levels of velocity and endurance.81 The data from this study show that exercise modulates genes and proteins important to the function of the basal nuclei.

Zhou et al82 showed in a mouse model system study that exercise slows progression of PD:

- Exercise prevents α-synuclein oligomer accumulation in the brain, but it increases α-synuclein monomers and dimers in blood plasma.
- Exercise significantly improves motor and cognitive functions.
- The beneficial effect of exercise is partly related to increased levels of DJ-1, Hsp70, and BDNF, which are neuroprotective substances.
- It is not possible to describe how exercise alters brain function in PD when exercise itself has such widespread systemic changes/benefits.

Studies in humans with PD have shown similarly promising results.83-85 One study demonstrated that multidisciplinary intensive rehabilitation treatment, involving aerobic training and physical and occupational therapy, reduced the severity of PD symptoms.84

In a comprehensive review of physical exercise in PD and Alzheimer disease, it was recommended to do aerobic physical exercise with neuromuscular system work combined with balance and motor function exercises.86 Thus, focus your exercise routine on combining aerobic physical exercise with strength/power training, incorporate balance/coordination routines with motor function exercises, and then attempt to improve cognitive function while exercising.

Amara and Memon87 studied the impact of exercise on nonmotor PD symptoms. Specifically, they studied how exercise affected PwP with autonomic nervous system dysfunction, cognitive impairment, and sleep disorders.88 Their results suggest that some of the symptoms experienced by PwP (symptoms that increase risk of falls, depression, apathy, and cardiac sympathetic denervation) might limit exercise because these are symptoms that contribute to a sedentary lifestyle. Identifying and better treating these symptoms, combined with a creative system to incorporate an exercise routine, might help facilitate the ability of these PwP to perform specific exercises. Importantly, we are just beginning to use physical exercise to address nonmotor symptoms of PD. This is likely the start to future exercise studies concerned with alleviating both motor and nonmotor symptoms of PD.

A study by van der Kolk et al89 used a home exercise strategy in PD. They compared a high-intensity aerobic exercise group (stationary cycling) with a nonaerobic exercise group, and they exercised at least 3 times per week for 30 to 45 minutes each session. Each study participant received in-home and online exercise coaching assistance. The high-intensity exercise group had a statistically significant and clinically improved motor score (using the MDS-UPDRS) compared with the nonaerobic exercise group.90

All of these studies collectively reinforce the axiom that exercise is medicine for PD.

Exercise plan for PD
In planning your exercise program, consider going “FAR” with the plan. FAR is an acronym that stands for Flexibility,
A daily routine, is to increase range of motion and flexibility. The simple goal is to deliberately flex a certain muscle group, exercises are performed to target specific muscle groups. The goal of consistent stretching exercises, incorporated within a routine basis, is to increase range of motion and flexibility in tandem with increased muscle control. A study from 1986 that utilized a technique combining stretching with upper-body karate moves showed improvements in gait, tremor, and grip strength in PwP. In a review of the field of physical therapy for PD, “general physiotherapy” was the term used for stretching, muscle strengthening, balance, and postural exercises. In general, the review article emphasized that stretching and exercise do provide improvement in flexibility, range of motion, and gait; however, these benefits were short-lived if not done on a regular basis.

Since increased rigidity is a common occurrence in PwP, a simple priority is to do stretching exercises on a very routine basis. If you are at home sitting down and watching television, get up every other commercial break and do some simple stretching exercises. Likewise, if you are working and sitting at a desk/table, set an alarm and every 20 minutes stand up and do 1 to 2 minutes of stretching exercises. There are many other daily scenarios that contribute to body stiffness. If you have PD, you likely can never do stretching exercises too much. We recommend

<table>
<thead>
<tr>
<th>TABLE 2 A Healthy Aging Exercise Plan for Parkinson Disease</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Be safe.</strong></td>
</tr>
<tr>
<td>The benefit of an exercise routine/program will work only if you have (i) talked it over first with your neurologist; (ii) consulted with a physical therapist or certified personal trainer about the available exercise programs for PD; and (iii) realize most PwP typically have gait and balance issues.</td>
</tr>
<tr>
<td><strong>2. Stretch frequently (from several times/day to at least daily) and exercise on a regular basis (refer to the text for suggestions and see point 4 later).</strong></td>
</tr>
<tr>
<td>We recommend PWR!Moves—Parkinson Wellness Recovery created by Dr Becky Farley. PWR!Moves (<a href="https://www.pwr4life.org/moves">https://www.pwr4life.org/moves</a>) are performed with large amplitude, high effort, and attention to action in multiple postures. The 20 exercises specifically target typical physical deficiencies found in most PwP. PWR!Moves can also be adapted and used for stretching exercises; the sitting/standing series are most useful if you spend many hours daily sitting at a desk. PWR!Moves are outstanding as a stand-alone exercise program using all 5 positions for the 4 exercises.</td>
</tr>
<tr>
<td><strong>3. What is good for your heart is likely good for your brain.</strong></td>
</tr>
<tr>
<td>Think about it this way; blood circulates to your heart and the brain through the same blood vessels. Therefore, it is reasonable to assume that good heart health through exercise is going to be beneficial for good brain health too.</td>
</tr>
<tr>
<td><strong>4. Strenuous aerobic exercise is better than just exercise; however, both are far better than no exercise.</strong></td>
</tr>
<tr>
<td>Plan to exercise 45 min per day with a goal of 3-4 d/wk, and try to do more than 3 d without exercising. Within that 45 min, set a goal of 12-20 min 3 times per week to get your heart rate elevated. Aim for the “Orange zone,” which is 80%-85% of your maximum heart rate (on the “Perceived Exertion” chart, this is 7—intense or 8—very intense). This is your uncomfortable zone. At your peak of shape, you should try to stay in this zone for 20 min of this 45-min workout. Get it to this level with sustainable benefits to potentially be neuroprotective; however, the key benefit will be an improvement in quality of life. Go back and reread point 1 before starting this strenuous workout program; build up to it.</td>
</tr>
<tr>
<td><strong>5. Neuroplasticity is how neurons in the brain compensate for injury and disease.</strong></td>
</tr>
<tr>
<td>Neuroplasticity is something to strive for and repetition, over time, will provide the circuits for your brain to rewire the neural networks diminished by PD. However, there are no shortcuts. It is going to take a lot of repetition and much time to accomplish this feat.</td>
</tr>
<tr>
<td><strong>6. Ultimately, you should strive to maintain effective brain health.</strong></td>
</tr>
<tr>
<td>With or without PD, taking care of the brain is all important to one’s overall well-being, life attitude, and health. For a balanced healthy brain, strive for the following: proper nutrition and be cognitively fit; exercise on a regular basis; reduce stress; try to stay mentally alert; practice mindfulness; sleep enough; stay positive; and be hopeful.</td>
</tr>
<tr>
<td><strong>Abbreviations:</strong> PD, Parkinson disease; PwP, people with PD.</td>
</tr>
</tbody>
</table>
that you stretch with some sort of exercise program every day and as often as you find yourself getting stiff. Likewise, when you feel stiff, get up, get out, and do some stretching exercises on a very frequent basis. Included in Table 2 is a suggestion for stretching exercises.

**Mindfulness for living in the moment and mindfulness for PD**

Much of our lives are led at a pace where we fret for the future, are remorseful of the past, and, frequently, remain oblivious and out of touch with the current moment. Some experts argue that one needs to practice mindfulness meditation for at least 20 minutes to achieve a positive return.\(^{99,100}\)

Other experts would suggest that even if you can do it for 5 minutes, there are rewards for such calming thoughts.\(^{101}\) We reason, if you can focus your mind on the current moment and maintain yourself in that moment for 60 seconds, a transient but a quality and beneficial calmness will be achieved. Centering yourself within the moment and your current environment and surroundings alters your life perspective temporarily, allowing your mind to maintain focus not only on one event but also on an awareness of self.

Several studies have shown that PwP who practice mindfulness have reduced anxiety and depression and improved cognition and motor function.\(^{102,103}\) In patients with constant pain, a study of mindfulness showed that within the study group, there was a reduction in quantified stress levels compared with the control group.\(^{104}\) In a study dealing with test subjects under stress, the use of mindfulness was effective in reducing blood pressure levels and blood pressure reactivity to stress in the participants.\(^{105}\) Finally, Seppala\(^{106}\) gives 20 scientific reasons why one should start mindful meditating today.

**A case study using this integrative medicine and health therapy plan**

**Patient presentation**

The patient was seen by a movement disorder specialist in 2014 at the age of 60 years and was given a diagnosis of idiopathic PD. His presenting symptoms included right-side stiff neck, stiff right hand, and slowness of movement. He had a swallowing defect, and the volume of his voice was lessened. His right leg would drag when overly tired. His tremor was not like the typical PD tremor. The patient left the neurologist’s office with a prescription for a dopamine agonist, whereby he was provided substantial symptom relief. The Office of Human Research Ethics at UNC-Chapel Hill determined that this case study does not constitute human subjects research; thus, it does not require institutional review board approval.

**Outcomes**

Because of his teaching position as a university professor, he started with LSVT-LOUD and speech pathologists and then he completed LSVT-BIG with physical therapists. After 2 years (in 2016), most of his symptoms were somewhat controlled with 2 dopamine agonists, but he was tapering up their amount, which indicated disorder progression. He began to exercise with Parkinson Wellness Recovery (PWR!Moves), and he took a course in mindfulness and meditation. He also began taking some CAM/OTC substances: vitamin B complex, vitamin C, vitamin D\(_3\), NAC, reduced CoQ\(_{10}\), and trans-resveratrol.

By 2017, because of PD progression, his traditional daily therapy grew to also include Sinemet (carbidopa/levodopa). Importantly, he also added a more rigorous exercise regimen (see Table 2) and altered his CAM/OTC therapy to include more of the substances given in Table 1.

Now into early 2020, the patient has a Hoehn and Yahr score of 2.0 (bilateral disease, without impairment of balance). The patient states that he has never taken more than 1 step backward when challenged by the pullback test given by his neurologist. Importantly, he notes that there is no change in cognitive function, although he is affected intermittently by a dysfunction in some executive processes and motions (eg, packing a suitcase and reading an online map). The patient wants to be clear that he still has PD but believes that this integrative treatment strategy has helped slow the rate of his disease progression.

**Life function**

Eight to 9 years from the start of noticeable symptoms (the patient can trace the onset of early motor symptoms to at least 2 to 3 years prior to diagnosis), the patient describes himself today as stable with mostly good days compared with the many bad days before his diagnosis. The patient notes that his QOL (work, leisure, and exercise) is significantly better in 2020 than at the time of the PD diagnosis in 2014. He gives credit to outstanding communication with his physician team (neurologist and internist) and adherence to the advice of several physical therapists. He also notes that his activity level is near normal, but he does have occasional drowsiness in the afternoons. The patient credits the exercise program (as described in Table 2) for much of his current stable state. The patient, to help reduce day-to-day stress, also utilizes mindfulness. Furthermore, the patient credits part of his stable condition to regularly visiting the golf course driving range, where he hits approximately 100 golf balls per day (5 days per week depending on weather and work). Finally, the patient is convinced of the nontraditional CAM/OTC strategy combined with traditional therapy to help stabilize his disorder.

**Perspective**

For the past 18 to 20 months, the patient reports taking the following conventional daily treatment that consists of 1 to 1½ tablets of carbidopa/levodopa (Sinemet; 25/100 mg tablets) 4 times per day, 3 tablets of ropinirole (Requip XL;
2 mg tablets) 3 times per day, and 1 patch per day of Neupro (rotigotine; 4 mg patch). The patient reports currently taking the following CAM/OTC supplements daily and the amounts given in Table 1: NAC (5 months on/1 month off), either trans-resveratrol or curcumin (6 months and then rotate), vitamin B₃ and magnesium l-threonate together, ALA and ALC together, taurine and Ashwagandha together, vitamin D₃ and vitamin C together, and a probiotic complex.

The patient believes that a crucial aspect to his success has been the ability to remain positive, stay hopeful, be persistent, and never give up. Apathy can defeat you at any given moment, and his biggest daily obstacle is getting enough hours of quality sleep (this remains as a current problem). Furthermore, he states there is a delicate balance between staying up with therapy, exercise, and mindfulness because the motor symptoms can return with any substantial break in his integrative health plan. More studies are currently needed in order to evaluate a treatment strategy of this nature. However, the patient is convinced that his tailored integrative medicine and health therapy plan has positively impacted his life by helping slow the progression of his PD and also by significantly improving his QOL.

CONCLUSIONS
PD is a complex disorder, underlain by both chronic and progressive neurodegenerative processes, that consists of an array of motor and nonmotor symptoms. However, we believe that there are steps a PwP can follow to maintain the highest possible level of health and wellness, taking into measure the full spectrum of physical, mental, social, and emotional factors that impact a person’s day-to-day wellbeing. In this article, we have presented an integrative medicine and health strategy that merges both conventional and nonconventional medical approaches with a third aspect of the plan that focuses on the inclusion of exercise and mind-body awareness. The goals of our focused treatment plan outlined through our integrative approach are to (a) manage the symptoms of PD, (b) help defend and attempt to reverse the hostile neuronal microenvironment created by PD, and (c) enable a PwP to begin to restore the health of both the brain and the body in the presence of PD.

References


Withania somnifera. 2009;45


