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Does Whole Body Vibration (WBV) therapy positively affect the motor skills of patients who have been diagnosed with Parkinson's disease?

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A SELECTIVE EVIDENCE BASED MEDICINE REVIEW

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In

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Philadelphia College of Osteopathic Medicine  
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## Abstract

**OBJECTIVE:** The objective of this systematic review is to determine whether Whole Body Vibration (WBV) therapy positively affects the motor skills of patients who have been diagnosed with Parkinson's disease.

**STUDY DESIGN:** Review of 3 English language primary studies. All three were randomized control trials; one was rater blinded and one double blinded with a placebo.

**DATA SOURCES:** All of the articles were Randomized Control Trials found using the PubMed database.

**OUTCOMES MEASURED:** Each of the three studies looked at the symptoms of Parkinson's disease patients before and after Whole Body Vibration Therapy. Each study used the Unified Parkinson's Disease Rating Scale (UPDRS). Other tests that were studied include the Tinetti Balance Score, a Functional Reach test, Gait evaluations, and the Berg Balance Test.

**RESULTS:** All three of the RTC's that are included in this review showed a significant improvement in the symptoms of those with PD after treatment with Whole Body Vibration therapy. No advantages over other therapies were found. No adverse effects were reported in any of the studies.

**CONCLUSION:** The results of the RTC's reviewed that Whole Body Vibration therapy does positively affect the motor skills of those who have been diagnosed with Parkinson's disease.

**KEY WORDS:** Parkinson's disease, Vibration Therapy

## **Introduction**

Parkinson's disease has become a rising issue in the United States today. It is estimated that about 347 out of 100,000 of those over the age of 40 are diagnosed. Currently, about \$6 billion dollars is spent annually by the nation for Parkinson's disease, including funding for research on new treatments and possible cures.<sup>1</sup>

Parkinson's disease is a condition that affects and damages the nerve cells in the brain that release dopamine. Dopamine is the neurotransmitter that helps with coordination and movement. Without this chemical, the nerve cells are unable to communicate and, because of this, they will randomly fire causing rapid or unexpected movements.<sup>2</sup> The exact cause of Parkinson's is not currently known, however there are many different theories that appear to play a vital role. These theories include genetics, exposure to certain toxins and viruses, as well as a natural decrease in dopamine and norepinephrine.<sup>1</sup>

Parkinson's disease can affect either one or both sides of the body and usually has a slowly progressive course. The disease may first manifest in a slight tremor in the hands or a heavy feeling in a foot or leg. Later symptoms include impaired balance, lack of expression, slowed movements, stooped position, and difficulty swallowing. The tremors that occur in Parkinson's disease occur at rest and are relieved with movement. They can spread from the limbs to other parts of the body like the head, lips, and tongue. As the disease progresses, complete inability to walk and coordinate movements may occur.<sup>2</sup>

The diagnosis of Parkinson's is made upon physical examination. Many of the tests that are performed are typically done to rule out other neurologic disorders. Currently, there is no known cure for Parkinson's and the treatments are focused solely to control symptoms and slow the progression of the disease. There are currently five different classes of medications that are

being used to treat Parkinson's disease. The mechanisms of these drugs work by increasing dopamine levels and include: Dopaminergic agonists, dopamine precursors, dopamine releasers, catechol-*O*-methyltransferase inhibitors, and monoamine oxidase B inhibitors.<sup>1</sup> Along with medications, lifestyle changes are also recommended such as low stress, exercise, and general healthy eating. Research is continually being done to discover new methods of treating symptoms of Parkinson's disease, such as Whole Body Vibration therapy, which is the topic of this paper.<sup>2</sup>

Physician Assistants play a vital role in the care of those with Parkinson's, mostly because of the prevalence of the disease. In most medical environments, PAs will come in contact with a patient who is affected. It is important for PA's to understand the disease as well as different treatment options for their patients due to the difficulty in controlling the symptoms as well as the importance of patient education. While this new treatment of Whole Body Vibration Therapy requires time and patience, it may have a large symptomatic benefit for some patients.

### **Objective**

The objective of this selective EBM review is to determine whether or not Whole Body Vibration (WBV) therapy positively affects the motor skills of patients who have been diagnosed with Parkinson's disease. The hypothesis is that WBV therapy helps increase the motor skills and help alleviate symptoms of patients who have been diagnosed with Parkinson's disease.

### **Methods**

The three articles that were selected were done so on the PubMed database. The key words used to search this topic were Parkinson's disease and vibration therapy. All three articles are published data and written in English. The articles were selected by myself based on their

relevance to the topic as well as the importance of the outcomes to the patients (POEMs).

Inclusion criteria for this paper were that all articles must be Randomized Control Trials and had to be published after the year 1996. Exclusion criteria included subjects who had not been diagnosed with Parkinson's disease by a primary neurologist. The statistics that were reviewed were based on the p-values of the data collected by each article.

In the article written by Arias et al, 29 subjects were used in a RCT double-blinded study with 2 participants unable to follow-up due to lack of compliance. The age range for this study was 55-79 years old with a mean age of 66. The inclusion criteria was any person who had been diagnosed with Parkinson's disease by a primary neurologist. The exclusion criteria included those with dementia, lack of muscular deficit, and any joint prostheses. The study was split up into two groups: one experimental group and one placebo group. The experimental group received 12 Whole Body Vibration therapy sessions over a period of five weeks. In the placebo group, the subjects were placed in the same position on the stimulation platform, however no vibration was applied.<sup>3</sup>

In the second article by Ebersbach et al, there were 27 subjects in a RCT that was rater blinded, 21 of which completed the trial. The age range was 62-84 years old with a mean age of 73.8. Subjects that were included were patients with diagnosed Parkinson's disease that were on stable dopamine replacement medication and also had dopa-resistant imbalance. The exclusion criteria were conditions that required modification of medication, dementia, balance impairment due to other diseases, and severe dyskinesia that interfered with posturographic assessments. The experiment was performed with two groups: one received Whole Body Vibration therapy on an oscillating platform and the other group received only conventionally balance training.<sup>4</sup>

The third article by Haas et al was also a randomized control trial with 68 subjects that were all able to complete the experiment. The mean age was 65 years old  $\pm$  7.8 years and the duration of the disease was on average 5.9 years. The subjects were included based on the diagnosis of Parkinson's disease by a neurologist as well as symptomatic relief with a dopaminergic treatment. All subjects also had to be able to stand unsupported. The study did not accept subjects with dementia or other diseases that impaired gait, stance, or coordination. This experiment separated the participants into two groups: group A received Whole Body Vibration therapy and then rested and Group B rested before the vibration therapy.<sup>5</sup>

**Table 1:** Characteristics and Demographics of Studies

Study	Type	# of pts	Age	Inclusion Criteria	Exclusion Criteria	W/D	Interventions
Arias et al, 2009	Randomized Control Trial- double blinded, placebo	29	55-79, with a mean age of 66	Primary diagnosis of Parkinson's disease	Lack of dementia, lack of artromuscular deficit ,or joint prostheses	2	<u>Experimental Group:</u> received 12 WBV therapy stimulation sessions over five weeks. <u>Placebo Group:</u> the subjects were placed in the same position on the stimulation platform, however no vibration was applied.
<b>Ebersbach et al, 2008</b>	Randomized control trial-rater blinded	27	62-84, with a mean age of 73.8	Patients with PD and dopa-resistant imbalance on stable dopamine replacement medication	Conditions requiring modification of medication, dementia, balance impairment due to other disease, and severe dyskinesia interfering with posturo-graphic assessments	6	Two groups: one group received WBV therapy on an oscillating platform and the other group received conventional balance training.
<b>Haas et al, 2006</b>	Randomized control trial	68	Mean age was $65.0 \pm 7.8$ years, and the duration of the disease was 5.9 4.6 years.	Diagnosis of PD was established by primary care neurologist on the basis of unilateral onset, asymmetric motor symptoms, and symptom relief by dopaminergic treatment. All subjects had to be able to stand unsupported.	Pts. with dementia or other diseases impairing gait, stance, or coordination.	0	<u>Group A:</u> Whole body vibration therapy first, followed by a resting phase <u>Group B:</u> Resting phase first, followed by whole body vibration therapy

## **Outcomes Measured**

All 3 studies used the Unified Parkinson's Disease Rating Scale (UPDRS) as one of the methods to measure their results. The UPDRS is used to follow the longitudinal progression of the disease in an objective manner. The scale is split up into different sections including evaluation of mentation, behavior, and mood, self evaluation of the activities of daily life like speech, swallowing, writing, walking, etc., and also a clinician-scored motor evaluation. The UPDRS also includes the Hoehn and Yahr staging, which is scored 0-5; 0 shows no signs of disease and 5 would represent wheelchair bound patients. A final component of the UPDRS is the Schwab and England Activities of Daily Living Scale, which is scored based on percentages; 100% being completely independent. Scoring for the UPDRS is considered clinically important if the score changes by a minimum 2.5 in the motor section of the score or 4.3 points in the total score.<sup>6</sup>

Along with the UPDRS scoring system, Arias et al also used a number of other methods to measure outcomes. Gait was evaluated using velocity (m/sc), cadence (steps/sc), step amplitude (m), and turn time (scs). A functional reach test was also performed by pushing an anthropometer as far as the subject could without flexion of the knees. Lastly, a Berg Balance Test was obtained, which is a 14 item scaling system in which the patient is rated on how well they perform tasks requiring equilibrium (0-4; the higher the score the more independently the task was performed).<sup>3</sup>

Ebersbach et al used the Tinetti Balance Scale score as their main criteria, which includes ratings in sitting balance, rising, attempts to rise, immediate standing, standing balance, pushed slightly, eyes closed, turning, and sitting down. The scale is out of 16, the higher the score, the

more stable and balanced the patient preformed. Along with the UPDRS, secondary data also included walking measured by speed and a stand-walk-sit test measured in time.<sup>4</sup>

## **Results**

All three articles that were selected presented continuous data, which could not be converted to dichotomous. All data was presented with an intention to treat analysis. No adverse reactions or affects were reported in any of the experiments.

As described in Table 2, Arias et al found significant change in pretest and posttest scores for most of the variables tested. In the gait category, the velocity, cadence, and step amplitude all showed to have statistically significant effects from Whole Body Vibration Therapy with p-values  $\leq 0.001$ . Turn time, however, did not prove to be effected by the stimulation therapy and had a p-value = 0.190. In the rest of the testing, Functional reach increased on average by 116.824 mm with a p value of  $\leq 0.001$ , the UPDRS score decreased by 4.761 on average with a significant p-score of 0.003, and the Berg Balance test increased by 4.239 with a p-value of  $\leq 0.001$ .<sup>3</sup>

**Table 2:** Results of Arias et al

	<b>Pretest</b>	<b>Posttest</b>	<b>p-value</b>
<b>Gait: Velocity (m/sc)</b>	0.740	0.900	P $\leq 0.001$
<b>Gait: Cadence (steps/scs)</b>	1.783	1.889	P $\leq 0.001$
<b>Gait: Amplitude (m)</b>	0.412	0.474	P $\leq 0.001$
<b>Gait: Turn time (scs)</b>	2.142	1.884	N/A
<b>UPDRS score</b>	27.761	23.000	p = 0.003
<b>Berg Balance Test</b>	44.142	48.381	p $\leq 0.001$
<b>Functional Reach Test (mm)</b>	207.258	324.082	p $\leq 0.001$

Ebersbach et al found significant results with Whole Vibration Therapy as well, however, compared with conventional therapy, it was not found to have any greater effects. The baseline and follow up results are listed in Table 3 for both the Whole Body Vibration Therapy as well as the conventional therapy. The results showed a significant effect with the Whole Body Vibration Therapy on the Tinetti Balance Score ( $p < 0.001$ ) as well as the secondary measures like gait velocity ( $p < 0.003$ ), the stand-walk-sit test ( $p < 0.001$ ), as well as the UPDRS score ( $p < 0.001$ ). The p-scores for conventional therapy were the same as for the Whole Body Vibration therapy results. Both conventional therapy as well as Whole Body Vibration Therapy showed a significant effect in the variables tested.<sup>4</sup>

**Table 3:** Results from Ebersbach et al

	Whole Body Vibration Therapy		Controls		p-values
	Pretest	Posttest	Pretest	Posttest	
<b>Tinetti Balance Score</b>	9.3	12.8	8.3	11.7	$p < 0.001$
<b>Time to walk 10m (s)</b>	17.6	14.5	18.4	16.8	$p < 0.003$
<b>Stand-Walk-Sit</b>	10.8	8.2	12.0	8.9	$p < 0.001$
<b>UPDRS</b>	23.0	17.0	25.9	18.5	$p < 0.001$

The experiment performed by Haas et al looked solely at the UPDRS score before and after Whole Body Vibration Therapy. The results are depicted in Table 4. In both groups, the one that was treated first (Group A) and the one that rested first (Group B), there was a significant improvement in the score with p-values less than 0.001. On average the score improved by 5.2 for Group A and by 4.8 for Group B, which represents a 16.8% and 14.7% improvement, respectively. The UPDRS score was broken down and analyzed into its different

components in this study. The highest improvements within the UPDRS score were found in tremor and rigidity (25% and 24%). There was 15% improvement on average for both gait and posture. Bradykinesia improved on average by about 12%.<sup>5</sup>

**Table 4:** Results from Haas et al

	<b>Reduction in UPDRS scores (%)</b>	<b>p-value</b>
<b>Group A (WBV first)</b>	16.8%	p<0.01
<b>Group B (resting first)</b>	14.7%	p<0.01

## **Discussion**

The use of rehabilitation therapy in Parkinson's disease has been found to have an important affect on those who have been diagnosed. Certain symptoms of Parkinson's are greatly improved with medication, such as rigidity, tremor, and akinesia; whereas other symptoms do not seem to respond, such as speech, equilibrium and gait.<sup>2</sup> These are said to be less susceptible to the dopaminergic drugs that are prescribed to those with PD, or also known as dopa-resistant symptoms. These specific characteristics of PD become very prominent in the later stages of the disease. The conventional physical therapy has proved to help some of these dopa-resistant symptoms and slow down their progression. Other therapies have been researched, such as Whole Body Vibration therapy, to possibly help with the dopa-resistant symptoms of PD as well. Whole Body Vibration therapy acts to enhance sensorimotor stimulation that can aid with proprioceptive perception and processing, which is found to be lacking in those who have PD. Before researching the effects of Whole Body Vibration therapy on PD, it had been used for other patients with cerebral palsy, MS, and stroke and had showed improvement in gait and balance. It had also shown to help positively affect the balance and gait of elderly who are confined to a nursing home.<sup>4</sup>

In all three studies reviewed, there was a significant improvement in the symptoms of those who have been diagnosed with Parkinson's. In the study performed by Arias et al, it was concluded that, while they did find a significant improvement using the Whole Body Vibration therapy, it was mostly likely due to a placebo effect on the patients because the placebo group had similar findings. Both groups, the experimental group and the placebo group, were found to show improvements in their scores after the study. The study performed by Ebersbach et al also showed to have significant improvements after patients were treated with the WBV therapy, however, compared to their controls using conventional physical therapy there were no greater effects or benefits. This shows that both Whole Body Vibration therapy and conventional physical therapy improve a patient's symptoms and yield similar results. Lastly, in the study performed by Haas et al, it was found that the Whole Body Vibration therapy lead to significant improvements in the motor skills of PD patients regardless of whether the group was treated first or rested first. All three studies used different controls to test the accuracy of the WBV therapy, but all found similar effectiveness on the PD patients and their symptoms. While none of the experiments prove that Whole Body Vibration therapy is superior to other methods, all of the groups who were treated with this experimental therapy showed a significant decrease in symptoms.

In all three studies, no adverse reactions were reported. As far as the limitations within the studies, they all experienced similar drawbacks pertaining to data collection, some of which being self-reported and subjective. Another limitation that is present in all of the RTC's is the effect that outside activities, such as group activities and stretching, may have had on the patients. Most patients in the studies were involved in other activities and any type of exercise or

therapy that was being performed during the time of the experiment could have also had a positive effect on symptoms, skewing the results.

### **Conclusion**

All three studies that have been reviewed show that Whole Body Vibration therapy provides a significant statistical improvement on those who have been diagnosed with Parkinson's disease. With that being said, more studies and experiments need to be performed in order to determine whether a placebo effect is involved as well as what benefits that Whole Body Vibration therapy has over conventional physical therapy, if any. Currently, Whole Body Vibration therapy is not offered to PD patients on insurance plans, mostly due to the lack of research and evidence. Future studies need to evaluate this new therapy further in order to prove its effectiveness so that it can become a more realistic option as adjuvant treatment for those with Parkinson's disease.

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