Cover Page

Study Title: Use of a robotic walking device to improve home and community mobility in people with Parkinson's disease
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Use of a robotic walking device to improve home and community mobility in people with Parkinson's disease

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BACKGROUND

Individuals with Parkinson's disease (PD) experience difficulty participating in meaningful activities in their homes and communities due to slowing and increased energy expenditure of walking. Exercise that involves repetitive practice of stepping like treadmill walking, tango dancing or use of external cueing to facilitate larger steps improve walking performance in the PD population.[1-3] However, many individuals have difficulty adhering to regular exercise due to barriers including lack of access to exercise facilities, physical, cognitive, and psychologic (i.e., depression) impairments, and lack of motivation and/or self-efficacy.[4] To promote optimal functional recovery, rehabilitation interventions that encourage neuroplastic changes must provide high repetition, task-oriented movement training that promotes learning and sensory input.[5] Robotic devices have incited high interest among researchers and clinicians in the neurorehabilitation field because they can deliver high repetition task-specific training, while reducing the manual labor burden on therapists during delivery of the rehabilitation.[6] Clinical trials of robot-assisted treadmill training in individuals with PD demonstrate significant improvements in functional mobility, gait speed, walking endurance, freezing of gait, and quality of life.[7-11] While these studies showed that people with PD accept and benefit from the use of robots, the robots used in these studies were large, heavy, complex robots (i.e., Lokomat, G-EO) that are cost prohibitive for most people and require months of training before they can be used independently. Recently, Honda Research and Development (R&D) developed a robotic exoskeleton called the Honda Walking Assist device (Honda R&D Co. Ltd., Wako, Japan) that is lightweight and portable with a goal of affordability and ease of use for therapists and patients.[12] The HWA facilitates walking in people with gait deficits with little robotic interference while providing repetitive training of a symmetrical gait pattern in the home environment (Figure 1). The device is worn around the user's waist and thighs, and assists with hip flexion during swing initiation and hip extension during stance. The robot automatically calibrates leg movements to spatial and temporal cadence targets.[13] The device does not interfere with sitting and is not active during sit to/from stand transfers. Variable device settings allow for personalized, specific assistance. Advantages of wearable robotics such as the HWA include easy donning and doffing, and greater ease of use and free movement in the home and community, all of which yield greater walking practice.[14] **By allowing high repetition task-based exercise in the home and community, the use of the HWA has the potential to overcome exercise/activity barriers, thereby leading to improved gait parameters to prevent or slow functional decline and improve quality of life in individuals with PD.** Previous laboratory-based studies have examined the effects of HWA device usage on gait spatiotemporal parameters and efficiency in healthy adult and neurological populations.[14-18] Healthy elderly and middle-aged adults showed temporary improvements in stride length, gait speed, and energy costs wearing the HWA compared to unassisted walking.[15,16] Long-term HWA usage in patients with stroke improved gait parameters during unassisted walking.[14,17] Preliminary findings in 12

Figure 1. Honda Walking Assist Device

individuals with PD showed improved gait speed and walking endurance during unassisted walking after 10-12 sessions of HWA training in a clinic.[18] These preliminary findings of gait improvements in PD with HWA training warrant further study within home and community environments, and within a larger population of individuals with PD. Importantly, HWA training may be a useful intervention to overcome exercise barriers and improve mobility for daily life and warrants an innovative Phase II randomized controlled trial of real-world use over an extended period of time.

Project Objectives. This study will determine the impact of HWA usage on mobility in the home and community in individuals with PD. It will also examine feasibility and safety of HWA usage in the PD population. **As mobility limitations are highly associated with poor quality of life in people with PD,[19-21] any benefits of HWA usage to improve mobility are likely to positively impact the health and well-being of individuals with PD. Specific Aim 1**: Determine the short-term impact of mechanical gait assistance on efficiency and ease of walking in individuals with PD. With disease progression, individuals with PD develop gait impairments (e.g., slower gait velocity, shorter step lengths, increased step-to-step variability, and freezing of gait), that interfere with their abilities to perform daily living tasks and participate in work, home, and social activities and predispose them to falls.[22] *We hypothesize that wearing the HWA device will improve gait efficiency, gait parameters, and perceived ease of walking in individuals with PD compared to unassisted walking over a one session period.* Positive findings of immediate improved walking efficiency and perceived ease of walking will suggest that HWA usage can ameliorate gait impairments in individuals with PD, and thereby possibly allow them to more easily perform daily tasks, participate in work, home, and social activities, and reduce their fall risk. **Specific Aim 2**: Determine the effect of long-term HWA device usage on the ease and ability to walk unassisted in the home and community in individuals with PD. Angular sensors embedded in the HWA monitor the cadence, angular velocity, and degree of hip extension and flexion of the device user.[14] When the user initiates walking, the HWA automatically adjusts leg movements to reach target walk ratios (step length/cadence) by increasing the amount of hip flexion and/or extension using power supplied by the device. Thus, the HWA applies continuous, step-by-step cueing to individuals with PD to take bigger and more symmetrical steps, thereby producing a faster and more efficient walking pattern. By wearing the HWA device over an extended period of time, individuals with PD will repetitively practice walking with a more "normal" gait pattern, possibly driving neuroplastic changes that will translate to improve unassisted walking. *We hypothesize that an 8-week intervention of HWA device usage will improve gait efficiency, gait parameters, perceived ease of walking, self-confidence, and daily physical activity in the home and community in individuals with PD with and without the use of the device*. Positive findings would justify larger clinical trials to determine the efficacy of HWA device usage to encourage adherence to rehabilitation programs and to promote maintenance of an active lifestyle in individuals with PD.

METHODS

Participants: Adults aged 50-80 (n=46) who ambulate without assistance (Hoehn & Yahr stages 1-3) with diagnosed idiopathic PD and on stable doses of Parkinson's medications for at least 4 weeks prior to the study will be recruited from the Ohio State Movement Disorders Clinic and community support groups. Exclusion criteria will be: presence of other significant cardiac, neurological or orthopedic problems that affect gait, weight more than 220 pounds and height greater than 6'8", electronic medical devices embedded in the body, participating in any physical therapy, and inability to understand instructions

required by the study. **Study Design:** Proof-of-concept of the HWA device has already been established in prior single arm studies.[14-18] This study will be a prospective Phase II randomized controlled trial to assess preliminary efficacy. **HWA Device**: The HWA device weighs 5.95 lbs and has two motors that run on a single rechargeable battery (Figure 2). The device is equipped with angle and established in prior single arm studies.[14-18] This study will be a prospective Phase II randomized controlled trial to assess preliminary efficacy. **HWA Device**: The HWA device weighs 5.95 lbs and has two motors that run on a single rechargeable battery (Figure 2). The device is equipped with angle and current sensors to monitor hip joint angle and torque output respectively. The assist torque is transmitted to the user's thighs via thigh frames. A trained healthcare professional, who operates the device, can remotely change assist settings through software that runs on a mobile device. Honda will provide the researchers with a minimum of 3 HWA devices of different sizes for use in this study. The HWA devices have points of adjustability at the Waist Frame and Thigh Frames (Figure 2), such that the devices can accommodate ~75% of adult, United States (US) body sizes. **Randomization:** After obtaining written informed consent, participants will be randomly assigned to 1 of 2 groups (Trained – HWA group, Untrained – usual care group). Randomization allocation will be 1:1 and stratified by Hoehn & Yahr stage. Each stratum randomization scheme will be generated in permuted blocks of varying size. These techniques will help to ensure a balance in the randomization among stage. The randomization scheme will be prepared, uploaded and overseen by the study's biostatisticians. Given the nature of the intervention proposed, participants will know the intervention to which they have been assigned. Therefore, it will only be possible to blind assessors in this study.

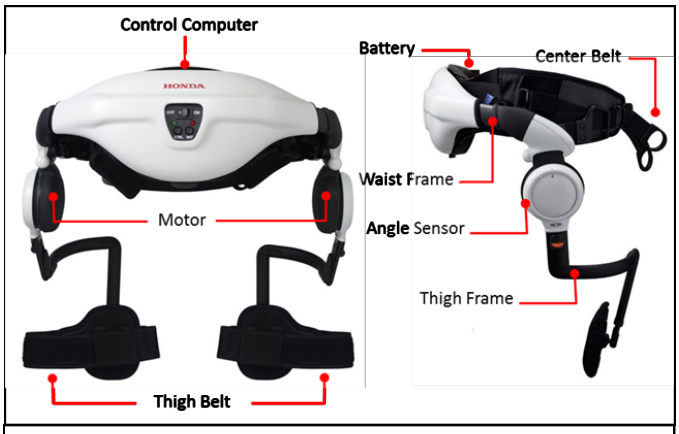

Figure 2. Components of the HWA Device

Procedures: Demographic information will be collected (i.e., age, sex, disease duration, Parkinson's medications, numbers of falls in past 6 months) and a neurologist with UPDRS motor rating certification will administer the Unified Parkinson Disease Rating Scale (UPDRS) Part III –Motor Scale [23] to assess motor impairments and determine the Hoehn and Yahr stage. A researcher who is blinded to the participants' group allocation and trained on relevant assessments will perform all outcome assessments. Assessments will be collected with participants in the ON phase at around one hour after taking their usual Parkinson's medications. *The primary outcome measure, gait velocity, will be used to validate the effectiveness of the HWA to improve gait parameters for both Aim 1 and 2.* Gait velocity (e.g., walking speed) correlates with functional ability and has been linked to clinically meaningful changes in quality of life and in home and community walking behavior.[24] **Aim 1**: Only participants randomized to the Trained group (n=23) will complete this part of the study to eliminate exposure of the Untrained group to the HWA device. Gait assessments will be conducted first during unassisted walking followed by HWA-assisted (i.e., wearing the HWA device) walking, with rest breaks allowed between tests. Prior to HWA-assisted walking, the researcher will select the appropriate sized HWA device, assist the participants to correctly don the device, and adjust the HWA device settings to maximize the participants' safety while walking. The PIs are experts in application and use of the HWA device (preliminary data and unshown pilot studies). Initial device settings will be symmetrical flexion and extension assist bilaterally. The research therapist will make adjustments as needed based on the response to the symmetrical assist setting. If the therapist is unable to adjust the HWA to provide a safe gait pattern the testing will be ended and the device removed. Safe gait is defined as one that results in no increase in incidence of

stumbles and/or balance loss during HWA-assisted walking as compared to unassisted walking. ***Outcomes***: Gait efficiency will be assessed with the six-minute walk test (6MWT),[25] gait parameters (i.e., velocity, stride length, swing time, double support, and their coefficients of variability) using GAITRite, [26] gait safety using counts of observed episodes of stumbles and/or loss of balance, and participants' perceived ease of walking as indicated on a visual analog scale (100 mm line with anchors "Not at all easy" on the left end and "Extremely easy" on the right end).The GAITRite System® (CIR systems, Inc.: Havertown PA) is a 4.88 m electronic walkway with sensors arranged in a gridlike pattern to capture footfall contacts. The application software (version 3.9) processes the raw data into footfall patterns and computes spatial and temporal parameters. Participants will walk at a normal, comfortable pace across the walkway for 4 trials. The first trial under each condition will be a practice trial and the data from the remaining three trials for each condition will be averaged. **Aim 2**: All individuals (n=46) will participate in this part of the study. ***Intervention***: After undergoing the pre-assessment, participants randomized to the Trained group will be fitted with the HWA device in their home by a research physical therapist. They will be directed to walk with the device on and the therapist will adjust the settings until a safe gait pattern is obtained. The initial setting used will be the one that produced the safest walking at the pre-assessment. Adjustments will be made based on the response to this initial setting. Participants who achieve a safe gait pattern will receive physical therapist supervised home and community-based walking training wearing the HWA device 2 times per week for 45-60 minutes for 8 weeks. Training will consist of walking in and outside of the home while encouraging larger and more symmetrical steps with practice of activities (e.g., multi-directional stepping, turning, navigating around obstacles) that challenge the person's balance and motor control. Rest breaks will be allowed as needed. If the therapist is unable to adjust the HWA to provide a safe gait pattern, the session will be ended and the device removed. The Untrained group will continue their usual daily activities including any exercise regimen that they typically perform. However, they will be asked not to start any new exercise program during the study period. ***Outcomes***: All assessments will be performed within one week prior to and after the 8 week intervention in the researcher's laboratory at the Ohio State University with the exception of the activity monitors. The Untrained group will only perform gait assessments without use of the HWA. The same outcomes will be used from Aim 1 with addition of the Stanford Self-Efficacy for Measuring Chronic Disease 6-Item Scale (SSE) [27] questionnaire to measure participants' confidence in performing daily activities. The SSE has been found to have good reliability and validity in individuals with Parkinson's disease.[28] To determine changes in activity levels, all participants will wear activity monitors (e.g., Biosensics LEGSys™ and PAMSys™ system wearable accelerometers) to quantitatively measure physical activity (e.g., number of steps, time spent walking, gait parameters, number of falls) for 5 consecutive days and complete a diary recording their daily activities during weeks 1 and 8 of the intervention period. To monitor safety during the study period the participants will be asked to record any falls (i.e., an event which causes the person to rest inadvertently on the ground or floor) or other adverse events that occur in a diary. **Sample Size**: The primary outcome for Aim 1 is to compare gait velocity pre and post treatment. For Aim 1, we will use the 23 patients randomized to the treatment arm and will have at least 80% power to detect a difference of 0.61 standard deviations in gait velocity using a two-sided paired t-test with type I error rate of 0.05. The primary outcome for Aim 2 is the gait velocity at 8 weeks. For Aim 2, we will have at least 80% power with 18 evaluable patients per group to detect a difference of 0.96 standard deviations in gait velocity at week 8 using a two-sided t-test with type I error rate of 0.05. Assuming a loss to follow-up rate of 20%,

we will enroll 23 patients per group for Aim 2. **Data Analysis**: The primary outcome for Aim 1 is the change in gait velocity with and without the use of the HWA device. This analysis will compare the difference in gait velocity using a paired t-test. The test of the with/without HWA gait change will be two-sided and at the 0.05 level. Exploratory analyses may consider associations of difference with patient characteristics such as Hoehn & Yahr stage. Secondary outcomes for Aim 1 will be analyzed similarly using appropriate methods for paired data. The primary outcome for Aim 2 is gait velocity at 8 weeks. The primary analysis will follow intention to treat principles to preserve the balancing properties of randomization.[29,30] The primary analysis will assess the effect of treatment on gait velocity at 8 weeks using a linear regression model that includes an indicator of treatment, stage, and baseline gait velocity. The test of the treatment effect will be two-sided and conducted at the 0.05 significance level. Sensitivity analyses will examine the per protocol population (those who followed the assigned treatment correctly) and will utilize methodology for handling missing data (i.e., multiple imputation) to account for loss to follow-up. Exploratory analyses may explore differences in the treatment effect across baseline patient characteristics (such as Hoehn & Yahr stage). Secondary outcomes for Aim 2 will be assessed similarly to the primary outcome using appropriate generalized linear models. **Interim Monitoring** We will conduct an interim analysis to ensure that the rate of patients in the treatment arm unable to attain a safe gait is not unacceptably high. We will evaluate the failure rate after 10 patients in the treatment arm complete the study. If 5 or more of the 10 patients fail to attain a safe gait with the device, the study will stop to determine if termination is warranted. Assuming an acceptable failure rate is 20%, we would have a 62% chance of correctly stopping the study early with an observed failure rate of 0.5. With the same assumptions, we also have a 3% chance of incorrectly stopping the trial. According to Honda R&D personnel, all participants who have met inclusion criteria during studies with the device have been able to safely use the device during walking. Therefore, the failure rate of 20% is an estimation and not based on preliminary findings. We will also conduct an interim analysis of data to ensure data quality and refine data analysis processes at the end of 12 months.

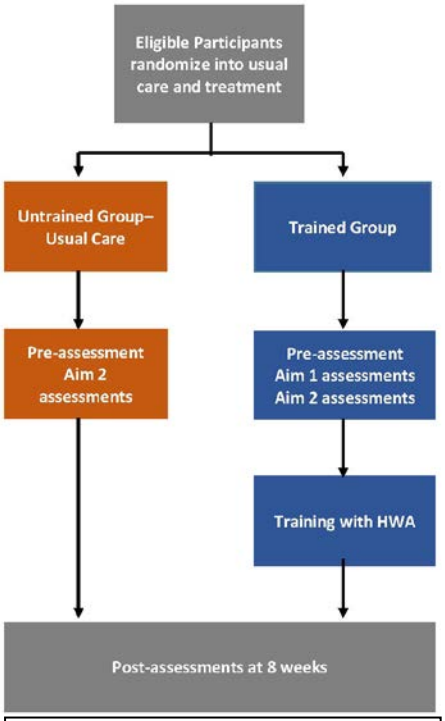

Figure3. Study Flowsheet

References

1. Keus S, Graziona M, Group obotGD. European physiotherapy guideline for Parkinson's disease 2014; http://parkinsonnet.info/guidelines/european-guidelines. Accessed 5/25/2018.
2. Harro CC, Shoemaker MJ, Frey OJ, et al. The effects of speed-dependent treadmill training and rhythmic auditory-cued overground walking on gait function and fall risk in individuals with idiopathic Parkinson's disease: a randomized controlled trial. *NeuroRehabilitation.* 2014;34(3):557-572.
3. Duncan RP, Earhart GM. Should One Measure Balance or Gait to Best Predict Falls among People with Parkinson Disease? *Parkinsons Dis.* 2012;2012:923493.
4. Ellis T, Boudreau JK, Deangelis TR, et al. Barriers to Exercise in People With Parkinson Disease. *Phys Ther.* 2013.
5. Cramer SC, Sur M, Dobkin BH, et al. Harnessing neuroplasticity for clinical applications. *Brain.* 2011;134(Pt 6):1591-1609.
6. Poli P, Morone G, Rosati G, Masiero S. Robotic technologies and rehabilitation: new tools for stroke patients' therapy. *Biomed Res Int.* 2013;2013:153872.
7. Barbe MT, Cepuran F, Amarell M, Schoenau E, Timmermann L. Long-term effect of robot-assisted treadmill walking reduces freezing of gait in Parkinson's disease patients: a pilot study. *J Neurol.* 2013;260(1):296-298.
8. Paker N, Bugdayci D, Goksenoglu G, Sen A, Kesiktas N. Effects of robotic treadmill training on functional mobility, walking capacity, motor symptoms and quality of life in ambulatory patients with Parkinson's disease: a preliminary prospective longitudinal study. *NeuroRehabilitation.* 2013;33(2):323-328.
9. Sale P, De Pandis MF, Le Pera D, et al. Robot-assisted walking training for individuals with Parkinson's disease: a pilot randomized controlled trial. *BMC Neurol.* 2013;13:50.
10. Furnari A, Calabro RS, De Cola MC, et al. Robotic-assisted gait training in Parkinson's disease: a three-month follow-up randomized clinical trial. *Int J Neurosci.* 2017;127(11):996-1004.
11. Fundaro C, Giardini A, Maestri R, Traversoni S, Bartolo M, Casale R. Motor and psychosocial impact of robot-assisted gait training in a real-world rehabilitation setting: A pilot study. *PLoS One.* 2018;13(2):e0191894.
12. Young AJ, Ferris DP. State of the Art and Future Directions for Lower Limb Robotic Exoskeletons. *IEEE Trans Neural Syst Rehabil Eng.* 2017;25(2):171-182.
13. Shimada H, Kimura Y, Suzuki T, et al. The use of positron emission tomography and [18F]fluorodeoxyglucose for functional imaging of muscular activity during exercise with a stride assistance system. *IEEE Trans Neural Syst Rehabil Eng.* 2007;15(3):442-448.
14. Buesing C, Fisch G, O'Donnell M, et al. Effects of a wearable exoskeleton stride management assist system (SMA(R)) on spatiotemporal gait characteristics in individuals after stroke: a randomized controlled trial. *Journal of neuroengineering and rehabilitation.* 2015;12:69.
15. Shimada H, Suzuki T, Kimura Y, et al. Effects of an automated stride assistance system on walking parameters and muscular glucose metabolism in elderly adults. *Br J Sports Med.* 2008;42(11):922-929.
16. Otsuki R, Matsumoto H, Ueki M, et al. Automated stride assistance device improved the gait parameters and energy cost during walking of healthy middle-aged females but not those of young controls. *J Phys Ther Sci.* 2016;28(12):3361-3366.
17. Shimada H, Hirata T, Kimura Y, et al. Effects of a robotic walking exercise on walking performance in community-dwelling elderly adults. *Geriatr Gerontol Int.* 2009;9(4):372-381.
18. Sahei R, Kobayashi R, Shiina Y ea. The effect of walking practice for maintenance stage walking disorders using the walking assist robot “walking assist”. . Proceedings of 51st Congress of Japanese Society of Neurological Physical Therapy; 2016; Japan.
19. Scalzo PL, Flores CR, Marques JR, Robini SC, Teixeira AL. Impact of changes in balance and walking capacity on the quality of life in patients with Parkinson's disease. *Arq Neuropsiquiatr.* 2012;70(2):119-124.
20. Soh SE, McGinley JL, Watts JJ, et al. Determinants of health-related quality of life in people with Parkinson's disease: a path analysis. *Qual Life Res.* 2013;22(7):1543-1553.
21. Tu XJ, Hwang WJ, Ma HI, Chang LH, Hsu SP. Determinants of generic and specific health-related quality of life in patients with Parkinson's disease. *PLoS One.* 2017;12(6):e0178896.

22. Hausdorff JM, Cudkowicz ME, Firtion R, Wei JY, Goldberger AL. Gait variability and basal ganglia disorders: stride-to-stride variations of gait cycle timing in Parkinson's disease and Huntington's disease. *Movement disorders : official journal of the Movement Disorder Society.* 1998;13(3):428-437.
23. Goetz CG, Fahn S, Martinez-Martin P, et al. Movement Disorder Society-sponsored revision of the Unified Parkinson's Disease Rating Scale (MDS-UPDRS): Process, format, and clinimetric testing plan. *Mov Disord.* 2007;22(1):41-47.
24. Kegelmeyer D, Kostyk S, Fritz N, Kloos A. The Effect of Video Game-Based Exercise on Dynamic Balance and Mobility in Individuals with Huntington's disease. *Journal Neurologic Physical Therapy.* 2009;4(33).
25. Guyatt G, Sullivan MJ, Thompson PJ, et al. The 6-minute walk: a new measure of exercise capacity in patients with chronic heart failure. *Canadian Medical Association journal.* 1985;132(8):919-923.
26. Menz HB, Latt MD, Tiedemann A, Mun San Kwan M, Lord SR. Reliability of the GAITRite walkway system for the quantification of temporo-spatial parameters of gait in young and older people. *Gait & posture.* 2004;20(1):20-25.
27. Ritter PL, Lorig K. The English and Spanish Self-Efficacy to Manage Chronic Disease Scale measures were validated using multiple studies. *J Clin Epidemiol.* 2014;67(11):1265-1273.
28. Dal Bello-Haas V, Klassen L, Sheppard MS, Metcalfe A. Psychometric Properties of Activity, Self-Efficacy, and Quality-of-Life Measures in Individuals with Parkinson Disease. *Physiother Can.* 2011;63(1):47-57.
29. Lee YJ, Ellenberg JH, Hirtz DG, Nelson KB. Analysis of clinical trials by treatment actually received: is it really an option? *Stat Med.* 1991;10(10):1595-1605.
30. Ruiz-Canela M, Martinez-Gonzalez MA, de Irala-Estevez J. Intention to treat analysis is related to methodological quality. *Bmj.* 2000;320(7240):1007-1008.

The Ohio State University Combined Consent to Participate in Research and HIPAA Research Authorization

Study Title: Use of a robotic walking device to improve home and community mobility people with Parkinson's disease

Principal Investigator: Anne Kloos, PT, PhD

Sponsor: Michael J. Fox Foundation

- **This is a consent form for research participation.** It contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to participate.
- **Your participation is voluntary.** You may refuse to participate in this study. If you decide to take part in the study, you may leave the study at any time. No matter what decision you make, there will be no penalty to you and you will not lose any of your usual benefits. Your decision will not affect your future relationship with The Ohio State University. If you are a student or employee at Ohio State, your decision will not affect your grades or employment status.
- **You may or may not benefit as a result of participating in this study.** Also, as explained below, your participation may result in unintended or harmful effects for you that may be minor or may be serious depending on the nature of the research.
- **You will be provided with any new information that develops during the study that may affect your decision whether or not to continue to participate.** If you decide to participate, you will be asked to sign this form and will receive a copy of the form. You are being asked to consider participating in this study for the reasons explained below.

1. Why is this study being done? People with Parkinson's disease develop difficulties with walking over time that prevent them for doing their daily activities and put them at higher risk of falling. There is some emerging evidence that the use of mechanical walking devices (also known as robotic devices) can improve the walking ability of people with Parkinson's disease. The purpose of this research is to determine the immediate and long-term impact of using a light-weight mechanical walking assist device that is worn around a person's waist and thighs and helps to move a person's legs to take bigger steps on the walking ability of people with Parkinson's disease.

2. How many people will take part in this study?

46 individuals with a diagnosis of mild to moderate Parkinson's disease will be recruited to participate in this study.

3. What will happen if I take part in this study?

If you elect to be in the study you will be assigned to one of two groups, either a treatment group or a usual care group. You will be asked information about your age, time since diagnosis, Parkinson's medications, and a falls history and a researcher will have you perform motor tests (e.g., finger tapping, alternating movements, backward pull, getting up from chair, walking) that are routinely done in the clinic. You will be asked to walk at a comfortable pace for 6 minutes and you will walk over a mat that has sensors that record your footsteps. If you are in the treatment group you will perform these walking tests first without using a mechanical walking assist device and then again wearing the device. A researcher will help you to put on the device and will make sure that you are able to safely walk with the device before doing the testing. After the 6 minute walking tests you will be asked to rate how easy you feel your walking is. You will also be asked to fill out a questionnaire that asks 6 questions about your confidence to perform daily activities. All of the walking tests and questionnaires will be conducted in the researchers' laboratory at the Ohio State University. During the first week and the eighth week after the initial laboratory testing, you will be asked to wear activity monitors attached to your trunk and both legs with straps during the day for 5 consecutive days and complete a diary of your daily activities during those days.

If you are in the treatment group you will be asked to take part in a walking training program using the mechanical walking assist device for 45-60 minutes per session for two days a week for eight weeks under the supervision of a physical therapist. The training will take place in your home and/or outside your home as you are doing walking activities. If you are in the control group you will be asked to continue your usual care.

After eight weeks you will go back to the laboratory at the Ohio State University where you will undergo all of the same walking tests and questionnaires that you did at the first visit.

4. How long will I be in the study?

The study will last for 8-10 weeks. This includes 2 testing sessions and 8 weeks of walking training wearing the mechanical walking assist device for a total of 16 sessions.

5. Can I stop being in the study?

You may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are

otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

6. What risks, side effects or discomforts can I expect from being in the study?

There is a risk that you could become tired or have muscle soreness during or after the walking training. You will be allowed to rest whenever you need to rest. Muscle soreness, if it develops, usually resolves within 24 hours. There is a risk that you could fall during the walking training. The therapist will observe your walking with the mechanical walking assist device and make adjustments as needed to ensure that you are able to walk safely with the device. The therapist will also put a gait belt around your waist and will guard you at all times while you are walking.

7. What benefits can I expect from being in the study?

You may obtain some physical conditioning from the walking training wearing the mechanical walking assist device. By participating in the study you will help us to know whether the device could potentially improve the walking ability of individuals with Parkinson's disease in their homes and communities.

8. What other choices do I have if I do not take part in the study?

You may choose not to participate without penalty or loss of benefits to which you are otherwise entitled.

9. What are the costs of taking part in this study?

You will have to drive to and from the Ohio State University 2 times eight weeks apart. There will be no cost for parking but you will incur costs for gasoline.

10. Will I be paid for taking part in this study?

By law, payments to subjects are considered taxable income. You may receive up to $75.00 for completing the study. You will receive $25.00 if you complete the initial testing session and $50.00 if you complete the second testing session.

11. What happens if I am injured because I took part in this study?

If you suffer an injury from participating in this study, you should notify **Sandra Kostyk, MD, PhD at 614-685-1734**, who will determine if you should obtain medical treatment at The Ohio State University Wexner Medical Center.

The cost for this treatment will be billed to you or your medical or hospital insurance. The Ohio State University has no funds set aside for the payment of health care expenses for this study.

12. What are my rights if I take part in this study?

If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

You will be provided with any new information that develops during the course of the research that may affect your decision whether or not to continue participation in the study.

You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

13. Will my study-related information be kept confidential?

Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by state law.

Also, your records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- U.S. Food and Drug Administration;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;
- The sponsor supporting the study, their agents or study monitors; and
- Your insurance company (if charges are billed to insurance).

A description of this clinical trial will be available on http://www.ClinicalTrials.gov, as required by U.S. law. This website will not include information that can identify you. At most, the website will include a summary of the results. You can search the website at any time.

14. HIPAA AUTHORIZATION TO USE AND DISCLOSE INFORMATION FOR RESEARCH PURPOSES

I. What information may be used and given to others?

- Past and present medical records;
- Research records;
- Records about phone calls made as part of this research;
- Records about your study visits;
- Information that includes personal identifiers, such as your name, or a number associated with you as an individual;
- Information gathered for this research about:
  - Physical exams
  - Diaries and questionnaires
- Records about the study device.

II. Who may use and give out information about you?

Researchers and study staff.

III. Who might get this information?

- The sponsor of this research. "Sponsor" means any persons or companies that are:
  - working for or with the sponsor; or
  - owned by the sponsor.
- Authorized Ohio State University staff not involved in the study may be aware that you are participating in a research study and have access to your information;
- If this study is related to your medical care, your study-related information may be placed in your permanent hospital, clinic or physician's office record;
- Others: Michael J. Fox Foundation

IV. Your information <u>may</u> be given to:

- The U.S. Food and Drug Administration (FDA), Department of Health and Human Services (DHHS) agencies, and other federal and state entities;
- Governmental agencies in other countries;
- Governmental agencies to whom certain diseases (reportable diseases) must be reported; and
- The Ohio State University units involved in managing and approving the research study including the Office of Research and the Office of Responsible Research Practices.

V. Why will this information be used and/or given to others?

- To do the research;
- To study the results; and
- To make sure that the research was done right.

VI. When will my permission end?

There is no date at which your permission ends. Your information will be used indefinitely. This is because the information used and created during the study may be analyzed for many years, and it is not possible to know when this will be complete.

VII. May I withdraw or revoke (cancel) my permission?

Yes. Your authorization will be good for the time period indicated above unless you change your mind and revoke it in writing. You may withdraw or take away your permission to use and disclose your health information at any time. You do this by sending written notice to the researchers. If you withdraw your permission, you will not be able to stay in this study. When you withdraw your permission, no new health information identifying you will be gathered after that date. Information that has already been gathered may still be used and given to others.

VIII. What if I decide not to give permission to use and give out my health information?

Then you will not be able to be in this research study and receive research-related treatment. However, if you are being treated as a patient here, you will still be able to receive care.

IX. Is my health information protected after it has been given to others?

There is a risk that your information will be given to others without your permission. Any information that is shared may no longer be protected by federal privacy rules.

X. May I review or copy my information?

Signing this authorization also means that you may not be able to see or copy your study-related information until the study is completed.

15. Who can answer my questions about the study?

For questions, concerns, or complaints about the study, or if you feel you have been harmed as a result of study participation, you may contact **Anne Kloos 614-688-5942**.

For questions related to your privacy rights under HIPAA or related to this research authorization, please contact Frank White at 614-685-1734.

For questions about your rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at 1-800-678-6251.

If you are injured as a result of participating in this study or for questions about a study-related injury, you may contact **Sandra Kostyk, MD, PhD at 614-685-1734**.

Signing the consent form

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this combined consent and HIPAA research authorization form.

Printed name of subject	**Signature of subject**
	Date and time AM/PM
Printed name of person authorized to consent for subject (when applicable)	**Signature of person authorized to consent for subject (when applicable)**
Relationship to the subject	**Date and time** AM/PM

Investigator/Research Staff

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent	**Signature of person obtaining consent**
	Date and time AM/PM

Witness(es) - *May be left blank if not required by the IRB*

Printed name of witness	**Signature of witness**
	Date and time AM/PM
Printed name of witness	**Signature of witness**
	Date and time AM/PM