

Biomedical Technology for Individuals with Parkinson's Disease

The proposed study is designed to investigate the effect of Galvanic Vestibular Stimulation (GVS) on the gait (i.e. manner of walking) of individuals with Parkinson's disease (PD). GVS is a non-invasive technique that has been used in healthy individuals and individuals with stroke and PD. Different methods will be used to monitor physiological activities and trigger GVS. Methods include: electroencephalography (EEG), electromyography (EMG), and accelerometry.

Study Procedures: The testing protocol will be performed at the Simon Fraser University (SFU) Surrey or Burnaby campus, or City Centre 1 (CC1, Surrey) or during a home visit. Throughout the study we will do cognition assessment tests to determine and understand any present cognition impairment, as well as motor tests to understand the progression of PD. If you score low on the cognition test, then a family member should be present during the study. You will be asked to do motor activities such as moving from sitting to standing position, standing to sitting, walking, turning etc. in the study. You will be asked to wear a transfer belt for safety during the study. During testing we will use the following approved devices:

- a. GVS: It uses two electrodes that are placed behind the ears.
- b. EEG cap or headset: You will wear a head cap to record brain signals during activities.
- c. EMG: It uses electrodes that are placed on arm and/or legs to record muscle activity.
- d. Foot Sensors (Physilog[®]4 sensors, Force Sensitive Resistors (FSRs)): These will be attached to your feet via straps. These will record factors such as speed, velocity, etc.

Potential Risks: The risks you might encounter include potential muscular fatigue due to assessments and motor tests, minor skin itchiness and discomfort from the electrodes. Other less common risks include headaches, taste changes, feeling of vertigo, nausea, and tongue numbness associated with active GVS. Each of these side effects do not last for a long time. If at any point you feel uncomfortable you can tell the researchers and they will stop the testing.

WHO CAN PARTICIPATE IN THIS STUDY?

You have been identified because you have Parkinson's disease and you are between the ages of 35 and 85. To be a participant in this study the following must apply to you (Inclusion criteria):

- 1) Age between 35-85 years
- 2) Neurologist confirmed diagnosis of PD or Parkinsonism
- 3) Individuals with PD who are moderately affected while on medication (have symptoms of PD e.g. freezing, slow movements etc. while on medication).
- 4) Ambulatory individuals, able to walk 20 meters with or without assistive device (example: cane or walker)
- 5) Able to understand the study, follow commands and consent to participate in the study

WHO SHOULD NOT PARTICIPATE IN THIS STUDY?

You should not participate in this study if you have a history of ear disorders, seizure, stroke, heart pacemaker or a psychiatric diagnosis. If you are pregnant, or if you do not meet all of the exclusion criteria you should not participate.

You may NOT participate in the study if the following apply to you (Exclusion criteria):

1. Unable to sit or walk unsupported
2. Heart conditions including pacemakers
3. Any other neurological disorder like stroke, seizure, epilepsy, acquired brain injury
4. Any vestibular disorder
5. Pregnant
6. Currently enrolled in any other research study involving drugs or devices