

## PhD Course in Neuroscience XXXVIII cycle, a.y. 2022/2023

### PhD Executive Positions

#### N. 2 linked to research projects:

- 1) *Gait parameters (Kinetic and Kinematic) as potential predictors of fall risk in people with Parkinson's disease*
- 2) *Muscle functions during Gait as potential predictors of fall risk in people with Parkinson's disease*

**Company:** Istituti Clinici Zucchi S.p.A.

#### **Abstract:**

PREDICTIONS OF FALL RISK IN PEOPLE WITH PARKINSON'S DISEASE: AN INTEGRATED MODEL OF KINETIC, KINEMATIC AND EMG DATA DURING GAIT TASKS

This study project is aimed at identifying potential predictors of the risk of falling in people with Parkinson's Disease. To create a synthesis as complete as possible, it was decided to integrate two different research projects, which each investigate different parameters.

#### BACKGROUND AND HYPOTHESIS

Falls in the elderly are a very common problem. People with Parkinson's disease (PD) fall two to three times more often than a general elderly person. The fall in the patient with PD has a great impact both on a psychological level and on functional capacity. Walking is the main condition during which falls occur. In everyday life, walking often takes place in circumstances that complicated it: in fact, walking is almost always aimed at a specific goal. The cognitive commitment on a specific task - dual task walking - is one of the

possible complications. The effect of the dual task on motor behavior, measured as the change in motor performance compared to the single task, is indicative of 'cognitive-motor' interference. The underlying hypothesis is that performing two different tasks simultaneously creates interference on each other. hence, a greater understanding of the role that walking mechanisms play in exposure to the risk of falling - in single or dual task conditions - seems to be one of the basic elements for identifying high-risk individuals. Fall prevention is a key factor in preserving the patient's residual functional capacities for as long as possible. The aim of this study project is the identification of a predictive model of the risk of falling exposure in patients with Parkinson's disease.

The model will be built through the detection of objective parameters of a kinetic, kinematic and electromyographic nature, which will allow the analysis of:

PROJECT 1> Joint movements and angular moments (detection by Motion Capture)

PROJECT 2> Muscle activation (surface EMG) and displacement of the Center of Pressure (COP)

Our hypothesis is that the "fallers" are different from the "non-fallers" compared in conditions of single task and dual task.

The last aim is to act on the factors that determine this increased risk, thus allowing to reduce or minimize these highly traumatic events that significantly affect the quality of life of these patients.

STUDY TYPE: Prospective observational study (6 and 12 month follow-up)

SETTING: Istituti Clinici Zucchi di Carate Brianza – Gruppo San Donato, UNIMIB Motion Capture Laboratory.

FALL ASSESSMENT AND DIVISION BETWEEN "FALLERS AND NONFALLERS": Two groups (Faller and NonFaller) will be created to study any predisposing factors to the risk of falling. The subdivision will be performed by detecting the incidence of falls and this will be recorded weekly, by telephone, prospectively up to 12 months, starting from the day after the data acquisition for each individual patient. The first follow-up of data analysis was placed at 6 months. Patients will then be included in the Faller group when they report the fall event. Definition of fall: any accidental and unwanted contact of a part of the body, with the exception of the feet, with the floor or a plane placed below