Impact of foot reflexology on pain in Parkinson's disease and on the functional connectivity of Neural Network Correlates of Pain

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Introduction:

Parkinson's Disease

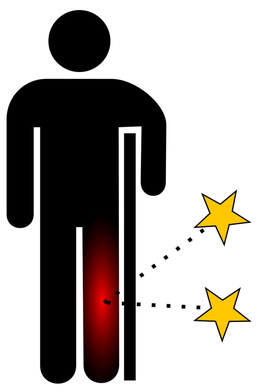
Motor symptoms: tremor, rigidity, akinésia
And
Non motor symptoms: cognitive, sensory impairments, sleep disturbance, **pain** …

PAIN:

Frequent: 40 to 80% of PD patients

Disabling

Major biopsychosocial impact:
↘Quality of life, professional activity and social ties
(Beiske et al., 2009; Defazio et al., 2008; Negre-Pages, 2008)



Dopaminergic treatments or conventional analgesic may be insufficient to relieve pain
pain remains a major issue
(Buhmann et al., 2017)

Non-Pharmacological Interventions (NPIs) should be considered in the context of evidence-based treatments. Despite this growing interest in NPIs, evidence for the effectiveness of these practices in PD pain management is generally limited in randomized controlled trials.

Foot Reflexology (FR): specialized massage consisting in applying **controlled pressure** on specific areas of the feet, **«reflex zones».** It consists of a specific, non-aggressive and precise solicitation of the cutaneous mechanoreceptors based on body landmarks of the foot map. The technique is exclusively manual, practiced with the pulp of the thumb or index finger.

→ **Restore Homeostasis**
(Botting, 1997)

↘Stress **↘Fatigue** **↘Pain** on ≠ aetiologies (Lee et al., 2011)

→ FR could relieve PD patients from pain by modulating its emotional aspect

→ modify their brain connectivity

Main objective: to study FR specific effect on pain management in PD patients.

Secondary objective: to study its effect on brain connectivity

Design:

single-center, longitudinal, prospective, double-blind, randomized exploratory study in 2 parallel groups (ratio 1:1): 1 group receiving **foot reflexology** sessions, 1 group receiving foot **sham massage** sessions

Control : The foot sham massage method used here was **similar to foot modelling** for well-being purposes and aimed to relax the muscles.
Double-blind : Participants and evaluators were blinded as well as investigators

Evaluation performed on **biopsychosocial dimensions of pain** :
- VAS= Visual analog scale,
- BPI=Brief Pain Inventory,
- McGill= McGill Pain Questionnaire,
- CPAQ8=Chronic Pain Acceptance Questionnaire 8,

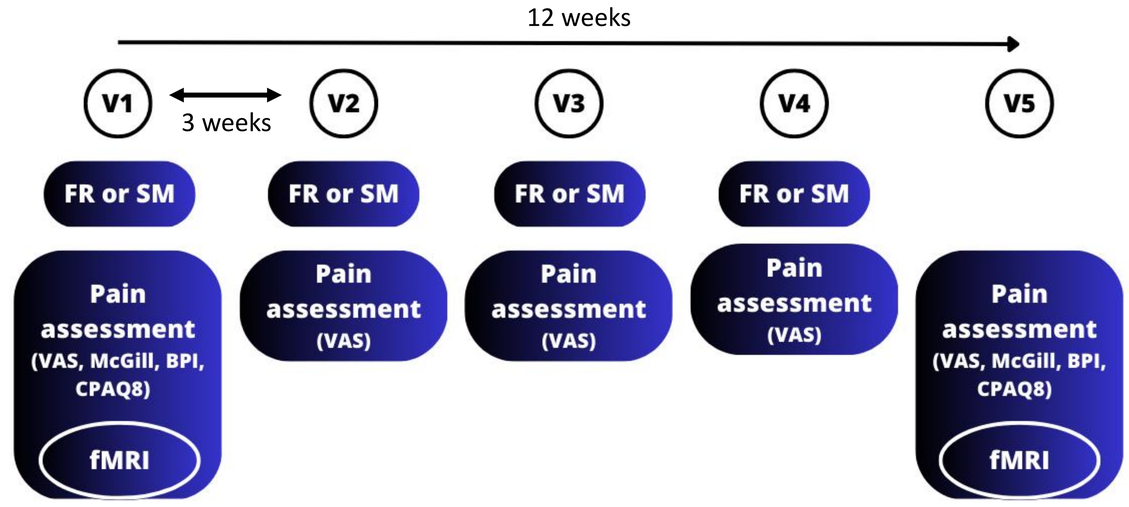


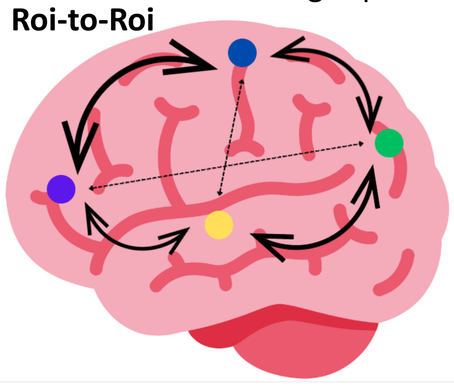
Figure1. Design of the study, FR=Foot Reflexology, SM= Sham Massage, V=Visit, fMRI= functional Magnetic Resonance Imaging,

Analysis method :

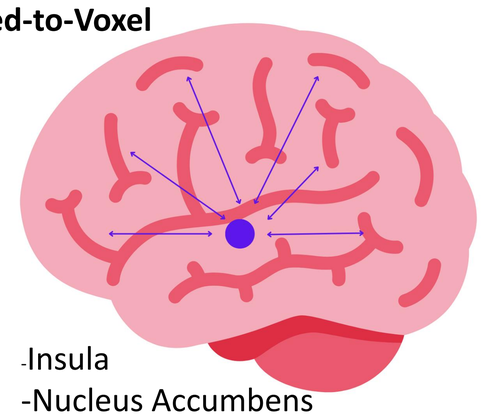
-Compare the **diminution of chronic pain** between the **FR and SM groups** with the **VAS scores changes**
-Compare the **modification of functional connectivity** between the **FR and the SM** groups
-**Correlate** theses modifications to the **VAS diminution**
-Compare the **number of "responders" (> -30% VAS)** between the **FR and SM groups**
-Compare the **modifications of connectivity** between **"responders" patients** and "non responders"

Methods of brain images processing:

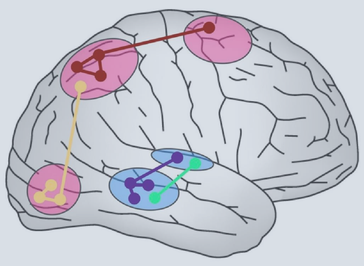
Roi-to-Roi



Seed-to-Voxel



-Insula
-Nucleus Accumbens
-medial Prefrontal Gyrus

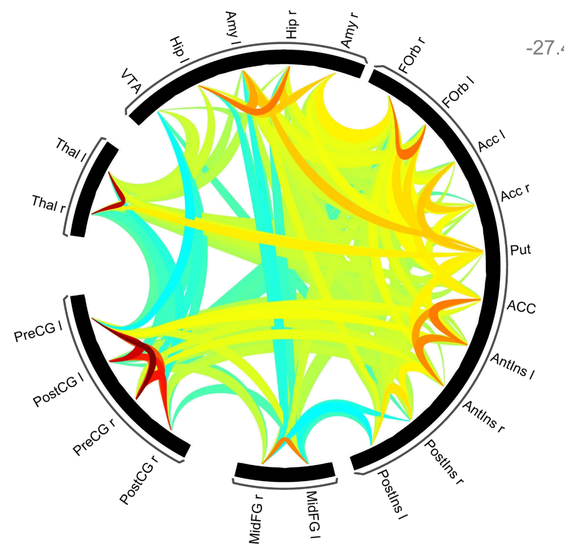


Functional Connectivity :
study of the communication between distant regions of the brain

CONN Toolbox (Whitfield-Gabrieli & Nieto-Castanon, 2012)

Figure2. Neural Network Correlates of Pain

A priori selection of 13 lateralized areas related to pain forming this pain network
l = left; r = right; PreCG = **precentral gyrus**; PostCG = **postcentral gyrus**; PostIns = **posterior insula**; AntIns = **anterior insula**; ACC = **anterior cingulate cortex**; Put = **Putamen**; FOrb = **frontal orbital cortex**; MidFG = **middle frontal gyrus**; VTA = **ventral tegmental area**; Acc = **accumbens**; Thal = **thalamus**; Amy = **amygdala**; Hip = **hippocampus**.



Expected results:

Diminution of **pain** according the treatment/sham and responders/non responders groups
Modification of the functional **connectivity** of the **Neural Networks Correlates of Pain** or of some specific areas in seed-to-voxel, **correlated** with the **diminution of pain**
Diminution of pain **not correlated to other parameters** such as the anxio-depressive state