Music-supported therapy induces plasticity in the sensorimotor cortex after chronic stroke
Brain Stroke

- It is ranked as the forth common cause of death and first common cause of long term disability.

- There are 1410 cases of brain stroke in every million of Spanish population

- 50% of patients suffer from residual motor deficit (Vega et al., 2009)

- Social and economical costs and very low-quality of life for the patients.
Cortical Plasticity

Constraint-Induced Movement Therapy.

Tranncraneal Magnetic Stimulation & Music

Pascual-Leone et al., J.Neurophysiol. 1995
• Auditory-Motor Coupling (Bangert et al., 2001)

NON-MUSICIANS  MUSICIANS  M vs N-M

Bangert et al., Neuroimage 2006
Objectives

• Need of efficient techniques of motor rehabilitation

• To realize changes in sensorimotor reorganization through neuroimaging techniques
Main Hypothesis

Musical therapy induces plasticity in sensorimotor cortex in chronic patients after stroke
Material and Methods

15 chronic stroke patients (>6 months post-stroke)

**INCLUSION CRITERIA**
- Hemiparesis
- Non previous stroke
- Age range 30-75 years old
- Finger and arm able
- Barthel index > 50
- Right Handed
- Signed Consent

**EXCLUSION CRITERIA**
- Multiple brain lesions
- Severe Perceptives and Cognitive Deficit
- Occlusion or estenosis
- Epilepsy
- Previous musical knowledge
Music-supported therapy

Experimental Design

Intervention

1st evaluation
Baseline

2nd evaluation

Music-supported therapy

Follow-up

3rd evaluation

6 months

1 week

= 30’ session
Evaluation

- Motor function and abilities (Motor Test & Zebris 3D)
- Sensorimotor reorganization (fMRI & TMS)
- Motor and cognitive ERP's (EEG)
- Neuropsychological test
- Patient mood
- Quality of life
- General Inabilities (Attentional, Memory...)
Neuroimaging Techniques

- TMS:
  - Motor threshold (resting and active)
  - Recruitment Curve
  - Cortical Silent Period
  - Mapping of active location

![TMS Image]
Neuroimaging Techniques

• FMRI & DTI
  - BOLD activation
  - Structural Changes
  - Path Changes

• Using fMRI we can check if the music learnt has some relation with the motor activation at the BOLD image.
Neuroimaging Techniques

• EEG
  - Motor ERP's
    - Bimanual Task
    - Reaction Time Task (CNV)
    - Readiness Potential

- Time-Frequency changes
Problems and Difficulties

• They are PATIENTS
• Long therapy and evaluation process
• Family collaboration
• Low recover expectancy
• The patient motivation
• Difficult inclusion/exclusion criteria
• Problems with the data recording
• ......