

# Music and the Brain:

## An analysis of how music therapy is used as a treatment for brain disorders

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### Purpose

The purpose of this study was to:

- Define the primary areas of the brain and their uses in everyday tasks
- Discuss the interaction of motor and mirror neurons as they relate to the listening and performance of music
- Document commonly used music therapy treatments
- Self publish a book of songs for use by music therapists in a variety of treatments

### Terminology

In order to understand how music affects the brain, we must first understand the basic lobes and functions of the brain. Below is a list of areas of the brain associated with the processing of music

Frontal Lobe- Voluntary movement, response to our environment, judgement, various memory functions

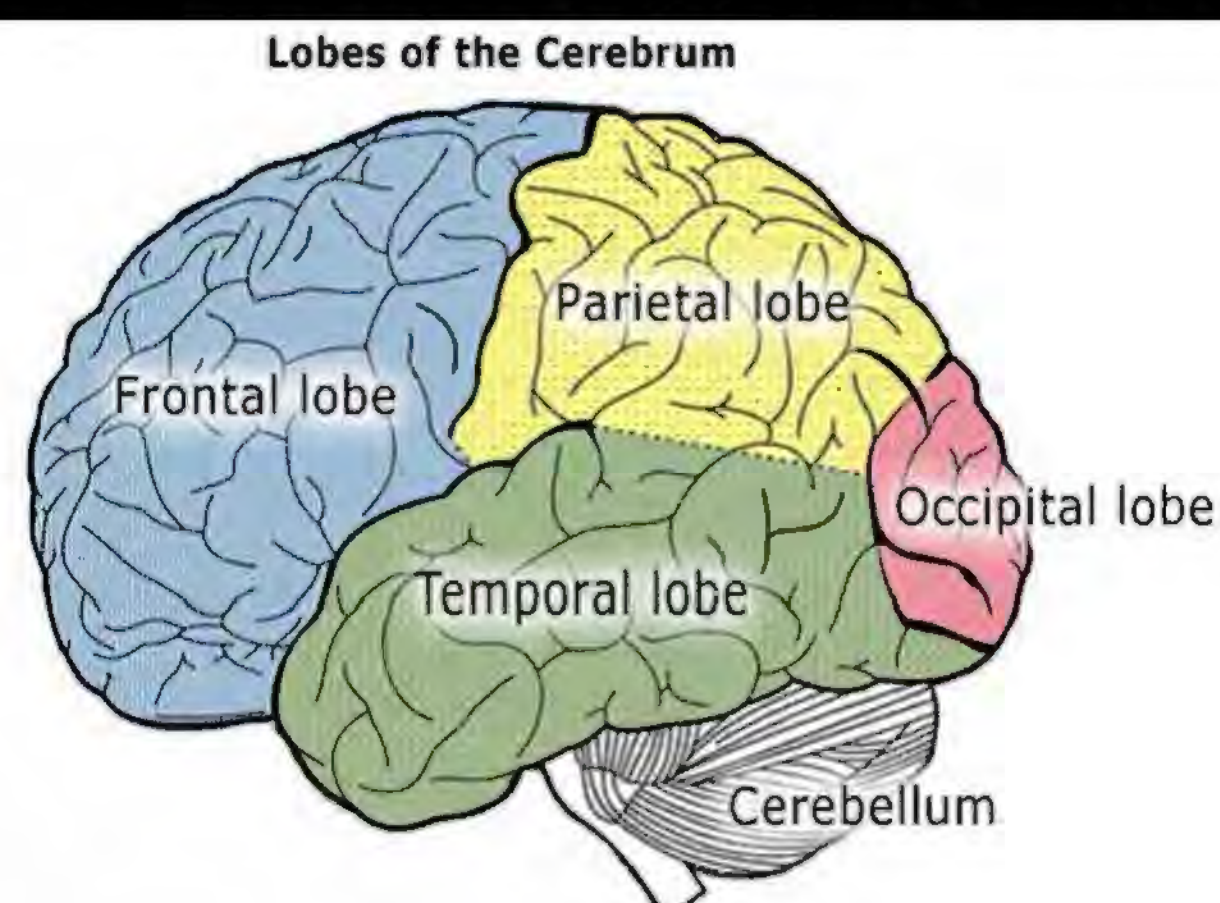
Parietal Lobe- Sensation from muscles and skin, location for visual attention, touch perception, goal directed voluntary movements, manipulation of objects.

Temporal Lobe- Hearing ability, memory acquisition, visual perceptions, categorization of objects.

Occipital Lobe- Visual Processing

Cerebellum- Coordination of voluntary movement, Balance and equilibrium, memory and reflex motor acts. (Queensland Health, 2016)

### Areas of the Brain that Process Music



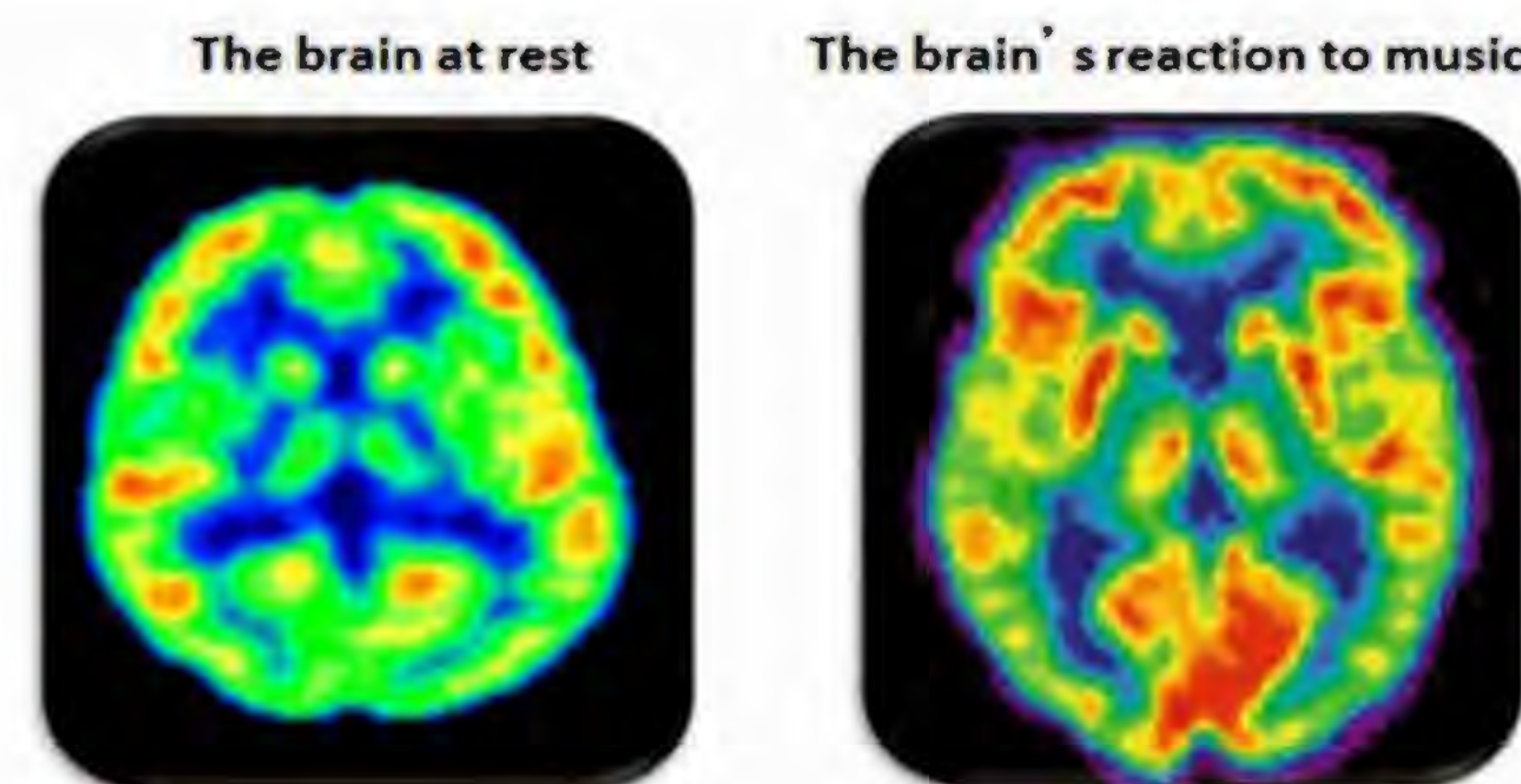
### Neurons and Music

Motor neurons allow for a physical response, while mirror neurons allow for an emotional response. Music therapy uses music to reconnect a patient's neurons with various emotions and physical responses in the brain.

Motor neurons- when we play an instrument, motor neurons in the brain allow our bodies to move in order to achieve the intended sound.

Mirror neurons- regardless of our musical background, when we hear or watch a performer, mirror neurons in the brain react just as if we were the ones actually performing. (David Byrne, 2012).

### fMRI of the Brain



### *The Music Therapist's Primer*

A self published repertoire of songs that included a variety of genres and styles from various decades was created. The book serves as a resource for music therapist in the treatment of many commonly found conditions including autism and neural degenerative diseases.

A special thanks goes to Dr. Brian Mason for his guidance.

### Music Therapy Treatments

Brain disorders have many different developmental challenges. Below are three categories of development challenges commonly associated with music therapy treatment.

#### Communicatory Development

- Autism Spectrum Disorders:
  - development of meaningful gestures, sounds, and language
  - diversion from repetitive behavior
  - increasing tolerance of sounds
- Neural Degenerative Diseases (Dementia, Alzheimer's):
  - Music that has a deep connection can cause patients to sing with the song, or begin to communicate more freely while the song is playing

#### Social Development

- Autism Spectrum Disorders:
  - motivation to interact
  - tolerance of change and unpredictability
  - enhancing flexibility and responsiveness
  - providing meaningful shared experiences
- Neural Degenerative Diseases (Dementia, Alzheimer's)
  - motivation to interact
  - Relation to other patients that are feeling similar emotions

#### Emotional Development

- Autism Spectrum Disorders improving sense of self and self esteem
  - developing expressive abilities
  - sharing of emotional experience (Nordoff Robbins Music Therapy, 2011)
- Neural Degenerative Diseases (Dementia, Alzheimer's)
  - Stimulative music can excite the patient with its high energy rhythms and heavy percussive sounds. This often times leads to a motor reaction (foot tapping)
  - Sedative music such as ballads and lullabies, or music that include unaccented beats, little syncopation, and a primarily slow tempo are the best when preparing for bed or any stressful change that can cause agitation. (AFA, 2016)