**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**

- **Motor 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).

- **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)

- **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.

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