

# Neurologic Music Therapy

## Rhythmicity and Brain Function: Toward a Scientific Model of Music in Therapy

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# Neurologic Music Therapy

## A Research-Based System of Standardized Clinical Techniques

- For:
  - Sensorimotor Training
  - Speech/Language Training
  - Cognitive Training

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# Neurologic Music Therapy

## A Research-Based System of Standardized Clinical Techniques

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# Neurologic Music Therapy

## Basic Definitions

- NMT is defined as the therapeutic application of music to cognitive, sensory, and motor dysfunctions due to neurologic disease of the human nervous system.

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# Neurologic Music Therapy

## Basic Definitions

- NMT is based on a neuroscience model of music perception and production and the influence of music on functional changes in nonmusical brain and behavior functions. (R-SMM)

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# Neurologic Music Therapy

## Basic Definitions

- Treatment techniques in NMT are based on scientific research and are directed towards functional therapeutic goals. (TDM)

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## Neurologic Music Therapy Basic Definitions

- Treatment techniques are standardized and applied to therapy as Therapeutic Music Interventions (TMI) which are adaptable to the patient's needs.

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## Neurologic Music Therapy Basic Definitions

- In addition to music therapy training, consortium university trained NMT's are educated in the areas of neuroanatomy, physiology, brain pathologies, medical terminology, and rehabilitation of cognitive and/or motor functions.

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## Neurologic Music Therapy Gait, Arm, Trunk, & Posture Training

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| <ul style="list-style-type: none"> <li>● <b>Techniques</b> <ul style="list-style-type: none"> <li>● Rhythmic Auditory Stimulation (RAS)</li> <li>● Patterned Sensory Enhancement (PSE)</li> <li>● Therapeutic Instrumental Music Performance (TIMP)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>● <b>Mechanisms</b> <ul style="list-style-type: none"> <li>● Audio-Spinal Facilitation</li> <li>● Sensorimotor Integration</li> <li>● Rhythmic Entrainment</li> <li>● Auditory Feedback</li> <li>● Patterned Information Processing (Sonification)</li> </ul> </li> </ul> |
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## Neurologic Music Therapy Speech and Language Training

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| <ul style="list-style-type: none"> <li>● <b>Techniques</b> <ul style="list-style-type: none"> <li>● Melodic Intonation Tx (MMIT)</li> <li>● Musical Speech Stim (STIM)</li> <li>● Rhythmic Speech Cueing (RSC)                             <ul style="list-style-type: none"> <li>● Rhythmic</li> <li>● Patterned</li> </ul> </li> <li>● Vocal Intonation Tx (VIT)</li> <li>● Therapeutic Singing (TS)</li> <li>● Oral Motor and Respiratory Exercises (OMREX)</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>● <b>Mechanisms</b> <ul style="list-style-type: none"> <li>● Differential Hemispheric Processing</li> <li>● Patterned Information Processing</li> <li>● Perceptual Sensory Priming</li> <li>● Rhythmic Entrainment</li> </ul> </li> </ul> |
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## Neurologic Music Therapy Cognition: Attention and Perception

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| <ul style="list-style-type: none"> <li>● <b>Techniques</b> <ul style="list-style-type: none"> <li>● Musical Sensory Orientation Training (MSOT)</li> <li>● Musical Neglect Training (MNT)</li> <li>● Auditory Perception Training (APT)</li> <li>● Musical Attention Control Training (MACT)                             <ul style="list-style-type: none"> <li>● Selective</li> <li>● Sustained</li> <li>● Divided</li> <li>● Alternating</li> </ul> </li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>● <b>Mechanisms</b> <ul style="list-style-type: none"> <li>● Patterned Information Processing (Gestalt Principles of Groupings)</li> <li>● Perceptual Sensory Priming</li> <li>● Rhythmical Attention</li> <li>● Auditory Information Processing</li> </ul> </li> </ul> |
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## Neurologic Music Therapy Cognition: Memory Training

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|---|--|
| <ul style="list-style-type: none"> <li>● <b>Techniques</b> <ul style="list-style-type: none"> <li>● Musical Mnemonics Training (MMT)                             <ul style="list-style-type: none"> <li>● Echoic Mnemonics (Immediate Recall, Sensory Register)</li> <li>● Procedural Mnemonics (Rules, Skills)</li> <li>● Declarative Mnemonics (Semantic, Episodic Memory)</li> </ul> </li> <li>● Associative Mood and Memory Training                             <ul style="list-style-type: none"> <li>● Mood State-Dependent Learning and Recall</li> </ul> </li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>● <b>Mechanisms</b> <ul style="list-style-type: none"> <li>● Patterned information Processing (Gestalt Principles)</li> <li>● Affect Modification</li> <li>● Associative Network Theory of Mood and Memory</li> </ul> </li> </ul> |
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## Neurologic Music Therapy

### Cognition: Executive Functions Training

- **Techniques**
  - Musical Executive Function Training (MEFT)
    - Organization
    - Problem Solving
    - Decision Making
    - Reasoning
    - Comprehension
- **Mechanisms**
  - Patterned information Processing (Gestalt Principles)
  - Social Learning Theory

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## Neurologic Music Therapy


### Cognition: Psychosocial Behavior Training

- **Techniques**
  - Music Psychotherapy and Counseling (MPC)
    - Mood Induction
    - Cognitive Reorientation
    - Affective Behavior Training
    - Social Competence Training
    - Musical Incentive Training for Behavior Modification
- **Mechanisms**
  - Affect Modification
  - Assoc' Network Theory of Mood and Memory
  - Classical Conditioning
  - Operant Conditioning
  - Social Learning Theory

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## Audio-Spinal Facilitation

- **Motor Responses to Music** - (i.e. tapping your foot, fingers, etc.)
- **Audio-Spinal Facilitation** - Auditory stimuli excite neurons in the spinal cord (RST) which in turn ready or prime muscles for movement. Occurs at a pre-cognitive level. The more intense the stimulus, the greater the neuromuscular response. (Paltsev & Elner, 1967; Rossignol & Melvill-Jones, 1976, etc.) Click Here for example of [Anatomy of Movement Example](#)



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## Audio-Spinal Facilitation


- **Motor Responses to Music** - (i.e. tapping your foot, fingers, etc.)
- **Audio-Spinal Facilitation** - Rhythmically structured sound patterns, such as a simple dance tune in 2/4 meter, can entrain the timing of muscle activation patterns, as measured by electromyography (EMG), facilitating more efficient movement during rhythmic movements (gait, hopping, & skipping).



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## Physiological Entrainment

- **Physiological Entrainment** - Occurs when the frequency of activity of one system determines the frequency of activity in another system. Internal oscillator (internal time-keeper) entrains to a more powerful external oscillator (metronome or music). (Haas & Distenfeld, 1986; Miller et al., 1996).




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### Rhythmic Auditory Stimulation

- **RAS - (Rhythmic Auditory Stimulation)**
  - **RAS** is a specific technique to facilitate rehabilitation of movements that intrinsically are biologically rhythmical. One of the most important of these rhythmical movements is gait. Therefore, the most prominent application of RAS is to gait disorders, e.g. in stroke patients, Parkinson's patients, and traumatically brain injured patients.



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## Neurologic Music Therapy Therapeutic Instrumental Music Performance

- **TIMP** - (Therapeutic Instrumental Music Performance)

- **TIMP** uses the playing of musical instruments to exercise and simulate functional movement patterns in motor rehabilitation. Musical instruments and their appropriate spatial configurations are selected to emphasize and train range of motion, endurance, strength, adduction/abduction, supination/pronation, flexion/extension, digit dexterity, limb coordination, etc.



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## Neurologic Music Therapy Patterned Sensory Enhancement

- **PSE** - (Patterned Sensory Enhancement)

- A technique using rhythmic, melodic, harmonic, and dynamic elements of music to provide temporal, spatial, and force patterns to structure and cue functional movements. The auditory-musical patterns or 'kinematic compositions' are derived from translating all components of the kinematic patterns of the movement in space, time, and force into sound patterns. For example, the rhythmic patterns simulate the timing patterns of the movement, pitch patterns simulate changing spatial positions, and harmonic and dynamic patterns simulate applications of force and muscle tone. PSE has its equivalent in sports training in the concept of 'sonification'. PSE can be used to structure in time, space, and force any functional movement patterns and sequences, regardless if intrinsically rhythmic or discrete, of the upper trunk, arms, hands, or whole body, e.g., reaching and grasping and lifting motions, sit-to-stand.



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