



Therapeutic Listening added to original SI program

Case selection criteria :

1. Sensory Modulation Disorder

- ↪ hypersensitivity to sound or touch
- ↪ difficulty grading responses to sensation
- ↪ difficulty grading functional range of arousal states

2. Regulatory issues (related to vagus nerve, ANS)

- ↪ sleep problems
- ↪ eating problems
- ↪ bowel and bladder control

3. Functional difficulties

- ↪ Vestibular-auditory-visual integration dysfunction
- ↪ poor attention
- ↪ poor orientation to auditory and visual information
- ↪ overall poor engagement and organization in activities

4. Emotional and social difficulties

- ↪ emotional instability
- ↪ temper tantrums with increased behaviors of hitting and squeezing others
- ↪ Poor facial expression, vocalization, eye contact

Background understanding

1. From course note : TL is an expansion of SI.

- ◆ music serves to arouse (↑-regulate) or calm down (↓-regulate)
- ◆ music has great impacts on mm tone, postural stability and rhythmic movements
- ◆ eye ball movements highly related to auditory system
- ◆ humming gives a sense of the body through the use of diaphragm, midline orientation

2. Music can change physiology

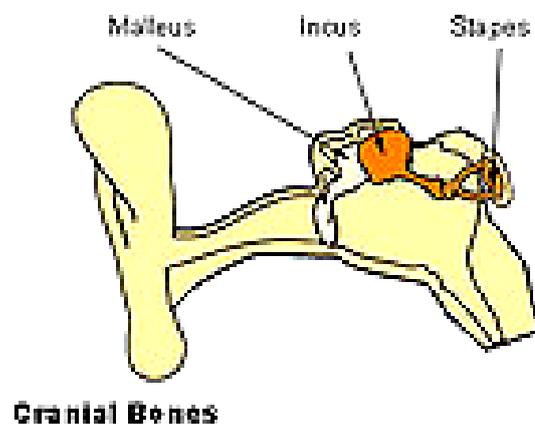
- ◆ Relaxing music results in lowered heart rate and respiratory rate and reduced anxiety in 40 patients suffered from heart attack
- ◆ Noisy music results in increased blood pressure as much as 10%
- ◆ Participants listened to music for 15 minutes, a 12.5 to 14% increase in immune cell messenger molecule noted (1993)
- ◆ Participants chose their own music e.g. Mozart, Jazz or New age, a decrease of stress hormone, cortisol, by 25% noted, this is in turn related to improved immune system

3. Some characteristics of sound wave

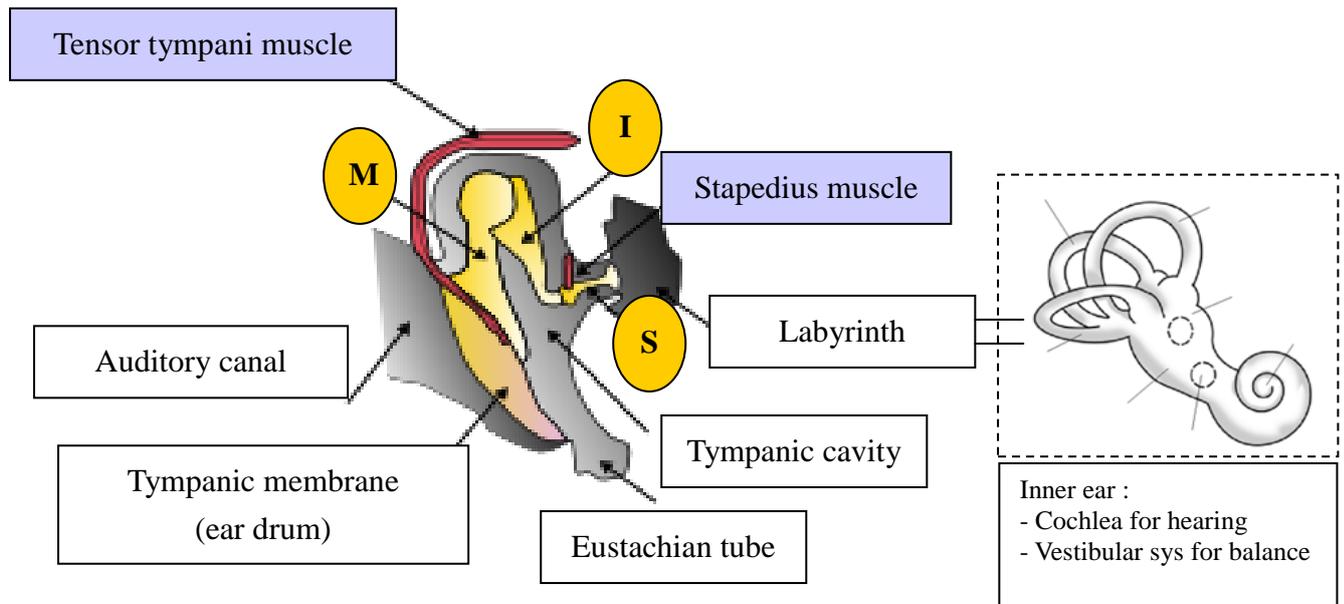
- ◆ Audible sound 20-20000Hz
- ◆ most easily located 500-1500Hz (many vowel sounds of speech are in this freq)
- ◆ lower frequency sound, e.g. lawn mowers and trucks (<300 Hz) has very little directional information, therefore, they are hard to locate (they often fill the background)
- ◆ lower frequency sounds are more related to movements and rhythm
- ◆ transition between movement, rhythm and sound happens between 16 to 50 Hz

5. Structured understanding of hearing

- ◆ **Three ear bones** transfer the vibratory movements of the eardrum to the fluid-filled inner ear



- ◆ **Middle ear muscles** prevent sensory overload and to enhance sound discrimination (acoustic reflex is the reflexive contraction right after the sound is heard)
- ◆ The weakness of these muscles will weaken this protective function and may be the cause of certain types of **auditory defensiveness**
- ◆ **In autistic children**, there may be a shut down of auditory information due to prolonged threat of sudden noises, the difficulty in filtering and figure-ground hearing and the strong input of sounds through bony conduction

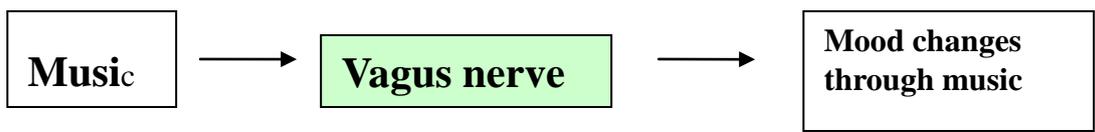


- ◆ The Mindbody connector :

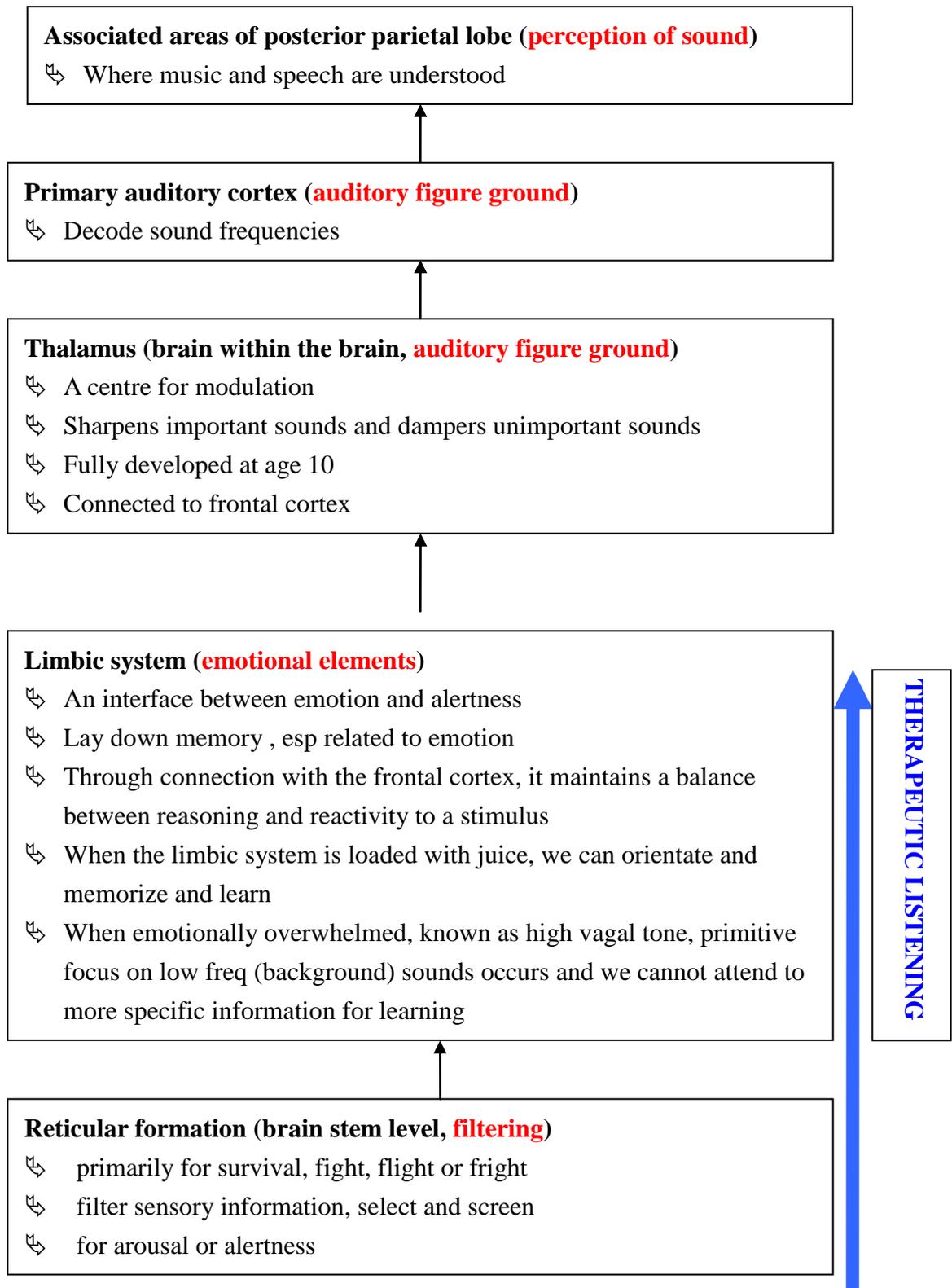
Vagus nerve 迷走神経

- ↪ a link between the emotional centre of the brain and the body
- ↪ regulates autonomic body functions
- ↪ vagus has a direct branch to the eardrum

Therefore , sound has a direct line of influence over our bodily functions through the vagus



- ◆ **The 8th cranial nerve** serves to connect between the ear to the primary auditory cortex with many stop stations



Facts on Therapeutic Listening

1. Understand the nature of Low and High sounds

1.1 Low sound

- ◆ associates with movements, rhythms
- ◆ multidirectional, providing information of the background and space
- ◆ travels faster and greater distance
- ◆ tends to overpower higher sounds

1.2 High sound

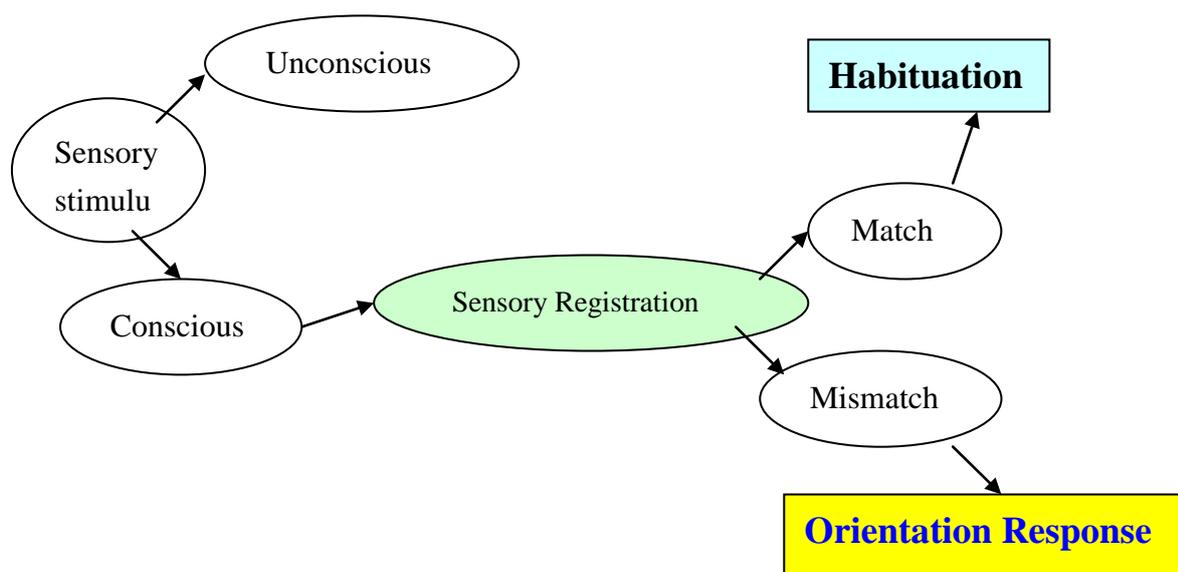
- ◆ unidirectional, providing information of the direction and location of sound source
- ◆ carries more details
- ◆ more difficult to transmit

2. Therapeutic Listening

- ◆ designed to elicit and sustain the **orientation response**
- ◆ facilitates perception of the difficult portion
- ◆ creates the contrast between the low and high will call for “orientation response”
- ◆ makes use of the different qualities of sound, including tone, rhythm, melody, harmonics (overtones), instruments and space (flat or spatial)
- ◆ instrumentation :
 - percussion and baseline instruments provide rhythm, bridging between vestibular (ear of the body) and auditory (ear of the environment)
 - strings provide emotional colors
 - guitar and cello are the “body instruments” provide grounding and soothing
 - violin and viola adds emotional colors and details
 - flute and voice call and hold attention and emotional response
 - piano provides structure

3. The Orientation Response

3.1 Arouse → Alert → Attend



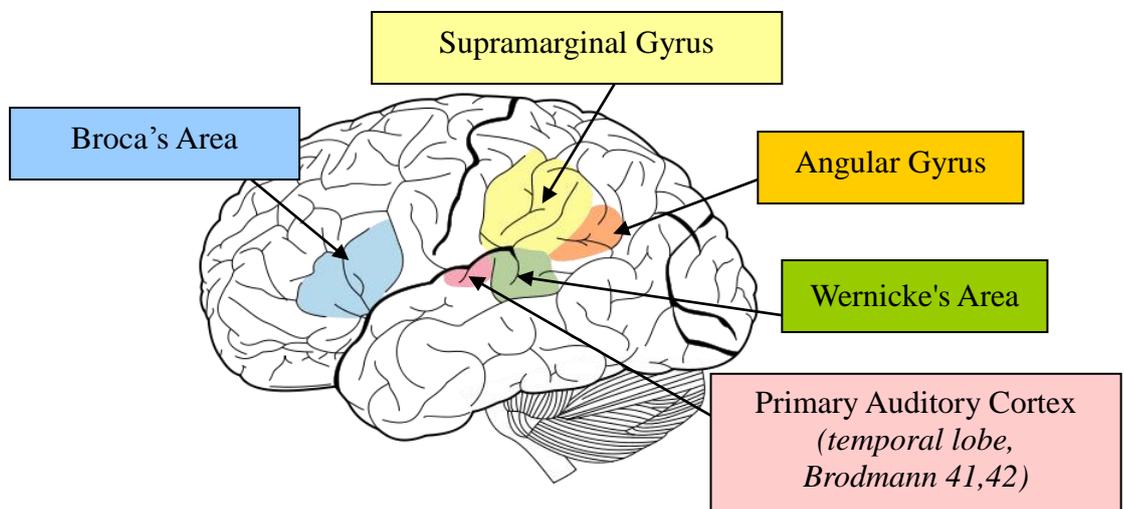
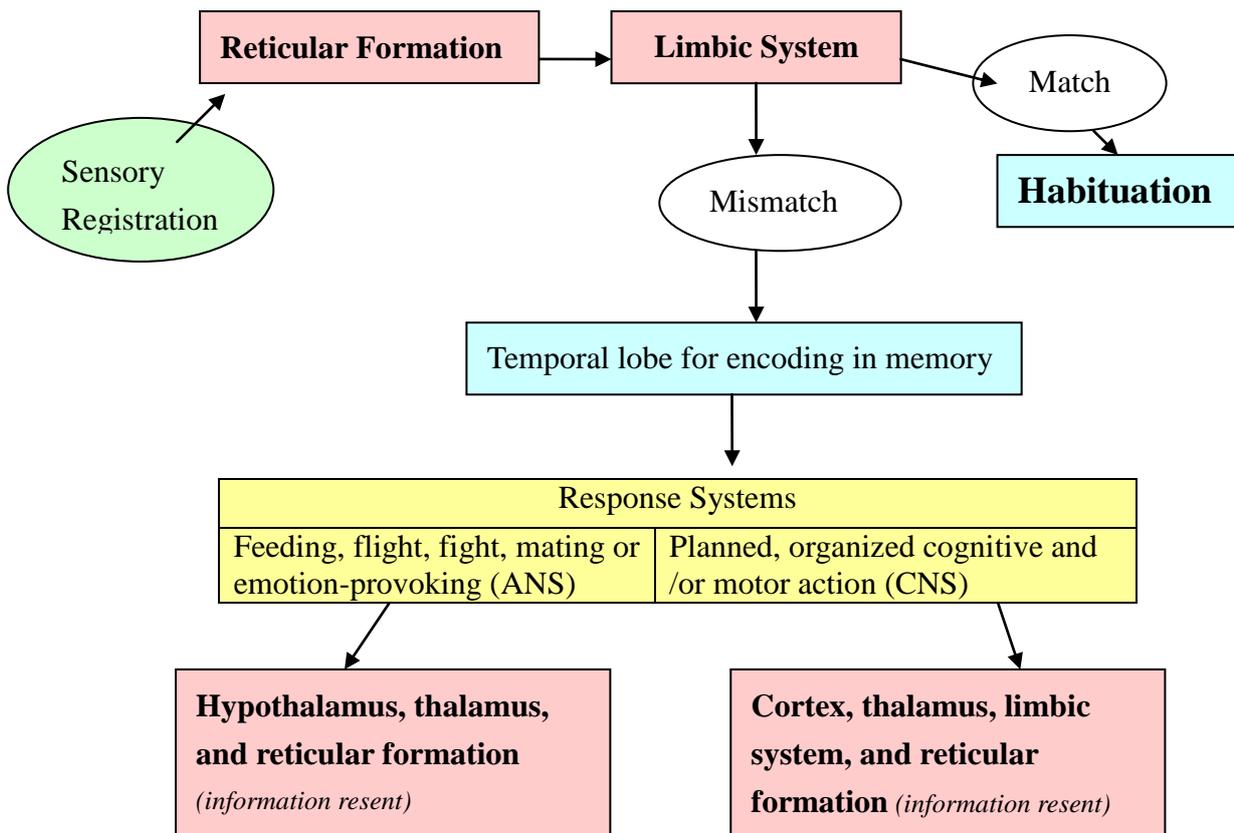
3.2 Physiology of the Orientation Response as opposite to Defense Response

- ◆ peripheral vasoconstriction
- ◆ vasodilation in head, including pupil dilation and cheeks redden
- ◆ heads turn to stim
- ◆ body stills and softens
- ◆ postural muscles activated

As opposed to Defense Response, child would

- ◆ have a decrease in heart and breath rate
- ◆ momentary stillness in which child will decrease body movements but increase visual acuity for attention

3.3 Arousal and selective attention



3.4 Neuronal Model for the Orienting response

- ◆ incoming information is encoded on many dimensions and levels
- ◆ multiple encoding allows for memory and discrimination
- ◆ cortex recognizes that a stimulus is new or important
- ◆ cortex identifies a “mismatch” and sends out excitatory impulses to RF via corticoreticular connections
- ◆ RF is activated from sensory areas in cortex

3.5 For the stimuli to elicit interest, it must have the following qualities ...

- ◆ Novelty
- ◆ Complexity
- ◆ Conflict
- ◆ Surprise
- ◆ Uncertainty
- ◆ Moderate duration

4. Modulated CDs

- ◆ Low pass is more towards movement and core activation
- ◆ High pass is more towards attention, but it cannot be kept for too long, since too tiring
- ◆ High vs low pass : 1000 Hz is the cutting point (2 octave higher than middle C on piano)
- ◆ Different filtering patterns :
 - modulated CDs : alternating between high and low pass
 - more high pass filter : intensive stimulation for attention, then back to low pass to increase the contrast
 - fine tuning CDs : sliding high pass filter
 - 2000 Hz (for space)
 - 4000Hz (for language)
 - 6000Hz (for attention and discrimination)

Compiled by Ivy Tam (1/2012)