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From "Hopeless" to "Healed"

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Imagine waking up after a stroke completely unable to speak. Two years of speech therapy later, the gift of words has still not returned. Samuel S. found himself in this very situation—brain damage from a stroke had confiscated his ability to speak and had not given it back, and the speech therapists had deemed his case “hopeless” (Sacks 232). Yet Samuel could still sing “Ol’ Man River,” though only a few words of the lyrics survived the ravages of the stroke (232). One day the resident music therapist, Connie Tomaino, heard him singing in the hospital corridor and decided to experiment (232). Two months of music therapy later, Samuel had not only regained the ability to sing lyrics to several songs; he also had begun to speak in short, effective sentences (232-3). Stories such as these illustrate music’s restorative power for those suffering from neurological disorders, physically reorganizing the brain and reconnecting various brain structures. The efficacy of neurological music therapy relies on music’s influence over brain organization and structure.

Music’s neurological effects encompass genuine physical changes in the brain. Gaser and Schlaug actually discovered “gray matter volume differences in motor as well as auditory and visuospatial brain regions comparing professional musicians . . . with matched amateur musicians and nonmusicians” (514). Like any other habitual action, professional musicians’ long-term, repeated practice of their instruments contributes to the increase in gray matter (514). But not only does musical training add brain mass; it also reorganizes the cerebral cortex. As a structure of the brain, the brain’s cerebral cortex includes both the motor cortex and the sensory cortex, which respectively send out and receive messages to and from the other organs in the body. Depending on specific environmental demands, cortical organization can actually change through an ability of the brain known as “plasticity.” Plasticity particularly evidences itself in the brains of musicians: as compared to non-musicians, musicians’ auditory cortexes contain “enlarged cortical representation of tones of the musical scale as compared to pure tones [non-musical tones]” (Pantev et al., “Cortical Plasticity” 438). This variation in cortical organization displays the remarkable effects on the brain wrought by music coupled with the brain’s power of plasticity.

The same cortical plasticity that allows reorganization of the auditory cortex also triggers tinnitus, a ringing in the ears. In the absence of auditory stimuli—for example, in the case of a person going deaf—the excitation-inhibition balance in the auditory cortex is distorted, causing a lack of inhibition that affects the activity of specific neurons in the brain (Pantev et al., "Tinnitus" 253-254). This "maladaptive plasticity" allows the neurons to fire more frequently and spontaneously, resulting in the typical ringing sound of tinnitus (253-254). Because of its origins in cortical organization, Pantev et al. term tinnitus "the dark side of cortical plasticity" (253).

Though no standard therapy for tinnitus exists, the cure may actually come from music. Pantev et al. propose a method involving custom-made songs in which the particular frequency that buzzes through the patient's head is removed from the entire song, resulting in "notched" music ("Tinnitus" 254). Listening to such "notched" music dampens the hyperactive cortical activity that produces the tinnitus. With the affected neurons no longer firing as frequently and spontaneously, the brain will in time reorganize the auditory cortex, returning it to its normal state (254). Thus the brain's very mechanism that created the problem of tinnitus can also reverse it, assisted by a novel usage of music therapy.

Applications of neurological music therapy do not end with tinnitus, however. Music therapy for stroke-impaired motor function provides reorganization not only of the auditory portions but of the motor and auditory-sensorimotor portions of the brain (Altenmuller et al. 395). A key aspect of this type of music therapy, actual music-making (playing the piano or the drums, for example) involves accumulated repetition of the same movements, which develops motor skills (395). More traditional therapies for motor impairment take advantage of the same principle, but music therapy includes an extra advantage: an auditory component, which provides reinforcement and feedback corresponding to the movement (395). Altenmuller et al. found that between the people treated with music therapy and the people treated with traditional therapies, "music-supported therapy yielded significant improvement in fine as well as gross motor skills with respect to speed, precision, and smoothness of movements" (395). The auditory and motor dimensions of music-making combine to render music therapy an effective treatment for stroke-induced motor impairment.

Not only people with stroke-impaired motor skills but also those suffering from aphasia can benefit from music therapy.

People who have had a stroke—like Samuel S.—sometimes develop nonfluent aphasia, also known as Broca's aphasia, which takes away their ability to speak without touching their ability to understand. Even though they have lost their speech, people with nonfluent aphasia often retain the ability to sing (Tomaino 312). Based on this fact, therapists have developed melodic intonation therapy (MIT) for treating patients with Broca's aphasia. In one form of MIT, the therapist sings sentences to a tune familiar to the patient; in another version, the therapist sings familiar songs to the patient and lets the patient join in (313). The goal of these techniques is to encourage the patient to interact with the therapist by song, ultimately progressing through the course of the therapy to speech (313).

MIT's success in neurological music therapy stems partly from the unique characteristics of music itself that contribute to its particular suitability for aphasic patients. Nonfluent aphasia results from damage Broca's area, the area of the brain that controls speech production. Broca's area is located in the left hemisphere, which has the ability process "more rapidly modulated signals" than the right hemisphere (Norton et al. 435). Because of the damage sustained by the left hemisphere, aphasic patients often struggle to keep up with the speed of spoken words. However, the musical aspect of MIT slows down the rate of words, moving the processing from the damaged left hemisphere to the right hemisphere (435). In addition, Norton et al. point out that "when words are sung, phonemes are isolated and thus, can be heard distinctly while remaining connected to the word," giving aphasic patients time to process information mid-word and to plan their next syllable (436). The measured, rhythmic aspect of music contributes to MIT's virtue as speech therapy.

Neurologically, the efficacy of MIT arises from the strengthening of certain brain structures. In their article, Schlaug et al. list several brain regions active in the course of recovery from aphasia (385). These regions are connected with one another by a tract named the arcuate fasciculus (AF) (385). Each hemisphere contains an AF; however, the right hemisphere AF is naturally smaller and less developed than the AF in the left hemisphere (385). In the particular case of aphasia, left hemisphere damage often renders the left AF ineffective but leaves the weaker right AF untouched. In Schlaug et al.'s study, patients with aphasia showed significantly strengthened right AFs after concentrated treatment with MIT (385). This evidence suggests that "intense, long-term MIT leads to remodeling of the right AF"—the neurological basis for the positive results of MIT and music therapy (385).

Through harnessing the brain's incredible plasticity, neurological music therapy holds the potential to overcome the brain's own damages. As more neurological findings unfold, music therapy may expand to include other dimensions of neurology and the brain. But people like Samuel S. do not have to wait for new discoveries. Where traditional therapy has failed, music has already changed their status from "hopeless" to "healed."

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