

# Music Soothes the Savage Breast

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“Music has Charms to soothe a savage Breast” is a familiar phrase which dates back to 1697 as part of a play entitled *The mourning bride* by the poet William Congreve. Less familiar are the lines which follow: “To soften Rocks, or bend a knotted Oak. I’ve read, that things inanimate have mov’d, And, as with living Souls, have been inform’d.”<sup>1</sup> The initial phrases of this poem may be interesting to think about in terms of music’s application in medicine. Music’s influence in medicine is relative to our understanding of how music can affect a person’s “living soul,” which may be an active and conscious process. Music’s impact also often takes on a more passive, but equally potent role, as sound and resonance can effect the movement of “inanimate objects.” If we think about the roots of entrainment<sup>2,3</sup> and the reports of the late 17th century’s Dutch scientist Christian Huygens, we realize that rhythm as an energetic force and its capacity to have mutual influence on motion is vast and on-going. Huygen’s discovery that pendulums swinging at different rates eventually shift to swing in synchrony provides the basis for primary energy concepts in physics and illustrates a complex process in our understanding of how we set out to apply and adapt sound and music to various systems of the body. Our understanding and application of Congreve’s revelation that in music, especially in rhythmic elements, “things inanimate have moved” is critical. Huygen and Congreve both lived in the 1600s; a poet and scientist recognizing phenomena, not unlike the perspectives we take on today as we view music’s capacity to effect physiological and psychological aspects of function.

The immediate influence of music’s effect on the body may be most readily recognized in the management of pain. Pain is one of the most disabling and costly afflictions among citizens of North America, Europe, and Australia, its prevalence estimated at 11% in adults.<sup>4</sup> Treatment of acute pain has been identified as a field of special interest in medical care only recently, leading the International Association for the Study of Pain (IASP) to declare 2011 Global Year Against Acute Pain.<sup>5</sup> The Declaration of Montreal, issued 2 months ago, points out that access to pain management is a fundamental human right.<sup>6</sup> This is an area where the Editors would like to see more applications of both live and recorded music trials particularly because we are convinced that music may attend to aspects of neural, cardiac, and pulmonary function in integral ways. Results of recent Cochrane Reviews underline the urgent necessity for clinical studies in the field.<sup>7</sup> Furthermore,

the management of pain is at times overlooked as a treatment strategy. Resnik and Rehm<sup>8</sup> point out reasons for this. First, that pain is subjective, not objective; and furthermore that its etiology tends to be poorly understood. Although pain management expert and coauthor of several *Pain* clinical manuals, Margo McCaffrey, has been quoted as early as 1989 in recognizing that “Pain is whatever the experiencing person says it is, and exists whenever he says it does,”<sup>9</sup> and the IASP adopted this definition, there are still, nevertheless, countless reports of the fact that this 5th vital sign remains underreported and undertreated.<sup>10</sup> Pain is “often regarded as a ‘mere’ symptom, not as a disease” and its treatment may not have a clear cut “expert” knowledge model application.<sup>8</sup> Recognition that scientific, clinical, cultural, and philosophical factors contribute to our poor assessment and treatment of pain is significant. Interestingly, music may provide important inroads in addressing each one of these critical aspects of understanding, which can enlighten models of best practice applications.

Music therapist Clare O’Callaghan<sup>11</sup> discussed 4 theoretical perspectives that substantiate specific aspects of how music reduces patients’ sensation of pain as influenced by music therapy. These include: the psychological relationship between music and pain; the psychophysiological reactions; spinal mechanisms involved in pain modulation; and the role of endorphins.

The psychological relationship between music and pain may be the most easily understood. Perhaps this is because the very definition of pain is not only the nociceptive muscle tissue trigger but also our emotional response to the unpleasant stimuli. This implies that where music influences the emotions is the potential and allowance for not only shifts in the response to the unpleasant stimuli, but alterations in perceptions as well.

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If the music can provide for release (drumming), emotions (crying—endorphins elicited in tears—discharge) or alternatively can allow for expression (as in singing), or the building of resilience (as in clinical improvisation), then the pain experience is malleable and can be altered and the psychophysiological experience manifested between therapist and patient can be a catalyst in shifting the experience of pain.

Positron emission tomography (PET) imaging studies have illustrated that “intensely pleasurable” responses to music correlate with activity in the brain regions implicated in reward, emotion, or pain, including ventral striatum, dorsomedial midbrain (PAG or pedunclopontine tegmental nucleus), amygdala, orbitofrontal cortex, the anterior cingulate cortex, and insula.<sup>12</sup> Neural circuitry does appear to have a strong influence on pain processing, and emotions associated with positive affect are evidently mediated by the same neural mechanisms that mediate reward. The premise that increased brain dopamine levels are influenced by positive mood and in frontal cortical regions<sup>13</sup> is important for music and pain potential particularly as the release of dopamine when music is played with investment can shift and immediately alter cognitive functioning. A multitude of research concludes that there is more than speculative evidence of forebrain dopaminergic systems in both pain and analgesia.<sup>14</sup>

Attention and emotion<sup>15</sup> afford us opportunities to cognitively modulate the experience of pain and this directly affects how pain is processed in the brain. According to pain veteran psychologist Phillip Wall: “If the input message comes only from the large A beta fibers as a result of touch, the cell fires briefly and then is turned off. If, however, the input volley comes from tissue damage detection fibers, A delta and C, the cell fires more vigorously and exaggerates the output. During all this time, the brain is sending down control messages to amplify, diminish, or ignore the signal.”<sup>16</sup> Music may have a vital impact on the experience of the brain’s signaling, particularly when the music is active and the patient is participating in its affectual regulation and control of the output.

The following issue of *Music and Medicine* offers some unique contributions to the effects of music on pain assessment, perception, and management. Mark Jude Tramo, Miriam Lense, Caitlin Van Ness, Jerome Kagan, Margaret Doyle Settle, and Jonathan H. Cronin report about their clinical trials and a review of the literature on a topic that is often overlooked; neonates and pain. Procedural pain in premature infants has been neglected for a long time. Potential risks of analgesic drugs prevent large-scale use of pharmaceuticals. This paper shows ways to ameliorate procedural pain and shorten stress responses of the infants markedly.

In a 2-part series on the May 2009 Sichuan Earthquake in China, Jennifer Hsiao-Ying Tiao Shih develops a unique model of stabilization through music therapy application. Indeed, the experience of trauma cannot be overlooked when treating acute stress incurred by natural disaster. The history of earthquakes in China is a long one. It goes back as early as to the year 1290 with as many as 100 000 fatalities and shows a series of devastating events over the course of the centuries to follow

up to the present day. The last big hit occurred in southern Qinghai April 2010 with 2267 fatalities officially counted. In her 2-part article, Shih describes a stabilizing Music Therapy Model and a process offered to victims of last year’s Sichuan earthquake crisis. Trauma therapy after such an outstanding natural catastrophe demands special methods, instruments, and personal sacrifice on the part of personal and professional caregivers. The authenticity of the report and the significance of the concept developed demonstrate the survival value of music in a very special sense.

Gabriella Engström, Lena Marmstål Hammar, Christine Williams, and Eva Götell highlight the importance of the singing voice as a means of communication between caregivers and residents who suffer from dementia. Mood and communicative capacities can both be improved, which provides a significant benefit for a steadily rising community of elderly persons with dementia.

One main methodological problem in conducting psychophysiological trials is that technology used can influence the result of any measurement. This holds true especially for invasive measures such as taking blood samples or running magnetic resonance tomography (MRT) scans. As all vital organ functions in the human body are governed by rhythmic actions of central networks in the autonomous nervous system, it is possible to gain insight into these control mechanisms though noninvasive measures such as Heart Rate Variability.<sup>2</sup> Data can be obtained without touching the participant’s body. László Harmat, Fredrik Ullen, Örjan de Manzano, Erik Olsson, Ulf Elofsson, Bo von Schéele, and Töres Theorell use this technology as part of a multimodal monitoring system comprising the rating of subjective emotional state with physiological response. Professional piano players show a pattern of activation of the autonomous nervous system which seems to differentiate between cognitive demanding musical tasks and effortless attention.

Another aspect of response to music is considered by Göran Krantz, Gunter Kreutz, Mats Ericson, and Töres Theorell. They show that bodily movement can significantly alter psychophysiological response to melodic intervals. Their research provides insight toward musical intervals and their impact on emotions and cognition.

And last Marko Punkanen, Tuomas Eerola, and Jaakko Erkkilä provide a unique study of the relationship between depression and emotion regulation through music representing basic emotional entities such as anger, sadness, or happiness. This research provides rich implications for the use of music in the treatment of depression. From China to Finland, from NICU to dementia, we are pleased to have the opportunity to offer a diversity of topics across settings within several continents.

### Authors’ Note

About IASP: IASP brings together scientists, clinicians, health care providers, and policy-makers to stimulate and support the study of pain and translate that knowledge into improved pain relief worldwide. IASP holds a biennial World Congress on Pain, sponsors grants, symposia, and programs to support pain research, and publishes books

and a scientific journal, *PAIN*. IASP is a nonprofit international organization based in Seattle, USA, and is recognized as an NGO by the World Health Organization (WHO). The International Association for the Study of Pain held their last World Congress 2 months ago in Montreal Canada. The final event of the congress was the International Pain Summit at which the Declaration of Montreal was published.

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