



## **Healing Music Proven by Medical Research**

### Medical, Mathematical and Scientific Proof Illustrates Efficacy of Sacred Healing Music

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At the Memorial Sloan Kettering Cancer Center (MSKCC) in New York City, mantra meditation has been delivered to pediatric patients at the bedside since 2011. These patients suffer from neuroblastoma, the most common extracranial solid cancer in childhood and the most common cancer in infancy. These tumors arise in developing tissues of the sympathetic nervous system and too frequently, have spread (metastasized) to other parts of the body before diagnosis. Today, standard treatment consists of immunotherapy, antibodies engineered to bind and destroy tumors. While this approach has increased survival rates from near 100% fatal to 80% remission, treatments are frequent and painful. These antibodies recognize and attack a molecule that is overexpressed in neuroblastoma, but also prevalent in normal peripheral nerves. As a result, children receive high doses of opioids in an attempt to curtail pain during treatment, for which they return weekly, and indefinitely. The maximum allowed dose of opioids does not spare them from intense pain.

## Mantra Meditation as Medical Intervention

Since meditation has been shown in randomized controlled trials in adults to reduce the feeling of pain, a leading team of researchers was established to study the effects of mantra meditation in this acute clinical setting for young children. Leading the team are doctors Sonia Sequeira, PhD, and Mahiuddin Ahmed, PhD, from Memorial Sloan-Kettering Cancer Center. They hypothesized that this form of meditation may be most effective because it is musical, easy to learn, easy to monitor and beyond language barriers. The meditation program consists of gentle stretching (this was important because children remain in bed for long periods of time), breathing exercises (pranayama), mudra (vayu, middle pillar, walking tattva) and mantra (typically Dr. Joseph Michael Levry's RaMaDaSa Adagio, Guru Ram Das, and I Am recordings, which the children really enjoyed). Most sessions begin 20 min. before antibody therapy, and continue for 30 min. or more as pain starts to peak, lasting for about an hour. Parents and translators for international families invariably join and enjoy the practice. Children as young as 3 years of age were able to complete an 11 min. session of chanting, irrespective of language spoken. The conclusions of this pilot study were that mantra meditation is a feasible clinical intervention in children 3-13 years of age. Moreover, a single session of mantra resulted in a 14% reduction of nurse-administered opioids. This is greatly significant over the course of repeated treatments. These results were published in the Journal of Pediatric Oncology and Hematology.<sup>1</sup>

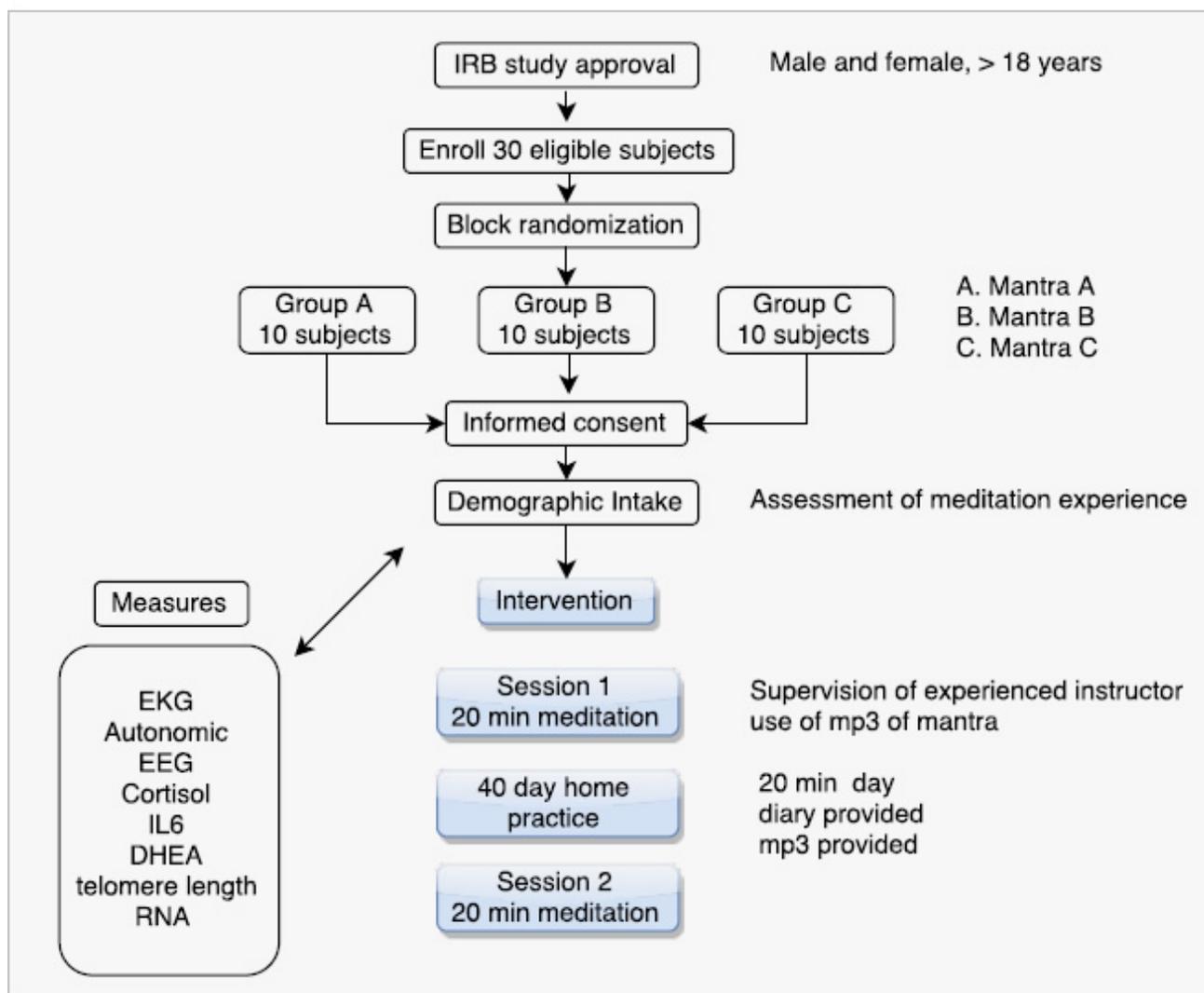
Looking at the future of mantra meditation as medical intervention, and with the support of the department of pediatrics at MSKCC, the investigators are planning a larger study to research the efficacy of mantra in this population. Specifically, we are interested in looking at duration of disease remission and survival using biological measures. Will training of vagal tone help achieve disease remission in SNS tissues? Will sound meditation reduce biological markers that predict poor outcomes and survival? To help answer some of these questions, the investigators recently initiated a pilot study in healthy volunteers to better understand the mechanisms of sound meditation, and hopefully translate the findings to the cancer and pediatric population. We look forward to sharing the full findings at the end of the study.

## The New Medical Frontier

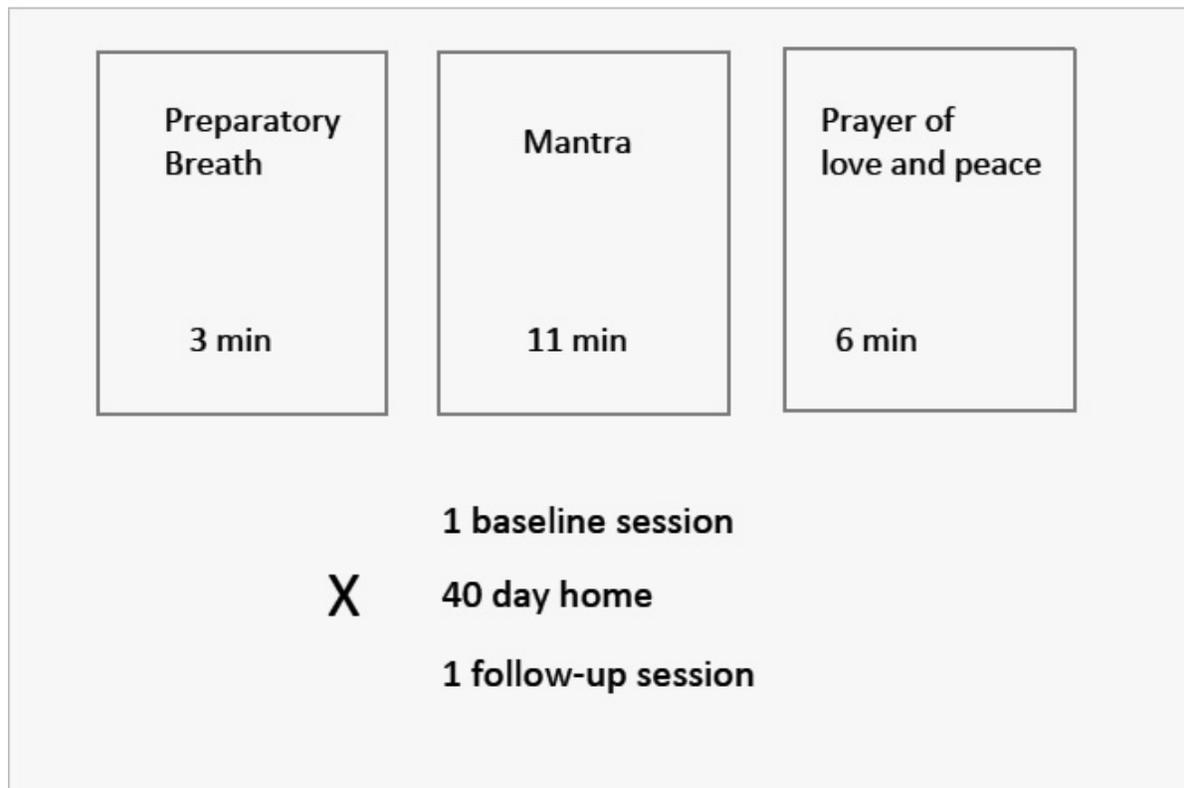
Can the change in breath rate during sound or mantra meditation result in significant improvements in brain performance and innate immunity? To answer this question doctors Sonia Sequeira, PhD, and Mahiuddin Ahmed, PhD, from Memorial Sloan-Kettering Cancer Center have launched a randomized, controlled study of the effects of sound meditation on gene,

brain, heart, immune and autonomic activity. The research team randomly assigning 30 subjects of varied meditation experiences to 3 different mantra designs. To put the practice into perspective, a normal person breathes at a rate of 10-14 breaths/minute; the vagus nerve, which is responsible for replenishing our energetic and immune resources after a stressful event, is activated when breath is reduced to 7-5 breaths/minute and these mantras (Dr. Levry's Sat Nam Wahe Guru, Guru Ram Das and Ra Ma compositions) reduce the breath to 3.5-2 breaths/min. We hypothesize that this significant change in breath rate will not only induce the relaxation response responsible for significant changes in heart, brain and gene expression (Jacobs et al., 1996, Lazar et al, 2000, Benson et al, 1975, Dusek et al, 2008) but cause profound, unique changes to brain connectivity and performance through vagal input with long lasting impact on endocrine and innate immunity. This is to our knowledge, the first study to take an in-depth look at the mechanistic effects of sound meditation.

## ■ Study Design



## ■ Intervention



## ■ Mantra

A. Sat Nam Wahe Guru	2 breaths/min	Gurmukhi
B. Guru Ram Das	3.5 breaths/min	Gurmukhi
C. Ra ma	30 exhales/min	Sanskrit
Normal Breath	10-14 breaths/min	
Vagus activation	5-7 breaths/min	

Thus far, 10 subjects have been enrolled into this study, and had their baseline covariance evaluated (factors that may affect outcomes such as age, meditation experience, health, left-handedness). The investigators compared subjective measures of mindfulness, physical and emotional health, human connectedness, before and after a 40 day intervention. They also measured the subject's ability to solve problems, and make decisions. At start of study, subjects were connected to EEG and EKG systems for real-time measure of brain, heart and autonomic activities for the duration of 20 min, while meditating. Subjects were then asked to practice at home and maintain a diary of their completed assignments. After 40 days, they returned for a final session, recorded by EEG and EKG. Saliva samples were collected at baseline and follow-up, for RNA, DNA and immune modulator analysis. The data is still being processed, however, we are already able to observe interesting trends. Those subjects that have a long-standing practice of meditation, scored highest in mindfulness and problem-solving measures compared to novices. They also had the highest vagal tone at baseline suggesting that they acquired resilience over the years with long-lasting effects. This also suggests heart dominance over brain processing. Brain activities in the different bands are remarkably synchronized during mantra meditation, and we are able to see very different signatures during pranayama, mantra and prayer. Next, this data will be compared with novice practitioners, and the differences in novices before and after a single session of sound meditation will be observed, as well as before and after 40 days of practice. This will reveal how sound meditation builds physical and emotional health after a 20 min/day, 40 day practice. Brain and heart activity will be correlated to significant immune molecules, specifically those molecules that are impaired in chronic disease such as cancer and cardiovascular risk. The research team will use these measures in their pediatric project at MSKCC. This project has generated interest in the Pediatric Pain and Palliative Care Unit and the adult Integrative Medicine department, which have invited the team to collaborate in other populations.

In the summer of 2015 the meditation research team was invited to teach sound meditation to the pediatric nursing staff at one of their wellness meetings. It was so well received that a monthly morning meditation program was immediately implemented. Based on this program, there will be a study to investigate the effects of sound meditation on nurse burnout and quality of life. Fundamental to the overarching goal of providing the best platform for recovery and healing to patients, there are now plans to study the effects of this practice on pediatric surgeon burnout, quality of life and patient trust in physician measures.

## Establishing the Institute for Meditation Sciences: Creating a healthier future through medical research on the effects of mantra meditation practices in clinical settings

To provide an entity and framework to these research programs, the Institute for Meditation Sciences was formed as a 501c3 not for profit organization. To fulfill an unmet need in the scientific community, the Advances in Meditation Research Conference Series was created in 2013, inclusive of different meditation traditions. In September 2015, we received 20 speakers from the US, Canada and India, 155 participants from 5 continents at Memorial Sloan Kettering. The conference has become known for its scientific rigor and open-minded approach to ancient teachings. 20 papers are being written for publication in the Annals of the New York Academy of Sciences that report findings that impact our understanding of aging, pain, social well-being and predictors of disease.

### References

1. Ahmed M, Modak S, Sequeira S, 'Acute pain relief after Mantram meditation in children with neuroblastoma undergoing anti-GD2 monoclonal antibody therapy,' J Pediatr Hematol Oncol. 2014 Mar;36(2):152-5.

<http://www.ncbi.nlm.nih.gov/pubmed/24065045>