

SciencefortheYogaTherapist

The Science of Mantra

By Julie K. Staples

Mantra has been a principal aspect of many spiritual traditions for thousands of years and is widely practiced today. A study based on the 2012 National Health Interview found that 2.6% of the U.S. population—nearly 6 million people—practiced mantra meditation in their lifetime.¹

In *The Yoga Tradition*, Georg Feuerstein defines mantra as follows:

“A mantra is sacred utterance, numinous sound, or sound that is charged with psychospiritual power. A mantra is a sound that empowers the mind, or that is empowered by the mind.”

Research studies on mantra have provided insight into how mantra may work to “empower the mind” and benefit physical and mental health.

Mantra is thought to have its effects through the vibrations of the sounds. One way this may happen is by stimulating the meridian points on the roof of the mouth. Yogi Bhanan, who introduced Kundalini Yoga in the West, taught that there are 84 meridian points located on the hard palate of the roof of the mouth. Thirty-two pairs of points are located along the inside of the teeth, and 20 more points are located in a U shape on the central part of the palate. He explained that as we chant mantras the movement of the tongue stimulates these meridian points and directly affects the hypothalamus.² Meridian points on the roof of the mouth are also recognized in Chinese medicine.

Research has not yet been done on the stimulation of these points using mantra. However, studies have demonstrated the effects of mantra on the cardiovascular system, the brain, and factors that control gene expression. Mantra recitation has been shown to have beneficial effects for posttraumatic stress disorder (PTSD), depression, insomnia, and cognition. Mantra also decreases stress and anxiety, improves mood, and enhances spiritual connectedness. This research is reviewed below.

Mantra's Effects

Breath Rate

A study published nearly 20 years ago in the *British Medical Journal* compared the effects on respiratory and cardiovascular rhythms when participants recited either the mantra “om-mani-padme-om” or the Ave Maria (Hail Mary) in Latin.³ Reciting either slowed respiration to 6 breaths/minute. Electrocardiogram, blood pressure, and brain circulation measurements from the people chanting the mantra or reciting the Ave Maria looked the same. These outputs were very different than those from spontaneous breathing. The authors concluded that mantras may have beneficial effects on the cardiovascular rhythms simply because they slow the breath down.

To investigate whether the effects of mantra were due to slower breathing alone, Bernardi et al.⁴ performed another study examining differences in cardiorespiratory functions during a meditation using a silent mantra compared to slow breathing. One of the measures in

this study was chemoreflex sensitivity. (Chemoreceptors in the brain are responsible for triggering breathing via the chemoreflex response. When this response is too sensitive, shortness of breath and difficulty with exercise result, as is often seen in patients with chronic heart disease.) The results of this study showed decreases in chemoreflex sensitivity during the mantra meditation and strongly suggest that this benefit was due to the mantra meditation rather than slow breathing alone. In addition, participants with a long-term mantra meditation practice experienced other benefits including lower blood pressure, slower baseline breathing, and higher brain oxygen saturation. This research demonstrates that mantra has physiological benefits beyond just slowing the breath. But what do we know about its vibrational effects?

Mantra may work on a variety of levels including physical, cognitive, emotional, and spiritual.

Does Meaning Matter?

One study looked at the effects of chanting a real mantra compared to a “fake” mantra on the balance of the three *gunas*, the forces or qualities of nature: *sattva* (enlightenment), *rajas* (passion) and *tamas* (inertia).⁵ They also measured stress and depression. The “real” mantra was the *maha* mantra: “Hare krishna hare krishna krishna krishna hare hare. Hare rama hare rama rama hare hare.” The “fake,” or alternate, mantra was made up by the researcher and consisted of a theoretically meaningless combination of Sanskrit syllables having the same syllabic pattern: “Sarva dasa sarva dasa dasa dasa sarva sarva. Sarva jana sarva jana jana jana sarva sarva.” Participants were given japa beads and instructed to chant 3 x 108 rounds of the meditation daily (about 20–25 minutes of meditation total) for 4 weeks. To measure the balance of the three *gunas*, the researchers developed a Vedic Personality Inventory (VPI).⁶ The lead investigator generated 150 statements for each *guna*. These statements were designed so that someone dominated by that *guna* would be likely to agree with the statement. With the help of Vedic experts, these statements were narrowed to 30 for each *guna*. The final VPI had good internal consistency (a measure of reliability). There was also “encouraging evidence” for construct validity because there were correlations between individual *gunas* and standardized questionnaires expected to reflect the characteristics of the *gunas*. The VPI was administered following the 4-week meditation practice.

Those practicing the *maha* mantra had significantly higher scores for *sattva* and lower scores for *tamas* compared to those chanting the alternate (i.e., fake) mantra. *Rajas* scores were not significantly different between the groups. The researchers conjectured that because *rajas* may be considered an intermediate mode between *tamas* and *sattva*, some *tamas* transformed into *rajas* and some *rajas* transformed into *sattva*, resulting in a decrease in *tamas* and an increase in *sattva* while leaving level of *rajas* unchanged overall. It is difficult to accurately measure change in qualities as subtle as the *gunas* because the measurement is only as valid as the VPI;

however, the VPI has been tested for reliability and validity. Based on this assessment, the data suggested that the real mantra resulted in a more sattvic state than an alternate mantra. Depression and stress were also significantly reduced in the group that chanted the maha mantra compared to those that chanted the alternate mantra. Overall, the results of this study support the idea that the sound vibration and/or meaning of the mantra may be responsible for its effects given that the mantra that was made up by the researchers did not change the state of the gunas nor reduce stress or depression.

To test the theory that the sound of Sanskrit contains the meaning and has specific physiological effects, another study used verses of the Bhagavad Gita.⁷ Participants knew how to pronounce words in Sanskrit, German, Spanish, and French, but did not know the meaning of these words. They read the same verses from the Bhagavad Gita first in Sanskrit and then in one of the other three languages. Skin conductance was measured as a marker of stress, and brainwave function was measured using an electroencephalogram (EEG). The results showed that skin conductance decreased significantly when reading the verses in Sanskrit as compared to reading in the other languages, indicating a reduced stress response with the Sanskrit reading. Brain wave function showed increased alpha activ-



ity (associated with relaxation and the lack of cognitive processing) during the Sanskrit reading compared to reading the verses in other languages. As in the above study with the fake mantra, these results support the importance of the sound vibration of the mantra.

One other study used functional magnetic resonance imaging (fMRI) to measure brain changes during two mantra meditations—from Acem and Kundalini traditions—and the recitation of a neutral phrase (“tables and chairs”) in moderately experienced meditators.⁸ The same parts of the brain were activated in the meditators with either mantra meditation, but different areas were activated while reciting “tables and chairs.” The areas of the brain activated during the mantras have a role in the awareness of body sensations, whereas areas activated during the word recitation are associated with language function. Therefore, we might conclude that reciting

mantra brings the brain to a more “aware” state compared to repeating a routine phrase.

Specific Benefits

Mantra has been studied in various populations including military veterans. Many studies have been published on the use of a group-based mantra repetition program (MRP) in the Veterans Administration (VA) Healthcare System. The MRP allows participants to choose their own mantra, preferably one from a spiritual tradition. When MRP was included with usual treatment for PTSD, veterans experienced significant improvement in PTSD hyperarousal symptoms, depression, mental health status, and spiritual well-being compared to usual treatment alone.⁹ Veterans participating in the MRP also had significant improvements in insomnia.¹⁰ The MRP helped VA staff as well. Staff members reported a significant reduction in burnout-related exhaustion and troubled consciences about stressful events.¹¹

A study with healthy individuals at Duke University found that a 4-week daily practice of a mantra meditation resulted in significantly decreased stress, anxiety, and symptoms of psychological distress while improving mood.¹² Mantra research has also been done with individuals experiencing cognitive decline and family caregivers of relatives with dementia. These studies examined the effects of Kirtan Kriya, a mantra-based Kundalini meditation. *Kirtan Kriya* includes recitation of a mantra, dynamic repetitive *mudras* (i.e., touching the thumb to each of the fingers), and a visualization. After practicing Kirtan Kriya for 8 weeks, family caregivers of relatives with dementia had significantly decreased depression symptoms and improved mental health and cognitive functioning compared to those listening to relaxing music.¹³

Another study found effects of Kirtan Kriya at the level of gene expression. Family caregivers of relatives with dementia practicing Kirtan Kriya versus listening to relaxing music had decreased activity of factors that control proinflammatory gene expression and increased activity of factors that control gene expression related to antiviral function.¹⁴ These results suggest that the practice of this mantra-based meditation results in healthier immune function. To assess the effects of cognitive function in individuals with subjective cognitive decline, Kirtan Kriya was compared to a standard memory-enhancement training program. Significant improvement in memory was seen with both interventions, but only Kirtan Kriya showed significant improvement in executive function (mental processes for the control of behavior).¹⁵ Therefore, a mantra-based meditation may be at least as effective as standard treatment for cognitive decline.

Mechanisms of Mantra



Mantra may work on a variety of levels including physical, cognitive, emotional, and spiritual.¹⁶ Physically, brain changes have been measured during mantra recitation. Combined data from eight fMRI studies showed that mantra activates the regions of the brain responsible for generating and staying focused on a phrase.¹⁷ These regions include the motor control network and the pre-motor and supplementary motor cortices,

as well as the putamen. Mantra also activates an area related to speech, while areas involved in the processing and comprehension of sounds and language are deactivated. This deactivation is consistent with the idea that mantra is a tool for focusing attention but that the meaning does not have to be understood in order to have an effect, as illustrated in the study above with the Bhagavad Gita.

Cognitively, mantra can interrupt negative, anxious, or irrational thoughts. Adults with HIV who participated in the MRP described above reported significant increases in a positive reappraisal coping mechanism related to living with HIV while those who were not in the mantra group (the control group) reported decreases in positive reappraisal.¹⁸ In addition, increased positive reappraisal significantly accounted for (i.e., mediated) decreased anger.

Emotionally, mantra may work by the associative network theory based on the idea that words generate either positive or negative feelings. When mantra is paired with calm and peacefulness it becomes associated with positive memories that are more easily accessed when the mantra is repeated during stressful moments.¹⁶

Mantra may also connect us to our inner spiritual resources. HIV-positive participants of a mantra program reported significantly increased spiritual faith and connectedness, which is positively associated with quality of life and can be a valuable coping resource.¹⁹

The above studies demonstrate ways Western science has begun shedding its own light on what has likely been a core component of spiritual practice from humankind's earliest origins. Research supports the idea that mantra may have benefits through the sound vibration and meaning of the words and plays a role in improving cognitive function, depression, PTSD symptoms, cognitive function, mood, and spiritual well-being. As our understanding of this powerful modality deepens and grows, we may well find additional clinical applications—further ways in which this ancient practice can strengthen and heal the human body and mind. **YTT**

References

1. Burke, A., Lam, C. N., Stussman, B., & Yang, H. (2017). Prevalence and patterns of use of mantra, mindfulness and spiritual meditation among adults in the United States. *BMC Complementary and Alternative Medicine*, 17(1), 316–1827.
2. Bhajan, Y. (2003). Sound & mantra. In G. R. K. Khalsa, G. S. Khalsa, S. P. K. Khalsa, J. Ricker, & G. S. Khalsa (Eds.), *The Aquarian Teacher* (pp. 65–87). Santa Cruz, NM: Kundalini Research Institute.

3. Bernardi, L., Sleight, P., Bandinelli, G., Cencetti, S., Fattorini, L., Wdowczyk-Szulc, J., Lagi, A. (2001). Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: comparative study. *The BMJ*, 323(7327), 1446–1449.
4. Bernardi, N. F., Bordino, M., Bianchi, L., & Bernardi, L. (2017). Acute fall and long-term rise in oxygen saturation in response to meditation. *Psychophysiology*, 54(12), 1951–1966.
5. Wolf, D. B., & Abell, N. (2003). Examining the effects of meditation techniques on psychosocial functioning. *Research on Social Work Practice*, 13(1), 27–42.
6. Wolf, D. B. (1999). A psychometric analysis of the three gunas. *Psychological Reports*, 84, 1379–1390.
7. Travis, F., Olson, T., Egenes, T., & Gupta, H. K. (2001). Physiological patterns during practice of the Transcendental Meditation technique compared with patterns while reading Sanskrit and a modern language. *The International Journal of Neuroscience*, 109, 71–80.
8. Engstrom, M., Pihlgard, J., Lundberg, P., & Soderfeldt, B. (2010). Functional magnetic resonance imaging of hippocampal activation during silent mantra meditation. *Journal of Alternative and Complementary Medicine*, 16(12), 1253–1258.
9. Bormann, J. E., Thorp, S. R., Wetherell, J. L., Golshan, S., & Jang, A. (2013). Meditation-based mantram intervention for veterans with posttraumatic stress disorder: A randomized trial. *Psychological Trauma*, 21(5), 259–267.
10. Beck, D., Cosco, H. L., Burkard, J., Andrews, T., Liu, L., Heppner, P., Bormann, J. E. (2017). Efficacy of the mantram repetition program for insomnia in Veterans with posttraumatic stress disorder: A naturalistic study. *Advances in Nursing Science*, 40(2), E1–E12.
11. Leary, S., Weingart, K., Topp, R., & Bormann, J. (2017). The effect of mantram repetition on burnout and stress among VA staff. *Workplace Health and Safety*, May 1:2165079917697215. doi: 10.1177/2165079917697215. [Epub ahead of print]
12. Lane, J. D., Seskevich, J. E., & Pieper, C. F. (2007). Brief meditation training can improve perceived stress and negative mood. *Alternative Therapies in Health and Medicine*, 13(1), 38–44.
13. Lavretsky, H., Epel, E. S., Siddarth, P., Nazarian, N., Cyr, N. S., Khalsa, D. S., ... Irwin, M. R. (2012). A pilot study of yogic meditation for family dementia caregivers with depressive symptoms: effects on mental health, cognition, and telomerase activity. *International Journal of Geriatric Psychiatry*, 28(1), 57–65.
14. Black, D. S., Cole, S. W., Irwin, M. R., Breen, E., St Cyr, N. M., Nazarian, N., ... Lavresky, H. (2013). Yogic meditation reverses NF-κB and IRF-related transcriptome dynamics in leukocytes of family dementia caregivers in a randomized controlled trial. *Psychoneuroendocrinology*, 38(3), 348–355.
15. Eyre, H. A., Siddarth, P., Acevedo, B., Van, D. K., Paholpak, P., Ercoli, L., ... Lavretsky, H. (2017). A randomized controlled trial of Kundalini yoga in mild cognitive impairment. *International Psychogeriatrics*, 29(4), 557–567.
16. Bormann, J. E. (2010). Mantram repetition: A “portable contemplative practice” for modern times. In T. G. Plante (Ed.), *Contemplative Practices in Action* (pp. 78–100). Santa Barbara: Praeger.
17. Fox, K. C., Dixon, M. L., Nijeboer, S., Girm, M., Floman, J. L., Lifshitz, M., ... Christoff, K. (2016). Functional neuroanatomy of meditation: A review and meta-analysis of 78 functional neuroimaging investigations. *Neuroscience and Biobehavioral Reviews*, 65, 208–228.
18. Bormann, J. E., & Carrico, A. W. (2009). Increases in positive reappraisal coping during a group-based mantram intervention mediate sustained reductions in anger in HIV-positive persons. *International Journal Behavioral Medicine*, 16(1), 74–80.
19. Bormann, J. E., Gifford, A. L., Shively, M., Smith, T. L., Redwine, L., Kelly, A., ... Belding, W. (2006). Effects of spiritual mantram repetition on HIV outcomes: a randomized controlled trial. *Journal of Behavioral Medicine*, 29(4), 359–376.



Julie K. Staples, PhD, is the Research Director at the Center for Mind-Body Medicine and adjunct assistant professor at Georgetown University. She teaches online courses for yoga therapists and yoga teachers on the science of yoga (www.awarenesstechnologies.net). She is author of Reclaiming Life After Trauma, which teaches Kundalini Yoga and cognitive behavioral therapy tools to heal PTSD.