YOGA STUDIES
Modulating the Stress Response

HPA axis
Modulating the Stress Response
HPG axis and Immune system
Modulation of the Neuro-endocrine-immune axis
“Specific components of yoga may affect cognitive, emotional, behavioral, and autonomic output under stress through an emphasis on interoception, resulting in physical and psychological health…facilitates bi-directional feedback and integration between brain networks and input from somatosensory, viscero-sensory and chemosensory (interoceptive processes)…optimizes self-regulation”
Mechanisms—How Yoga Works

- **Endocrine system**: strongest evidence shows yoga has a positive impact on hormone regulation. Lower cortisol, enhanced serotonin production, higher melatonin, oxytocin released (visualization)
- **Nervous system**: reduced sympathetic activation, increased levels of GABA, improved HPA axis regulation
- **Physical health**: reduces falls in elderly, lower resting heart rate, decreased BMI, lower oxygen consumption rate
- **Metabolism**: improved glucose tolerance and insulin sensitivity, improved uptake of triglycerides into cells
- **Circulatory**: lowering blood pressure, improving arterial function, increasing blood flow with the prompting of visual techniques
- **Behavioral/Social**: effective for binge eating, enhances sleep quality, reduces social isolation, healthier responses to stress
- **Antioxidant**: increase level of total antioxidant status
- **Inflammation**: decreases inflammation (IL-6, IL-2, CRP)
- **Psychology and cognition**: increases self-confidence and self-control, increased well-being

McCall, Marcy 2013
Here we have shown, to our knowledge for the first time, that there are rapid (within 2 hours of start of practice) and significant gene expression changes in PBMCs of practitioners during a comprehensive yoga program. These data suggest that previously reported effects of yoga practices have an integral physiological component at the molecular level which is initiated immediately during practice and may form the basis for the long term stable effects.

The fact that there were a larger number of genes (approximately 3-fold) which were affected by SK&P compared with the control regimen was consistent with our hypothesis that yoga has specific effects on gene expression in PBMCs. Surprisingly, whereas 97 unique genes were affected by SK&P, only 24 unique genes were affected by the control regimen.

A yoga program may have additional effects over exercise plus simple relaxation in inducing health benefits through differential effects at the molecular level.
Clinical Research

- **Psychological**: reduced stress, anxiety and depression, improved sleep
- Pain syndromes: low back pain, headache, osteoarthritis, rheumatoid arthritis
- **Cardiovascular**: coronary artery disease-reduced angina, less procedures, more disease regression; lowers mild to moderate blood pressure
- **Autoimmune conditions**: helps with asthma-less med usage, improved PEFR, less symptoms; diabetes, MS-improved fatigue
- **Immune conditions**: lymphoma-less sleep disturbance; breast cancer-less anxiety, fatigue, pain
- **Pregnancy**: less complications, reduced stress, higher levels of maternal comfort during and after labor, less labor pain, shorter total time spent in labor

Field, Tiffany 2011
Randomized, Controlled Trial of Yoga in Women With Breast Cancer Undergoing Radiotherapy

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See accompanying article on page 1040

ABSTRACT

Purpose
Previous research incorporating yoga (YG) into radiotherapy (XRT) for women with breast cancer finds improved quality of life (QOL). However, shortcomings in this research limit the findings.

Patients and Methods
Patients with stages 0 to III breast cancer were recruited before starting XRT and were randomly assigned to YG (n = 53) or stretching (ST; n = 56) three times a week for 6 weeks during XRT or waitlist (WL; n = 54) control. Self-report measures of QOL (Medical Outcomes Study 36-item short-form survey; primary outcomes), fatigue, depression, and sleep quality, and five saliva samples per day for 3 consecutive days were collected at baseline, end of treatment, and 1, 3, and 6 months later.

Results
The YG group had significantly greater increases in physical component scale scores compared with the WL group at 1 and 3 months after XRT (P = .01 and P = .01). At 1, 3, and 6 months, the YG group had greater increases in physical functioning compared with both ST and WL groups (P < .05), with ST and WL differences at only 3 months (P < .02). The group differences were similar for general health reports. By the end of XRT, the YG and ST groups also had a reduction in fatigue (P < .05). There were no group differences for mental health and sleep quality. Cortisol slope was steepest for the YG group compared with the ST and WL groups at the end (P = .023 and P = .008) and 1 month after XRT (P = .05 and P = .04).

Conclusion
YG improved QOL and physiological changes associated with XRT beyond the benefits of simple ST exercises, and these benefits appear to have long-term durability.

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Yoga’s Impact on Inflammation, Mood, and Fatigue in Breast Cancer Survivors: A Randomized Controlled Trial

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See accompanying article on page 1059

ABSTRACT

Purpose
To evaluate yoga’s impact on inflammation, mood, and fatigue.

Patients and Methods
A randomized controlled 3-month trial was conducted with two post-treatment assessments of 200 breast cancer survivors assigned to either 12 weeks of 90-minute twice per week hatha yoga classes or a wait-list control. The main outcome measures were lipopolysaccharide-stimulated production of proinflammatory cytokines interleukin-6 (IL-6), tumor necrosis factor alpha (TNF-α), and interleukin-1β (IL-1β), and scores on the Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF), the vitality scale from the Medical Outcomes Study 36-Item Short Form (SF-36), and the Center for Epidemiological Studies-Depression (CES-D) scale.

Results
Immediately post-treatment, fatigue was not lower \( P > .05 \) but vitality was higher \( P = .01 \) in the yoga group compared with the control group. At 3 months post-treatment, fatigue was lower in the yoga group \( P = .002 \), vitality was higher \( P = .01 \), and IL-6 \( P = .027 \), TNF-α \( P = .027 \), and IL-1β \( P = .037 \) were lower for yoga participants compared with the control group. Groups did not differ on depression at either time \( P > .2 \). Planned secondary analyses showed that the frequency of yoga practice had stronger associations with fatigue at both post-treatment visits \( P = .019 \), \( P < .001 \), as well as vitality \( P = .018 \), \( P = .0045 \), but not depression \( P > .05 \) than simple group assignment; more frequent practice produced larger changes. At 3 months post-treatment, increasing yoga practice also led to a decrease in IL-6 \( P = .01 \) and IL-1β \( P = .03 \) production but not in TNF-α production \( P > .05 \).

Conclusion
Chronic inflammation may fuel declines in physical function leading to frailty and disability. If yoga dampens or limits both fatigue and inflammation, then regular practice could have substantial health benefits.

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PRANAYAMA

Diaphragmatic breathing

Slow down
Most people take 13-20 breaths per minute. Try to take 8 or fewer. Relax the pace of your respiration.

Breathe deeply
Fully expand and contract your belly as you inhale and exhale. This allows over 10x the normal amount of air to enter your lungs.

Inhale
- through the nose
- chest expands
- diaphragm contracts
- belly expands

Exhale
- through the nose
- chest relaxes
- diaphragm relaxes
- belly contracts

Normal shallow breathing - only takes in about 350mL

Diaphragmatic breathing takes in the 10x amount of air

Graphical representation of respiratory volumes (IRV, VC, TV, IRV, ERV, RV, FRC, TV, FRC)
Pranayama: The power of breath  Singh, et al.  


MRI studies show that inspiration against gentle resistance (ujjayi) activates vagal efferents that affect parts of the brain associated with release of neurotransmitters (locus coeruleus and parabrachial nucleus).
WEBSITES

www.choprafoundation.org
www.isharonline.org