Clinical Yoga

Cognition Contemplation Meditation

Philip Stevens (Swami Samnyasananda) *BSc (Psych, Physiol); BSc (Hons) (Physiol); FWSCY; MWSCY*

Consultant Neurophysiologist currently teaching and tutoring at Monash Medical School (Dept of General Practice) while exploring research looking at the neurophysiological and neurohormonal effects of meditation techniques, pranayamas, and yoga breathing techniques for less stress and better sleep.

Harvard Medical

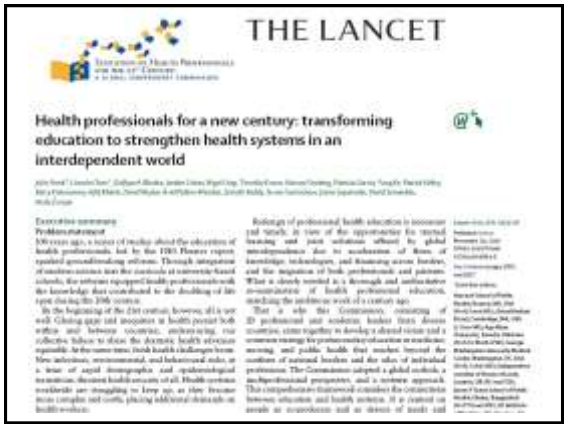
This presentation is based on research in undergraduate science degrees in Psychology and Physiology completed at the University of Adelaide and Flinders University under Professor David Kennaway (Uni of Adelaide) and Prof Leon Lack (Flinders Uni).

And Post-Graduate, research-based Honours-Degree in Physiology through the University of Adelaide, completed at The Centre For Sleep Research at The Queen Elizabeth Hospital in South Australia under Professor Drew Dawson from the University of South Australia.

PhD research under Prof Avni Sali through the Graduate School of Integrative Medicine at Swinburne University. PhD research at RMIT University under Prof Marc Cohen in the Dept of Complementary Medicine, School of Health Sciences.

Plus Post Graduate Clinical Training in Mind-Body Medicine, Harvard Medical School.

For updates on Clinical Yoga
www.yogalinks.net/signup.html



THE LANCET

Health professionals for a new century: transforming education to strengthen health systems in an interdependent world

INNOVATIONS IN INTEGRATIVE HEALTH CARE EDUCATION

THE HEALTH ENHANCEMENT PROGRAM AT MONASH UNIVERSITY MEDICAL SCHOOL

Craig Hassed, MD, Victor S. Sierpina, MD, and Mary Jo Kreitzer, RN, PhD

Clinical Yoga

Application of evidence-based, client-specific yoga-practices in a clinical or therapeutic setting.

Using medical knowledge in:
Anatomy, physiology, neurophysiology, chronobiology & human circadian-rhythms, neurocardiology & psycho-neuro-immunology to evaluate and safely apply clinically appropriate yoga practices such as asana, breathing and meditation techniques as well as lifestyle interventions for less stress, better sleep, improved health and greater well-being.

Clinical Yoga at Monash Medical School is an integrated unit incorporating theory & practice in an interactive, experiential style. Students explore techniques that assist them personally and professionally in clinical practice.

MONASH University
Medicine, Nursing and Health Sciences

Clinical Yoga Research

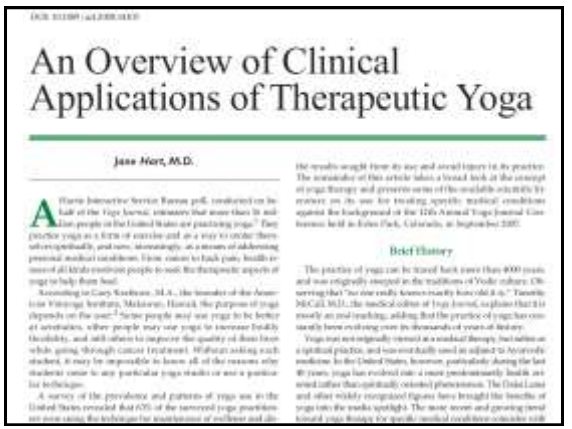
Aim: To explore peer-reviewed, evidence-based applications of yoga in clinical practice, using various techniques: asana, bodywork, breathing-based interventions and various meditation techniques suitable for dealing with stress, sleep, cancer and other illnesses presenting in clinical practice.

Objectives: To understand the principles of evidence-based yoga and explore its benefits in personal professional applications and in clinical settings.

To consider and evaluate evidence regarding principles and practice of yoga in relation to effects in physiology and psychology that are meaningful and clinically effective. To provide a basis in Clinical Yoga, encouraging further study in clinical applications of evidence-based yoga techniques in medicine.

Monash now offers a BMed Sci (Clinical Yoga)

MONASH University
Medicine, Nursing and Health Sciences



An Overview of Clinical Applications of Therapeutic Yoga

Jane Hurt, M.D.

Original Articles

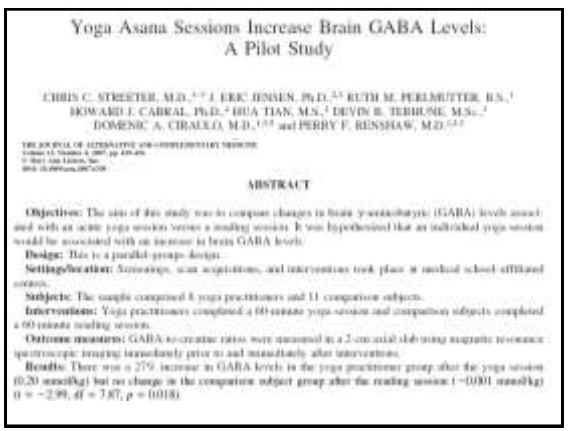
The Health Benefits of Yoga and Exercise: A Review of Comparison Studies

Alyson Ross, M.S.N., R.N.; and Sue Thomas, F.A.A.N., Ph.D., R.N.

Abstract

Beneficial Effects of Yoga Lifestyle on Reversibility of Ischaemic Heart Disease : Caring Heart Project of International Board of Yoga

Abstract



Yoga Asana Sessions Increase Brain GABA Levels: A Pilot Study

ABSTRACT

Asian Journal of Psychiatry

Review

Yoga in the treatment of mood and anxiety disorders: A review

Changes in EEG and autonomic nervous activity during meditation and their association with personality traits

To join a professional mailing list for Clinical Yoga updates go to www.yogalinks.net/signup.html

The neural basis of the complex mental task of meditation: neurotransmitter and neurochemical considerations

A. B. Newberg,[1] J. Iversen[2]

Summary Meditation is a complex mental process involving changes in cognition, sensory perception, affect, hormones, and autonomic activity. Meditation has also become widely used in psychological and medical practices for stress management as well as a variety of physical and mental disorders. However, until now, there has been limited understanding of the overall biological mechanism of these practices in terms of the effects in both the brain and body. We have previously described a rudimentary neuropsychological model to explain the brain mechanisms underlying meditative experiences. This paper provides a substantial development by integrating neurotransmitter systems and the results of recent brain imaging advances into the model. The following is a review and synthesis of the current literature regarding the various neurophysiological mechanisms and neurochemical substrates that underlie the complex processes of meditation. It is hoped that this model will provide hypotheses for future biological and clinical studies of meditation.

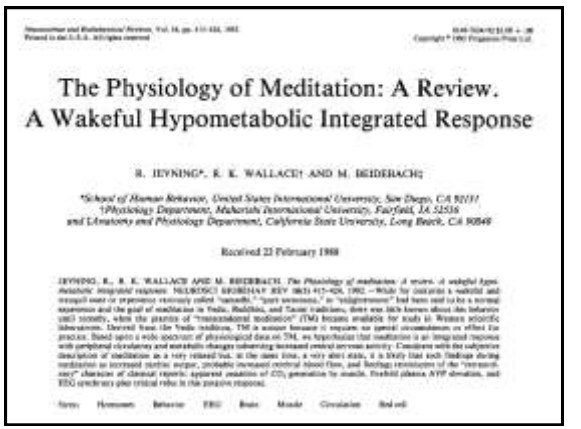
New Beginnings: Evidence That the Meditational Regimen Can Lead to Optimization of Perception, Attention, Cognition, and Other Functions

William C. Bushell

Anthropology Program, Massachusetts Institute of Technology, Cambridge, Massachusetts, USA

A "framework" is presented for understanding empirically confirmed and unconfirmed phenomena in the Indo-Tibetan meditation system, from an integrative perspective, and providing evidence that certain meditative practices enable meditators to realize the innate human potential to perceive light "at the limits imposed by quantum mechanics," on the level of individual photons. This is part of a larger Buddhist agenda to meditatively develop perceptual/attentional capacities to achieve penetrating insight into the nature of phenomena. Such capacities may also allow advanced meditators to perceive changes in natural scenes that are "hidden" from persons with "normal" attentional capacities, according to research on "change blindness," and to enhance their visual system functioning akin to high-speed and time-lapse photography, in turn allowing for the perception, as well as sophisticated understanding, of the "moment to moment change or impermanence" universally characteristic of the phenomenal world but normally outside untrained attention and perception according to Buddhist doctrine.

Key words: Indo-Tibetan meditation system; perception; cognition



The Physiology of Meditation: A Review. A Wakeful Hypometabolic Integrated Response

R. JEVNING*, R. K. WALLACE† AND M. BEIDEBACH‡

Received 22 February 1988

NeuroImage

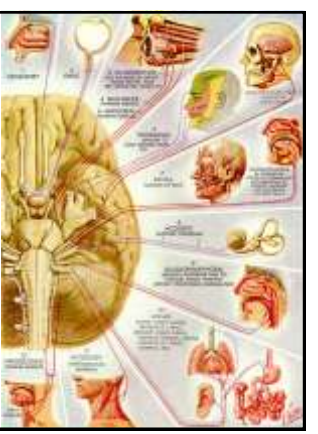
The underlying anatomical correlates of long-term meditation: Larger hippocampal and frontal volumes of gray matter

Eileen Luders[a], Arthur W. Toga[a,b], Natasha Lepore[a], Christian Gaser[c]

Pathways to control

In yoga, there are many direct pathways to the brain using various pranayamas, breathing, meditation, relaxation and lifestyle techniques.

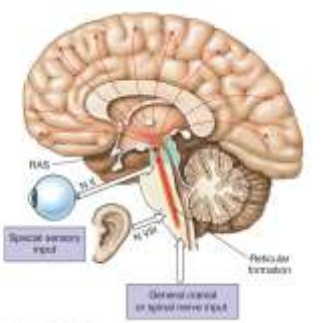
We can slow the heart rate and reduce blood pressure using conscious control of certain aspects of normally unconscious physiological processes.



Waking Consciousness

The Reticular Activating System is network of neurons extending from medulla to the Mesencephalon.

Its primary importance is maintaining alertness and attentiveness, but it can become over activated through stress and disrupted sleeping patterns over time.



(From http://www.iupucanatomy.com/images/Picture%201215.jpg)

Unconscious patterns of behaviour

Without awareness, we are simple, automatic machines.

Most people breathe, act, live and sleep in unconscious patterns learned from birth or from early childhood.

Yogic lifestyle requires an awareness of one's self, one's physiology and how it is affected by the environment.

Meditation is a state of mind.

Cognition Contemplation Meditation

Concentration requires cognition – a left brain activity.

Contemplation involves stillness & silence – right brain activity.

Methods of contemplation involve a principle, a word or phrase on which to reflect, but give no clues of the insights to come.

In yogic psychology there are four functions of mind:

- Manas — Lower mind
- Buddhi — Higher mind
- Chitta — Mind stuff
- Ahamkara — Ego, identity

Plus Chit – consciousness.

Meditation is an altered state of consciousness.

(from http://www.ucmas.ca/page/Left_Vs_Right_Brain)

Meditation

Meditation is an English word for practices that bring awareness to the inner world instead of always being extroverted. This can lead to a transcendence of normal awareness along with reducing many stresses in life.

Meditation is an integral part of yoga, with different approaches and different techniques.

Without a meditation component, many popular practices often called yoga in the West are simply just exercise.

Meditation, in its simplest and most general definition, is ***"a mental discipline involving attention regulation."***

There are both **concentrative** and **contemplative** methods of meditation known in yoga as **Dharana** and **Dhyan**.

Meditation can also be classified according to the *process used* or the intended *outcome*.

Process

Meditation can involve sensory processes such as sounds, visual images, touch, tactile or proprioceptive inputs, taste, smell or the flow of the breath, observing the body, use of a mantra, awareness of thought or prayer, a visualisation or mental image, a sense of being, walking or stillness.

Meditation develops cognitive and physiological changes in concentration, relaxation, non-attachment to experiences, stillness of mind and an attitude of inner acceptance.

Meditation practice can lead to altered states of awareness.

Meditation can also be classified according to the *process used* or the intended *outcome*.

Outcomes

Meditation can be seen an outcome such as a meditative state or trait, an undistracted awareness, a feeling of oneness, certain cognitive changes, therapeutic effects, transcendence of thought, spiritual and personal insight.

Meditation techniques can be identified by the process involved or by the measures of behavioural, physiological and psychological outcomes such as, neurophysiological, hormonal, biochemical, immunological or neurological.

Meditation practice can lead to a state of Meditation.

Meditation States and Traits: EEG, ERP, and Neuroimaging Studies

B. Rael Cahn
University of California, San Diego, and University of Zurich Hospital of Psychiatry

John Polich
The Scripps Research Institute

Biological Psychology

Review

The neurobiology of Meditation and its clinical effectiveness in psychiatric disorders

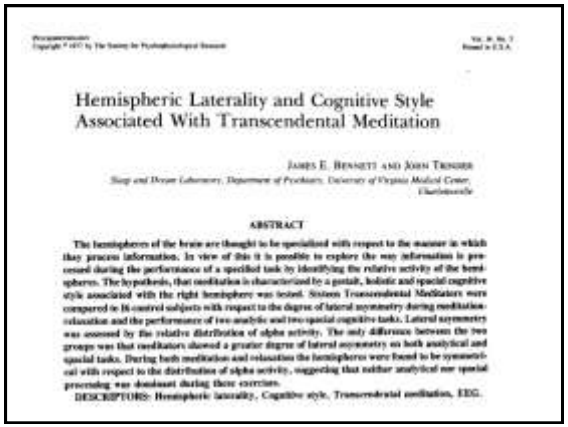
Katya Rubia

COGNITIVE BRAIN RESEARCH

Research report

Frontal midline theta rhythm is correlated with cardiac autonomic activities during the performance of an attention demanding meditation procedure

Yasunka Kubota, Wataru Sato, Motomi Toichi, Toshiyo Murai, Takeshi Okada, Akiko Hayashi, Akira Sengoku



Hemispheric Laterality and Cognitive Style Associated With Transcendental Meditation

JAMES E. BENNETT AND JOHN TRINDER

ABSTRACT

The hemispheres of the brain are thought to be specialized with respect to the manner in which they process information. In view of this it is possible to explore the way information is processed during the performance of a specified task by identifying the relative activity of the hemispheres. The hypothesis, that meditation is characterized by a postalt, holistic and spacial cognitive style associated with the right hemisphere was tested. Sixteen Transcendental Meditators were compared in 16 control subjects with respect to the degree of lateral asymmetry during meditation-relaxation and the performance of two analytic and two spacial cognitive tasks. Lateral asymmetry was assessed by the relative distribution of alpha activity. The only difference between the two groups was that meditators showed a greater degree of lateral asymmetry on both analytical and spacial tasks. During both meditation and relaxation the hemispheres were found to be symmetrical with respect to the distribution of alpha activity, suggesting that neither analytical nor spacial processing was dominant during these exercises.

DESCRIPTORS: Hemispheric laterality, Cognitive style, Transcendental meditation, EEG.

PRACTICE

An Introduction to Kundalini Yoga Meditation Techniques That are Specific for the Treatment of Psychiatric Disorders

DAVID S. SHANNAHOFF-KHALSA

ABSTRACT

The ancient system of Kundalini yoga includes a vast array of meditation techniques and many were discovered to be specific for treating the psychiatric disorders as we know them today. One such technique was found to be specific for treating obsessive-compulsive disorder (OCD), the fourth most common psychiatric disorder, and the tenth most disabling disorder worldwide. Two published clinical trials are described here for treating OCD using a specific Kundalini yoga protocol. This OCD protocol also includes techniques that are useful for a wide range of anxiety disorders, as well as a technique specific for learning to manage fear, one for transforming an angry mind, one for meeting mental challenges, and one for learning negative thoughts into positive thoughts. Part of this protocol is included here and published in detail elsewhere. In addition, a number of other disorder-specific meditation techniques are included here to help bring these tools to the attention of the medical and scientific community. These techniques are specific for phobias, addictive and substance abuse disorders, major depressive disorders, dyslexia, grief, insomnia and other sleep disorders.

medical hypotheses

Meditation may predispose to epilepsy: an insight into the alteration in brain environment induced by meditation

Harinder Jeeja*

Cardiology

Heart rate dynamics during three forms of meditation

C.-K. Peng, Isaac C. Henry, Joseph E. Mietus, Jeffrey M. Hausdorff, Gurucharan Khalsa, Herbert Benson, Ary L. Goldberger

ELSEVIER

International Journal of cardiology

Exaggerated heart rate oscillations during two meditation techniques

C.-K. Peng[1,*], Joseph E. Mietus[1,2], Yanbin Liu[1], Gurucharan Khalsa[3], Pamela S. Douglas[4], Herbert Benson[3,5], Ary L. Goldberger[1,2,5,*]

Accepted 1 March 1999

Abstract

We report unusually prominent heart rate oscillations associated with slow breathing during specific traditional forms of Chinese Chi and Kundalini Yoga meditation techniques in healthy young adults. We applied both spectral analysis and a novel analysis technique based on the Hilbert transform to quantify these heart rate dynamics. The amplitude of these oscillations during meditation was significantly greater than in the pre-meditation control state and also in three non-meditation control groups: (1) elite athletes during sleep, (2) healthy young adults during metronomic breathing, and (3) healthy young adults during spontaneous paced breathing. This finding, along with the marked variability of the heart rate dynamics during such profound meditative states, challenges the notion of meditation as only an autonomically quiescent state. © 1999 Elsevier Science Ireland Ltd. All rights reserved.

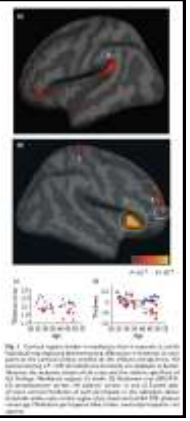
Keywords: Athletes; Autonomic nervous system; Chi meditation; Hemodynamics; Hilbert transform; Hyperpnea; Sinus arrhythmia; Spectral analysis; Yoga

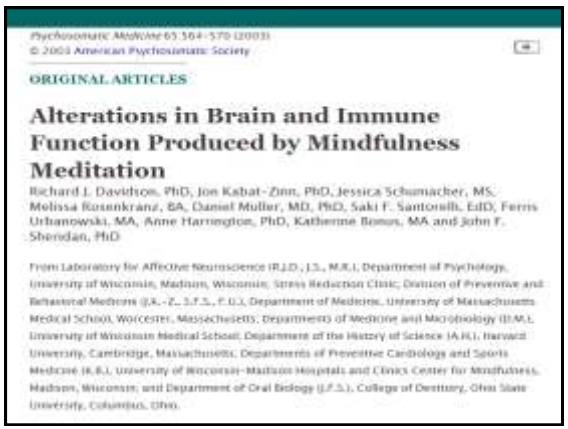
Meditation Increases Cortical thickness

Regular practice of meditation is associated with increased thickness in a subset of cortical regions related to somatosensory, auditory, visual and interoceptive processing.

Furthermore, regular meditation practice may even slow age-related thinning of the frontal cortex.

Lazar et al., (2005) Neuroreport Vol 16(17) pp 1894.





Psychosomatic Medicine 65:564–570 (2003)
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ORIGINAL ARTICLES

Alterations in Brain and Immune Function Produced by Mindfulness Meditation

Richard J. Davidson, PhD, Jon Kabat-Zinn, PhD, Jessica Schumacher, MS, Melissa Rosenkranz, BA, Daniel Muller, MD, PhD, Saki F. Santorelli, EdD, Ferris Urbanowski, MA, Anne Harrington, PhD, Katherine Bonus, MA and John F. Sheridan, PhD

From Laboratory for Affective Neuroscience (R.J.D., J.S., M.R.), Department of Psychology, University of Wisconsin, Madison, Wisconsin; Stress Reduction Clinic, Division of Preventive and Behavioral Medicine (J.K.-Z., S.F.S., F.U.), Department of Medicine, University of Massachusetts Medical School, Worcester, Massachusetts; Department of Medicine and Microbiology (D.M.), University of Wisconsin Medical School; Department of the History of Science (A.H.), Harvard University, Cambridge, Massachusetts; Departments of Preventive Cardiology and Sports Medicine (K.B.), University of Wisconsin–Madison Hospitals and Clinics Center for Mindfulness, Madison, Wisconsin; and Department of Oral Biology (J.F.S.), College of Dentistry, Ohio State University, Columbus, Ohio.

Mindfulness meditation

Mindfulness is a process of directing attention to what is happening in the present moment without being distracted by the past or what might happen in the future.

Mindfulness is learned and developed over time, initially directed towards the body and senses but also towards cognitive, contemplative, behavioural and lifestyle processes.

The yoga practice of Antar Mouna (5 stages of mindfulness) begins with sensorial awareness and then moves towards the thoughts and eventually inner stillness.

When practiced in a disciplined manner over time, meditation can reduce anxiety, stress & pain and assists sleep & healing.

Mindfulness-based psychotherapies: a review of conceptual foundations, empirical evidence and practical considerations

Melbourne Academic Mindfulness Interest Group*

Objective: This paper, composed by an interest group of clinicians and researchers based in Melbourne, presents some background to the practice of mindfulness-based therapies as relevant to the general professional reader. We address the empirical evidence for these therapies, the principles through which they might operate, some practical questions facing those wishing to commence practice in this area or to refer patients into mindfulness-based therapies, and some considerations relevant to the conduct and interpretation of research into the therapeutic application of mindfulness.

Method: Databases (e.g. PsycINFO, MEDLINE) were searched for literature on the impact of mindfulness interventions, and the psychological and biological mechanisms that underpin the effects of mindfulness practice. This paper also draws upon the clinical experience of the author group.

Results: Mindfulness practice and principles have their origins in many contemplative and philosophical traditions but individuals can effectively adopt the training and practice of mindfulness in the absence of such traditions or vocabulary. A recent surge of interest regarding mindfulness in therapeutic techniques can be attributed to the publication of some well-designed empirical evaluations of mindfulness-based cognitive therapy. Arising from this as well as a broader history of clinical integration of mindfulness and Western psychotherapies, a growing number of clinicians have interest and enthusiasm to learn the techniques of mindfulness and to integrate them into their therapeutic work. This review highlights the importance of accurate professional awareness and understanding of mindfulness and its therapeutic applications.

Conclusions: The theoretical and empirical literatures on therapeutic applications of mindfulness are in states of significant growth and development. This group suggests, based on this review, that the combination of some well-developed conceptual models for the therapeutic action of mindfulness and a developing empirical base, justifies a degree of optimism that mindfulness-based approaches will become helpful strategies to offer in the care of patients with a wide range of mental and physical health problems.

Key words: cognitive therapy, depression, meditation, mindfulness, psychotherapy, stress

Australian and New Zealand Journal of Psychiatry 2008; 42:266–284

International Journal of Behavioral Medicine
2005, Vol. 12, No. 4, 278–285

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Impact of Mindfulness-Based Stress Reduction (MBSR) on Sleep, Mood, Stress and Fatigue Symptoms in Cancer Outpatients

Linda E. Carlson and Sheila N. Garland

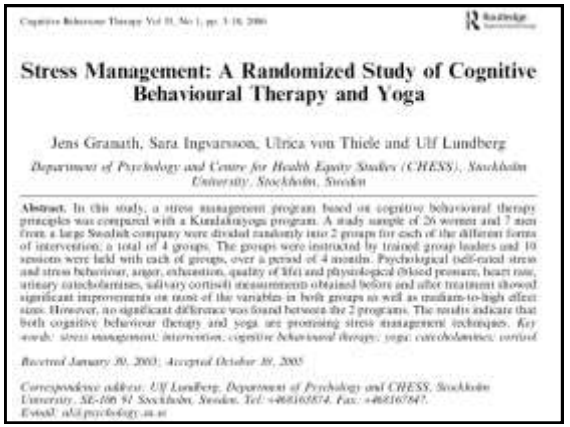
Sleep disturbance is a very common problem for cancer patients that has largely not been addressed in the clinical intervention literature. Mindfulness meditation has demonstrated clinical benefit for a variety of patient populations in other areas of functioning. This study examined the effects of an 8-week Mindfulness-Based Stress Reduction (MBSR) program on the sleep quality of a heterogeneous sample of 63 cancer patients. Overall sleep disturbance was significantly reduced ($p < .001$) and participants reported that their sleep quality had improved ($p < .001$). There was also a significant reduction in stress ($p < .001$), mood disturbance ($p = .001$), and fatigue ($p < .001$). The associations among these changes and implications for improving quality of life of cancer patients are discussed.

Key words: mindfulness, meditation, cancer, sleep, stress, fatigue

Complementary Therapies in Clinical Practice

The relaxation response: Reducing stress and improving cognition in healthy aging adults

Jennifer A. Galvin, Herbert Benson, Gloria R. Deckro, Gregory L. Fricchione, Jeffery A. Dusek*

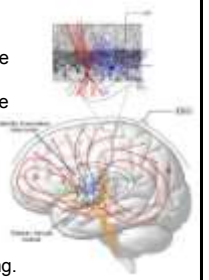


Stress Management: A Randomized Study of Cognitive Behavioural Therapy and Yoga

Jens Granath, Sara Ingvarsson, Ulrica von Thiele and Ulf Lundberg

Department of Psychology and Centre for Health Equity Studies (CHESS), Stockholm University, Stockholm, Sweden

Stress and the Brain



Continuous exposure to stress can cause increased sympathetic nervous activity, increased heart rate, decreased digestive functioning and increased adrenalin.

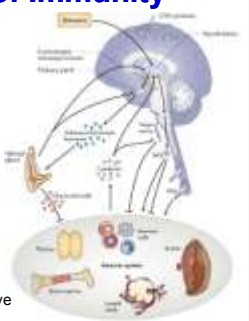
Stress increases the secretion of glucocorticoids in the brain & reduces melatonin levels. Constant exposure to glucocorticoids can also destroy sensitive neurones in the hippocampus, which is crucial in memory and in learning.

Caffeine stimulates the heart and the sympathetic nervous system. It reduces melatonin at night for up to 10 hours.

Vitetta, L., Anton, B., Cortizo, F., Sali, A. (2005) "Mind-Body Medicine: Stress and Its Impact on Overall Health and Longevity" in Reversal of Aging: Resetting the Pineal Clock. Vol 1057 Ann. N.Y. Acad. Sci. 1057: 492–505. doi: 10.1196/annals.1322.038

Neural Regulation of Immunity

Signalling between the immune system and the central nervous system (CNS) through systemic routes, the vagus nerve, the hypothalamic–pituitary–adrenal (HPA) axis, the sympathetic nervous system (SNS) and the peripheral nervous system (PNS).



Melatonin traps free radicals and is very efficient at preventing damage. Melatonin is the most potent neutralizer of hydroxyl radicals ever detected and is more effective as an antioxidant than vitamins C and E. (Reiter 1995, Reiter 1998)

Image from Sternberg *Nature Reviews Immunology* **6**, 318–328 (April 2006) | doi:10.1038/nri1810

Meditation and Immunity

A study on mindfulness meditation measuring brain electrical activity before, after and 4 months after an 8-week training program showed increases in antibodies among the meditation group, when compared with the control group.

Both groups had been vaccinated with influenza vaccine.

The magnitude of increase in left-sided EEG activation predicted the magnitude of antibody rise.

Mindfulness meditation produced demonstrable effects on brain and immune function and suggests that meditation may change the brain and immune function in positive ways.

Davidson, R. J., J. Kabat-Zinn, et al. (2003). **Alterations in brain and immune function produced by mindfulness meditation**. Psychosom Med **65**(4): 564-70.

Melatonin and Cancer

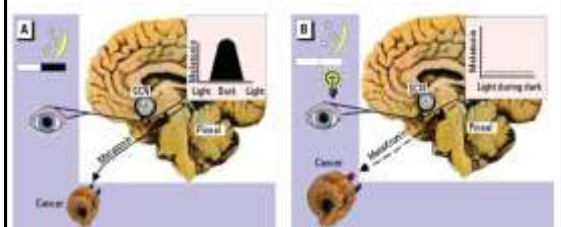


Figure 2. A schematic representation of the cancer response to the effects of an intact nocturnal, circadian melatonin signal (*A*) under 12-hr:12-hr light/dark conditions and (*B*) under conditions in which the melatonin signal is disrupted by ocular exposure to bright polychromatic light at night.

(Image from http://www.ehponline.org/members/2007/10200/fig2.jpg)

Melatonin and Stress

Stress is a natural reaction to events t
can affect the way we think and feel a
can build causing anxiety & affect hea

Stress builds up due to an inability
to deal with the cumulative effects of
stress on various physiological system

Stress reduces melatonin levels by
changing ANS balance and the immun
system suffers as a consequence.

Modern stress is chronic hyper-arousa
from continuous exposure to physical,
physiological, pharmacological,
emotional and psychological stressors

Sleep loss & Psychiatric Disorders

In the first neural investigation into what happens to the emotional brain without sleep, results from a brain imaging study suggest that while a good night's rest can regulate your mood and help you cope with the next day's emotional challenges, sleep deprivation does the opposite by excessively boosting the part of the brain most closely connected to depression, anxiety and other psychiatric disorders.

"It's almost as though, without sleep, the brain had reverted back to more primitive patterns of activity, in that it was unable to put emotional experiences into context and produce controlled, appropriate responses," said Matthew Walker, director of UC Berkeley's Sleep and Neuroimaging Laboratory and senior author of the study, which will be published today (Monday, Oct. 22) in the journal *Current Biology*.

(From http://berkeley.edu/news/media/releases/2007/10/22_sleeploss.shtml)

Melatonin and Meditation

A significant increase in endogenous melatonin was found from practicing simple meditation techniques at night in research by Tooley et al, (1996).

Meditation had a profound effect on the production and release of melatonin.

Meditation increases parasympathetic tone and decreases sympathetic tone.

Meditation reduces stress restoring our body and brain to a state of balance and harmony. Breathing and meditation techniques can calm the mind and help balance the autonomic nervous system.

Yoga Nidra Relaxation

You need to reduce stress before it becomes a problem, by learning and practicing relaxation and stress avoidance techniques. The gentle stretches and controlled breathing techniques of yoga help to unite various aspects of body, mind & emotions and sensitise the relaxation response over time.

Slower, more deeper breathing helps to relax.

By learning to control the breath, you can learn to manage heart rate and autonomic nervous activity. You need to learn the relaxation response before you need it though.

Yoga Nidra is a very deep, relaxation, that anyone can learn and easily practice.

(Image from www.chiasma.info)

Yoga Nidra Pathways in the Brain

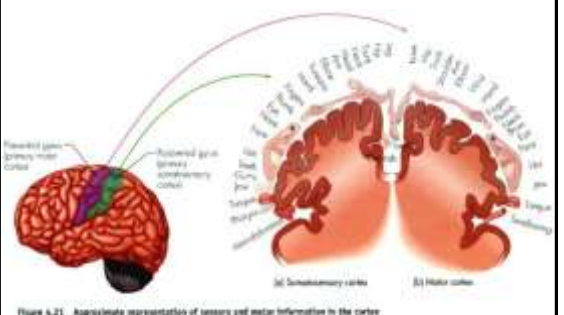
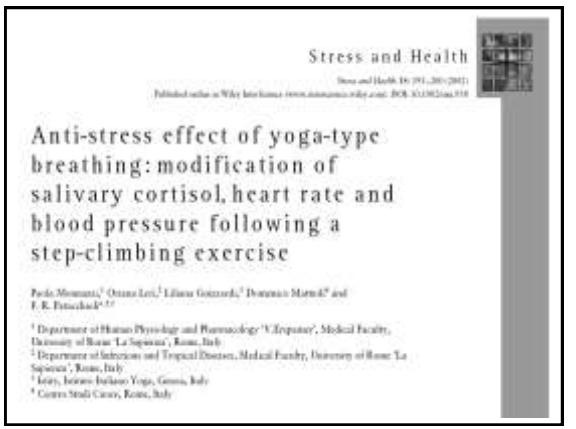


Figure 4.21 Approximate representation of sensory and motor information in the cortex

Genomic Counter-Stress Changes Induced by the Relaxation Response

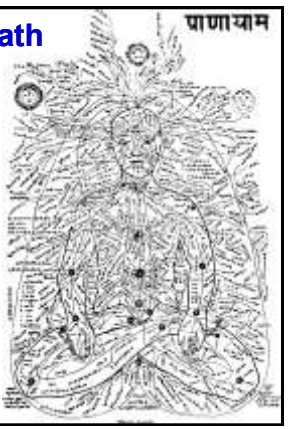

COGNITIVE BRAIN RESEARCH

Increased dopamine tone during meditation-induced change of consciousness


Stress and Health

Anti-stress effect of yoga-type breathing: modification of salivary cortisol, heart rate and blood pressure following a step-climbing exercise

Yoga and the Breath

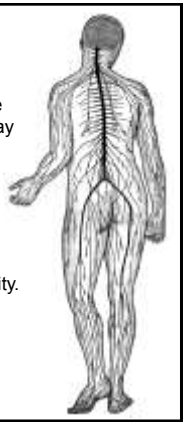


In yoga, becoming aware of the breath, we gradually become more sensitive to our mind and to the flow of energy throughout the body. Controlling the breath we can control the mind and the body.

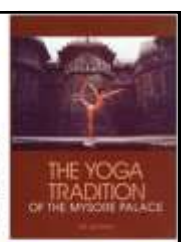
Yogic Breathing

Changes in breathing patterns can influence autonomic nervous activity, however and may profoundly impact human physiology and psychology.

Various yoga, meditation and relaxation techniques can affect melatonin by directly influencing autonomic nervous system activity.



Different schools of yoga have a differing focus and often promote different patterns of breathing according to their understanding.

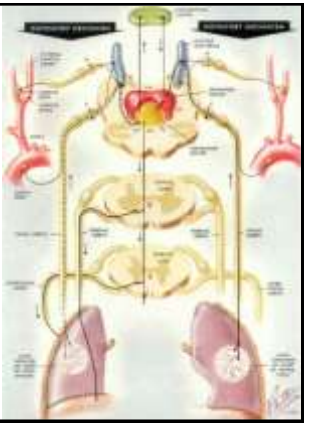


The yoga tradition that evolved through the patronage and participation of the Wodeyar royal family, rajas of the kingdom of Mysore, has today supplanted or affected a majority of the yoga teaching traditions primarily through the teachings of B.K.S. Iyengar and his students. This tradition is strongly preoccupied with the practice of asanas or yoga positions, appears to be distinct from the philosophical or textual tradition, and does not appear to have any basis as a tradition as there is no textual support for the asanas taught and no lineage of teachers.

Krishnamacharya taught yoga at the Mysore Palace from the early 1930s until 1950. He taught Patabhi Jois, BKS Iyengar and, later, his son, TKV Desikachar, making him one of the most influential teachers of yoga in the modern world. Sjoman's work looks at the history of asana practice, exploring information from different periods in Indian history. His work focuses on Krishnamacharya's teaching at the Mysore Palace and includes a translation and photographic reproductions of *Sritattvanidhi*, a sanskrit text written in the 1850s which provides a link between the limited and specific range of postures described in older texts such as the *Hathayogapradipika* and the hundreds of postures seen in modern works such as Iyengar's *Light on Yoga*.

Abhinav Publications (India)

How you breathe affects both the sympathetic and parasympathetic nervous systems differentially.



Thoracic dominant breathing stimulates sympathetic activity.

Abdominal breathing lowers sympathetic activity or increases parasympathetic nervous activity.

The Physiological Correlates of Kundalini Yoga Meditation: A Study of a Yoga Master

Pete Aranbula,[1,2] Erik Peper,[1] Mitsunasa Kawakami,[1] and Katherine Hughes Gibney[1]

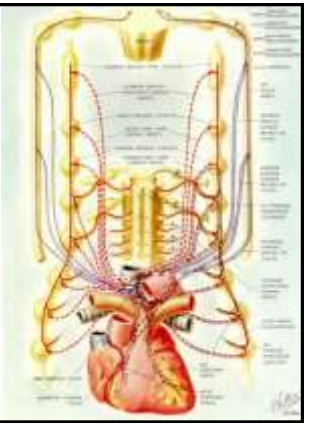
This study explores the physiological correlates of a highly practiced Kundalini Yoga meditator. Thoracic and abdominal breathing patterns, heart rate (HR), occipital patterned electroencephalograph (EEG), skin conductance level (SCL), and blood volume pulse (BVP) were monitored during prebaseline, meditation, and postbaseline periods. Visual analysis of the data showed a decrease in respiration rate during the meditation from a mean of 11 breaths/min for the pre- and 13 breaths/min for the postbaseline to a mean of 5 breaths/min during the meditation, with a predominance of abdominal/diaphragmatic breathing. There was also more alpha EEG activity during the meditation (M = 1.71 μV) compared to the pre- (M = .47 μV) and postbaseline (M = .78 μV) periods, and an increase in theta EEG activity immediately following the meditation (M = .62 μV) compared to the pre-baseline and meditation periods (each with M = .26 μV). These findings suggest that a shift in breathing patterns may contribute to the development of alpha EEG, and these patterns need to be investigated further.

Cardiac Autonomic Pathways

Slow rate abdominal breathing slows down the heart rate and can even lower blood pressure.

Breathwork and pranayama practices are important aspects of yogic lifestyle, meditation and relaxation practices.

Breath is life – Life is breath



THE UTILITY OF PROLONGED RESPIRATORY EXHALATION FOR REDUCING PHYSIOLOGICAL AND PSYCHOLOGICAL AROUSAL IN NON-THREATENING AND THREATENING SITUATIONS*

Bruce M. Cappo and David S. Holmes†

Abstract—To determine whether slowing and altering the respiratory pattern is an effective means for reducing physiological and psychological arousal, subjects participated in one of three treatment conditions in which they reduced their respiration rate to 6 rpm and either inhaled quickly and exhaled slowly, inhaled slowly and exhaled quickly, or spent equal amounts of time inhaling and exhaling. Other subjects participated in a distraction control condition or in a no-treatment control condition. Arousal was measured during a practice period, a threat (electrical shocks) anticipation period, and a threat confrontation period. The results indicated that the breathing manipulations were not effective in reducing arousal during the practice period, but that inhaling quickly and exhaling slowly was consistently effective for reducing physiological (skin resistance) and psychological (subjective cognitive) arousal during the anticipation and confrontation periods.

On Spectral Analysis of Heart Rate Variability during Very Slow Yogic Breathing

E. Jovanov

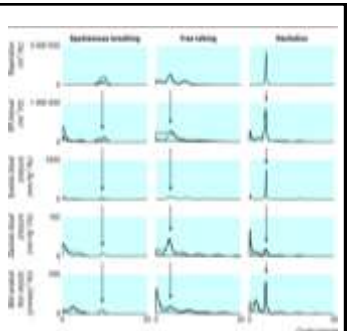
Electrical and Computer Engineering Department
University of Alabama in Huntsville, Huntsville, Alabama, U.S.A.

Abstract— Very slow yogic breathing techniques provide valuable insight into mechanisms of autonomous nervous system regulation that are usually not available for human subjects. This paper presents results of eight sessions of Nadi Shodhana Pranayama practiced at rate of one breath per minute. We characterized statistic and spectral measures of heart rate variability before, during, and after exercise. Significant changes include increase of VLF frequencies caused by slow breathing and decrease in average interval from 800.3 to 1004.1 ms ($t(7) = -7.5$, $p<0.001$). We present the results of RRS analysis and analyze origins of characteristic frequency components. The most prominent changes of the exercise include significant increase of respiratory sinus arrhythmia (RSA) and LF/HF ratio, and decrease of breathing frequency after the exercise against the state before the exercise. The maximum LF frequency decreased from 0.0010 Hz to 0.0719 Hz ($t(7) = -3.195$, $p = 0.01$), indicating the decrease of average breathing rhythm from 9.9 breaths/min to 4.3 breaths/min. In addition, the state after the exercise is characterized by disappearance of VLF frequencies from the spectrum, and a significant increase of LF/HF from 14.55 to 50.95 ($t(7) = 2.661$, $p = .05$).

Keywords— Heart Rate Variability, Respiratory Sinus Arrhythmia, Yogic Breathing, Spectral Analysis, Cardiorespiratory Interaction

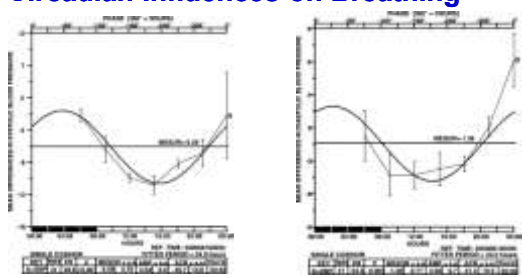
Slow breathing enhances heart rate variability and baroreflex sensitivity by synchronising inherent cardiovascular rhythms

Effects of rhythmic chanting (Ave Maria and mantra), compared with spontaneous breathing, on respiratory and cardiovascular rhythms. Note slow rhythmic oscillations (approximately 6Hz) in all signals during recitation of prayer and mantra.



From: Bernardi L, Sleight P, Bandinelli G, Cencetti S, Fattorini L, Wdowczyc-Szulc J, Lagi A.
Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: comparative study.
BMJ. 2001 Dec 22-29;323(7327):1446-9.

Circadian Influences on Breathing



(A) The response of systolic blood pressure to diaphragmatic breathing is circadian dependent, being largest in early afternoon.

(B) Response of diastolic blood pressure to diaphragmatic breathing (Rx) is circadian dependent, also largest in early afternoon.

From: John S. Lee, Mary S. Lee, Jong Y. Lee, Germaine Cornélissen, Kuniaki Otsuka and Franz Halberg
Effects of diaphragmatic breathing, on ambulatory blood pressure and heart rate
Biomedecine & Pharmacotherapy Volume 57, Supplement 1 , October 2003, Pages 87-91

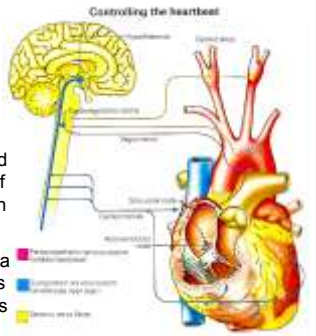
Cardiac Autonomic Control

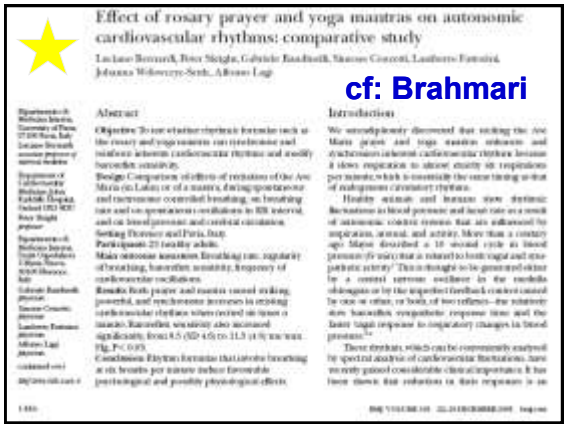
(From: Weston, 1985)

Ujayi pranayama utilises carotid pathways to further slow the heart rate and reduce blood pressure, which is what happens when this practice is used.

Baroreceptors in the carotid sinus sinapse with nuclei of the solitary tract, then down to the heart.

Sympathetic nerves fire at a slower rate, the heart slows down, vasodilatation occurs and blood pressure drops.





Effect of rosary prayer and yoga mantras on autonomic cardiovascular rhythms: comparative study

cf: Brahmari

EEG paroxysmal gamma waves during Bhramari Pranayama: A yoga breathing technique

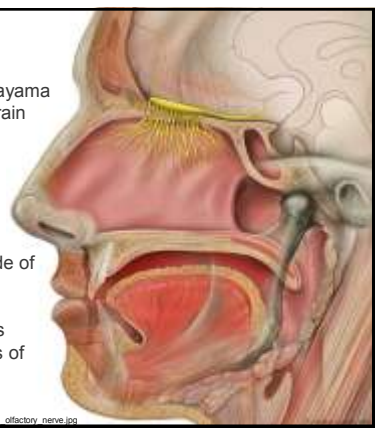
François B. Vialatte, Hovagim Bakardjian, Rajkishore Prasad, Andrzej Cichocki

Pranayama

The practice of pranayama directly affects the brain contralaterally.

The left nostril stimulates the right side of the brain.

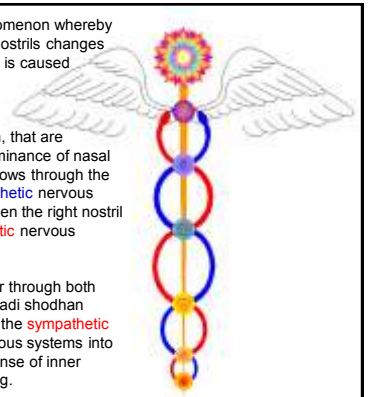
The right nostril stimulates the left side of the brain. Alternate nostril breathing alternately stimulates both left & right sides of the cerebral cortex.



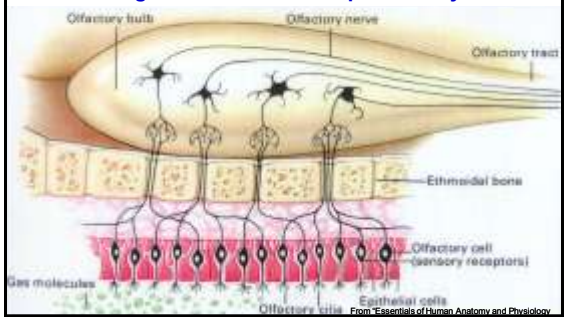
http://commons.wikimedia.org/wiki/Image:Head_olfactory_nerve.jpg

The nasal cycle is a phenomenon whereby the airflow in each of our nostrils changes sides on a regular basis. It is caused by alternations in autonomic balance, regulated by hypothalamic control centres in the brain, that are reflected in alternating dominance of nasal airflow. When our breath flows through the left nostril, the parasympathetic nervous system is more active. When the right nostril is dominant, the sympathetic nervous system is more active.

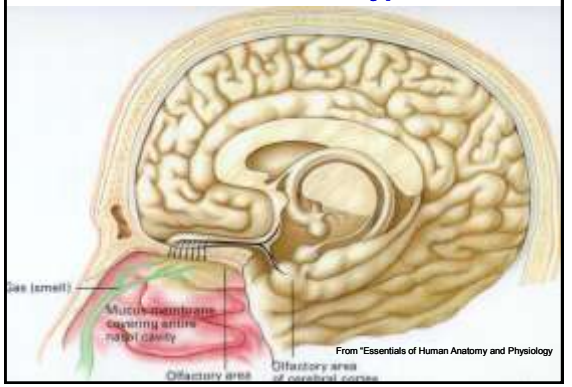
By balancing the flow of air through both nostrils in the practice of nadi shodhan pranayama, we also bring the sympathetic and parasympathetic nervous systems into balance. The result is a sense of inner peace, clarity and wellbeing.

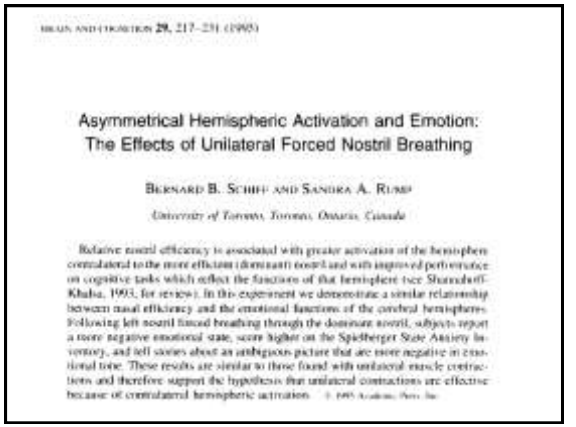


The nose is rich with blood vessels and nerves with each nostril connected differentially in the brain. It is also the only place in the human body where nerve endings exist outside the epithelial layer.



Nasal Innervation to the Hypothalamus





BRAIN AND COGNITION 29, 217–231 (1995)

Asymmetrical Hemispheric Activation and Emotion: The Effects of Unilateral Forced Nostril Breathing

BERNARD B. SCHIFF AND SANDRA A. RUMP

University of Toronto, Toronto, Ontario, Canada

Relative nostril efficiency is associated with greater activation of the hemisphere contralateral to the more efficient (dominant) nostril and with improved performance on cognitive tasks which reflect the functions of that hemisphere (see Shannahoff-Khalsa, 1993, for review). In this experiment we demonstrate a similar relationship between nasal efficiency and the emotional functions of the cerebral hemispheres. Following left nostril forced breathing through the dominant nostril, subjects report a more negative emotional state, score higher on the Spielberger State Anxiety Inventory, and tell stories about an ambiguous picture that are more negative in emotional tone. These results are similar to those found with unilateral muscle contractions and therefore support the hypothesis that unilateral contractions are effective because of contralateral hemispheric activation. © 1995 Academic Press, Inc.

Biological Psychology 23 (1986) 127–137
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NASAL AIRFLOW ASYMMETRIES AND HUMAN PERFORMANCE

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David SHANNAHOFF-KHALSA **

The Salk Institute for Biological Studies

Accepted for publication 16 April 1986

Recent studies of the nasal cycle and forced uni-nostril breathing have demonstrated that integrated EEG amplitudes are greater over the hemisphere contralateral to the dominant (less congested) or unblocked nostril. Two experiments were designed to determine if asymmetries in nasal airflow, occurring naturally as a result of the nasal cycle or artificially as a result of forced uni-nostril breathing have consequences for human performance on verbal and spatial tasks that are preferentially performed by the left and right hemispheres respectively. A significant relationship was obtained between the pattern of nasal airflow with normal breathing and relative spatial vs verbal performance. Forced uni-nostril breathing had no effect on performance.

Philip Stevens (Swami Samnyasananda) BSc (Psych, Physiol); BSc (Hons) (Physiol); FWSCY; MWSCY explores effects of yoga on the heart , brain and autonomic nervous system. Seminars and training available around Australia and overseas on various aspects of science and yoga. A Certified Yoga Teacher, a life member and Fellow of the "World Society For Clinical Yoga" (Lucknow, India. IYFM affiliated) with over 30 years of classes, personal tuition & counselling in Meditation, Relaxation, Stress Management, Sleep Problems and Lifestyle Counselling, Psychological Profiling, (M.B.T.I. Accredited).

Clinical Consulting, Professional Mentoring, Clinical Supervision & Training.

*Currently teaching **Clinical Yoga** & **Science of Sleep** at Monash Medical School (Dept Gen Practice) exploring the neurophysiological and neurohormonal effects of yoga techniques (meditation, pranayama, relaxation) for less stress & better sleep.*

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