Studien & Forschung

Subjektive Kriterien einer gesunden Lebensführung

In der Bevölkerung gelten als Elemente einer besonders gesunden Lebensführung

- gesunde Ernährung,
- sportliche Aktivitäten/Bewegung an der frischen Luft,
- Verzicht auf Zigaretten und Alkohol sowie
- ausreichend Schlaf.

Als ungesund werden demgegenüber

- Rauchen,
- fettreiche Kost,
- Süßigkeiten und Kohlenhydrate,
- zu wenig Bewegung sowie
- körperliche und seelische Belastungen am Arbeitsplatz

bezeichnet (GP Forschungsgruppe [1990]). Es fällt auf, dass Faktoren wie Hygiene oder Sexualverhalten weder im positiven noch im negativen Sinne spontan erwähnt werden.

Damit haben sich seit der Antike die Vorstellungen der Menschen kaum geändert; ein gesundes Leben ist weiterhin vor allem durch gute Ernährung, durch ausreichende Bewegung und Schlaf sowie durch seelische Ausgeglichenheit gekennzeichnet.

Gesundheitsbewußte Lebensführung

Vor dem Verhalten steht das Denken. Allerdings folgt nicht automatisch aus dem Wissen um und der Einsicht in gesundheitliche Zusammenhänge auch ein entsprechendes Gesundheitsverhalten.

Quelle: Gesundheitsbericht für Deutschland, 1998

Im folgenden finden Sie eine **Auflistung internationaler Studien und Forschungsarbeiten** zu der Wirkungsweise von Yoga in folgenden Bereichen:

Allgemein

http://www.biomedcentral.com/1472-6882/7/43 Atmung / Stress / Angstzustände / Energie / Depression / Emotionen; 2007

J Am Board Fam Pract. 2003 Mar-Apr;16(2):131-47.
Mind-body medicine: state of the science, implications for practice.

Astin JA, Shapiro SL, Eisenberg DM, Forys KL.

California Pacific Medical Center, San Francisco 94115, USA.

BACKGROUND: Although emerging evidence during the past several decades suggests that psychosocial factors can directly influence both physiologic function and health outcomes, medicine had failed to move beyond the biomedical model, in part because of lack of exposure to the evidence base supporting the biopsychosocial model. The literature was reviewed to examine the efficacy of representative psychosocial-mind-body interventions, including relaxation, (cognitive) behavioral therapies, meditation, imagery, biofeedback, and hypnosis for several common clinical conditions. METHODS: An electronic search was undertaken of the MEDLINE, PsycLIT, and the Cochrane Library databases and a manual search of the reference sections of relevant articles for related clinical trials and reviews of the literature. Studies examining mind-body interventions for psychological disorders were excluded. Owing to space limitations, studies examining more body-based therapies, such as yoga and tai chi chuan, were also not included. Data were extracted from relevant systematic reviews, meta-analyses, and randomized controlled trials. RESULTS: Drawing principally from systematic reviews and meta-analyses, there is considerable evidence of efficacy for several mind-body therapies in the treatment of coronary artery disease (eg, cardiac rehabilitation), headaches, insomnia, incontinence, chronic low back pain, disease and treatment-related symptoms of cancer, and improving postsurgical outcomes. We found moderate evidence of efficacy for mind-body therapies in the areas of hypertension and arthritis. Additional research is required to clarify the relative efficacy of different mind-body therapies, factors (such as specific patient characteristics) that might predict more or less successful outcomes, and mechanisms of action. Research is also necessary to examine the cost offsets associated with mind-body therapies. CONCLUSIONS: There is now considerable evidence that an array of mind-body therapies can be used as effective adjuncts to conventional medical treatment for a number of common clinical conditions.

J Altern Complement Med. 2002 Dec;8(6):797-812.

Psychophysiologic effects of Hatha Yoga on musculoskeletal and cardiopulmonary

function: a literature review.

Raub JA.

National Center for Environmental Assessment, Research Triangle Park, NC 27711, USA.

raub.james@epa.gov

Yoga has become increasingly popular in Western cultures as a means of exercise and fitness training; however, it is still depicted as trendy as evidenced by an April 2001 Time magazine cover story on "The Power of Yoga." There is a need to have yoga better recognized by the health care community as a complement to conventional medical care. Over the last 10 years, a growing number of research studies have shown that the practice of Hatha Yoga can improve strength and flexibility, and may help control such physiological variables as blood pressure, respiration and heart rate, and metabolic rate to improve overall exercise capacity. This review presents a summary of medically substantiated information about the health benefits of yoga for healthy people and for people compromised by musculoskeletal and cardiopulmonary disease.

Appl Psychophysiol Biofeedback 2001 Jun;26(2):147-53

The physiological correlates of Kundalini Yoga meditation: a study of a yoga master.

Arambula P, Peper E, Kawakami M, Gibney KH.

San Francisco State University, California, USA. petearambula@earthlink.net

This study explores the physiological correlates of a highly practiced Kundalini Yoga meditator. Thoracic and abdominal breathing patterns, heart rate (HR), occipital parietal electroencephalograph (EEG), skin conductance level (SCL), and blood volume pulse (BVP) were monitored during prebaseline, meditation, and postbaseline periods. Visual analyses 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 microV) compared to the pre- (M = .47 microV) and postbaseline (M = .78 microV) periods, and an increase in theta EEG activity immediately following the meditation (M = .62 microV) compared to the pre-baseline and meditative periods (each with M = .26 microV). These findings suggest that a shift in breathing patterns may contribute to the development of alpha EEG, and those patterns need to be investigated further.

Indian J Physiol Pharmacol 2001 Jan;45(1):37-53

Effect of yogic exercises on physical and mental health of young fellowship course trainees.

Ray US, Mukhopadhyaya S, Purkayastha SS, Asnani V, Tomer OS, Prashad R, Thakur L, Selvamurthy W.

Defence Institute of Physiology and Allied Sciences, Lucknow Road, Delhi-110 054.

A study was undertaken to observe any beneficial effect of yogic practices during training period on the young trainees. 54 trainees of 20-25 years age group were divided randomly in two groups i.e. yoga and control group. Yoga group (23 males and 5 females) was administered yogic practices for the first five months of the course while control group (21 males and 5 females) did not perform yogic exercises during this period. From the 6th to 10th month of training both the groups performed the yogic practices. Physiological parameters like heart rate, blood pressure, oral temperature, skin temperature in resting condition, responses to maximal and submaximal exercise, body flexibility were recorded. Psychological parameters like personality, learning, arithmetic and psychomotor ability, mental well being were also recorded. Various parameters were taken before and during the 5th and 10th month of training period. Initially there was relatively higher sympathetic activity in both the groups due to the new work/training environment but gradually it subsided. Later on at the 5th and 10th month, yoga group had relatively lower sympathetic activity than the control group. There was improvement in performance at submaximal level of exercise and in anaerobic threshold in the yoga group. Shoulder, hip, trunk and neck flexibility improved in the yoga group. There was improvement in various psychological parameters like reduction in anxiety and depression and a better mental function after yogic practices.

Prev Cardiol 2001 Autumn;4(4):165-170

Effects of Hatha Yoga Practice on the Health-Related Aspects of Physical Fitness.

Tran MD, Holly RG, Lashbrook J, Amsterdam EA.

Department of Exercise Science, University of California at Davis, Davis, CA 95616.

Ten healthy, untrained volunteers (nine females and one male), ranging in age from 18-27 years, were studied to determine the effects of hatha yoga practice on the health-related aspects of physical fitness, including muscular strength and endurance, flexibility, cardiorespiratory fitness, body composition, and pulmonary function. Subjects were required to attend a minimum of two yoga classes per week for a total of 8 weeks. Each yoga session consisted of 10 minutes of pranayamas (breath-control exercises), 15 minutes of dynamic warm-up exercises, 50 minutes of asanas (yoga postures), and 10 minutes of supine relaxation in savasana (corpse pose). The subjects were evaluated before and after the 8-week training program. Isokinetic muscular strength for elbow extension, elbow flexion, and knee extension increased

by 31%, 19%, and 28% ($p<0.05$), respectively, whereas isometric muscular endurance for knee flexion increased 57% ($p<0.01$). Ankle flexibility, shoulder elevation, trunk extension, and trunk flexion increased by 13% ($p<0.01$), 155% ($p<0.001$), 188% ($p<0.001$), and 14% ($p<0.05$), respectively. Absolute and relative maximal oxygen uptake increased by 7% and 6%, respectively ($p<0.01$). These findings indicate that regular hatha yoga practice can elicit improvements in the health-related aspects of physical fitness. (c)2001 CHF, Inc.

Indian J Physiol Pharmacol 2000 Apr;44(2):202-6

Effect of yogic practices on subjective well being.

Malathi A, Damodaran A, Shah N, Patil N, Maratha S.

Department of Physiology, LTMMC-LTMMGH, Sion, Mumbai.

Forty eight healthy volunteers who participated in the practice of yoga over a period of 4 months were assessed on Subjective Well Being Inventory (SUBI) before and after the course in order to evaluate the effect of practice of yoga on subjective feelings of well-being and quality of life. A significant improvement in 9 of the 11 factors of SUBI was observed at the end of 4 months, in these participants. The paper thus, reiterates the beneficial effects of regular practice of yoga on subjective well being.

CA Cancer J Clin 1999 Nov-Dec;49(6):362-75

Evaluating complementary and alternative therapies for cancer patients.

Cassileth BR.

Integrative Medicine Service, Memorial Sloan-Kettering Cancer Center, New York City, NY, USA.

"Complementary and alternative" therapies are actually a vast collection of disparate, unrelated regimens and products, ranging from adjunctive modalities that effectively enhance quality of life and promising antitumor herbal remedies now under investigation, to bogus therapies that claim to cure cancer and that harm not only directly, but also indirectly by encouraging patients to avoid or postpone effective cancer care. Complementary therapies such as music and massage, herbal teas to aid digestion and relieve nausea, yoga, tai chi, meditation, and the many other well-documented techniques that relieve stress and enhance well-being should be made available to patients to augment and ease the experience of cancer treatment and recovery. Many time-tested herbal and diet-based remedies are now being studied for their abilities to induce or extend remission without toxicity. At the same time, lack of government regulatory authority leaves consumers at the mercy of those who promote unproved remedies, scores of which the grocery store and pharmacy shelves.

Many of these over-the-counter products contain harmful ingredients. Herb-drug interactions, only some of which are documented, occur with frequency and are sufficiently problematic to require that patients stop taking herbal remedies prior to surgery (to prevent interactions with anesthetics and anticoagulant effects); before radiation (due to potential for increased photosensitivity); and during courses of chemotherapy (to prevent product-drug interactions). Moreover, both good information and misinformation that appear in printed materials and on the Internet appeal to better educated consumers, who are, in fact, the most likely to try complementary and alternative methods.

Nurse Pract Forum 1998 Dec;9(4):243-55

Yoga, meditation, and imagery: clinical applications.

Gimbel MA.

Hatha yoga and meditation as adjunctive therapies for promoting and maintaining wellness offer an excellent example of the mind-body connection at work. Hatha yoga creates balance, physically and emotionally, by using postures, or asanas, combined with breathing techniques, or pranayama. Meditation and guided imagery not only support the physical and emotional work being done by the postures and breathing, they open the door to self-actualization to create the perfect union of the mind, body, and spirit. This report discusses the definitions of hatha yoga, meditation, and imagery and their clinical applications. Three case studies from private practice are presented.

J Obstet Gynecol Neonatal Nurs 1998 Sep-Oct;27(5):563-8

Yoga: intuition, preventive medicine, and treatment.

Collins C.

College of Nursing, Michigan State University, East Lansing 48824-1317, USA.

Mind-body fitness programs use a combination of muscular activity and mindful focus on awareness of the self, breath, and energy to promote health. The ancient discipline of yoga includes physical postures and breathing and meditation techniques. Scientific evidence exists about the physiologic effects of yoga. Mind-body fitness programs may offer therapeutic effects different from those offered by traditional body fitness programs.

Indian J Physiol Pharmacol 1997 Oct;41(4):409-15

Muscle power, dexterity skill and visual perception in community home girls trained in yoga or sports and in regular school girls.

Raghuraj P, Telles S.

Vivekananda Kendra Yoga Research Foundation, Bangalore.

The present study was conducted to compare critical flicker fusion frequency (CFF), degree of optical illusion ("di"), dexterity scores, and grip strength in three groups of subjects, viz community home girls who had learned yoga for 6 months (CHY), age-matched community home girls who had physical activity training for 6 months (CHP), and girls who were attending a regular school (SCH). There were equal numbers in each group for each of the 4 assessment (range 11 to 30 subjects) and age range was 12 to 16 years of age. The CHP group had significantly lower CFF and "di" was significantly higher (one factor ANOVA, t test for unpaired data) in the CHP group, both compared to CHY and SCH groups. Right hand grip strength was also significantly less in the CHP group compared to SCH. The results were explained by previous reports of high levels of anxiety and aggression in community-home groups, which is known to influence the four parameters described here. The better performance of the CHY group compared to CHP, suggested that yoga practice has a beneficial effect in these subjects.

Indian J Med Sci 1997 Apr;51(4):123-7

Yoga for rehabilitation: an overview.

Telles S, Naveen KV.

Vivekananda Kendra Yoga Research Foundation, Banglore.

The use of yoga for rehabilitation has diverse applications. Yoga practice benefited mentally handicapped subjects by improving their mental ability, also the motor co-ordination and social skills. Physically handicapped subjects had a restoration of some degree of functional ability after practicing yoga. Visually impaired children children showed a significant decrease in their abnormal anxiety levels when they practiced yoga for three weeks, while a program of physical activity had no such effect. Socially disadvantaged adults (prisoners in a jail) and children in a remand home showed significant improvement in sleep, appetite and general well being, as well as a decrease in physiological arousal. The practice of meditation was reported to decrease the degree of substance (marijuana) abuse, by strengthening the mental resolve and decreasing the anxiety. Another important area is the application of yoga (and indeed, lifestyle change), in the rehabilitation of patients with coronary artery disease. Finally, the possible role of yoga in improving the mental state and general well being of HIV positive persons and patients with AIDS, is being explored.

J Cardiovasc Nurs 1997 Apr;11(3):53-65

Mind-body fitness: encouraging prospects for primary and secondary prevention.

La Forge R.

Lipid Disorders Training Program, San Diego Cardiac Center Medical Group, California, USA.

In recent years health promotion programs have generated many worthwhile psychologic and physiologic benefits but frequently with less than optimal long-term adherence. Incorporating approaches such as mind-body exercise with existing health promotion and cardiac rehabilitation services can improve self-efficacy and long-term adherence to healthy behaviors as well as improve personal stress management skills. Mind-body exercise couples muscular activity with an internally directed focus so that the participant produces a temporary self-contemplative mental state. This internal focus is in contrast to conventional body-centered aerobic and muscular fitness exercise in which there is little or no mindful component. Research on mind-body exercise programs such as yoga and tai chi reveal they have significant mental and physical value. There also are numerous primary and secondary preventive indications for cardiovascular disease in which mind-body exercise can play a primary or complementary role. Mind-body exercise programs will be a welcome and necessary addition to evolving disease management models that focus on self-care and decreased health care use.

Int J Psychosom 1994;41(1-4):46-52

Physiological and psychological effects of Hatha-Yoga exercise in healthy women.

Schell FJ, Allolio B, Schonecke OW.

Department of Internal Medicine, University of Wurzburg, Germany.

Hatha-Yoga has become increasingly popular in western countries as a method for coping with stress. However, little is known about the physiological and psychological effects of yoga practice. We measured heart rate, blood pressure, the hormones cortisol, prolactin and growth hormone and certain psychological parameters in a yoga practicing group and a control group of young female volunteers reading in a comfortable position during the experimental period. There were no substantial differences between the groups concerning endocrine parameters and blood pressure. The course of heart rate was significantly different, the yoga group had a decrease during the yoga practice. Significant differences between both groups were found in psychological parameters. In the personality inventory the yoga group showed markedly higher scores in life satisfaction and lower scores in excitability, aggressiveness, openness, emotionality and somatic complaints. Significant differences could also be observed concerning coping with stress and the mood at the end of the experiment. The yoga group had significant higher scores in high spirits and extravertedness.

Int J Aging Hum Dev 1983;17(3):169-76

Yoga as a preventive health care program for white and black elders: an exploratory study.

Haber D.

A ten-week yoga program was implemented with sixty-one white and forty-five low-income black elders at two community sites, along with a pretest-posttest control group research design with random assignment at each site. White elders attended class regularly, practiced yoga on their own on a daily basis, improved psychological well-being, and lowered their systolic blood pressure level, in comparison to a control group. Black elders, on the other hand, attended the once-a-week class regularly but did not practice on their own on a daily basis. Thus, they did not improve psychological well-being nor reduce blood pressure level in comparison to a control group. Social analysts suggest that low-income minority elders need more frequent contact with structured leadership in order to adhere to a daily routine that may lead to psychological and physical change. Other directions for controlled follow-up studies are suggested.

Acta Psiquiatr Psicol Am Lat 1975 Mar;21(1):56-63

Recent medical research on yoga and states of concentration

Article in Spanish

Lerner M.

Traditional oriental thinking attracts the growing scientific interest of occidental practitioners. Dr. Pierre Etevenon, head of the Department of Neuro-Psycho-Pharmacology at the French Institute for Health and Medical Research (INSERM), held several conversations and scientific exchanges with the author, and kindly provided copies of some of his works. They are at the basis of the present paper. M. A. Descamps (Paris) found that asanas--yoga postures-- are generators of dynamic action when there is an extension of the spinal column, whilst they lead to quiet states when there is a flexion of it. Claeys and Gones (Belgium) proved that overall global relaxation, as well as differential relaxation were far more effective and deep when obtained by yogis than those attempted by University students majoring in Physical Education. Lonsdorfer and Nussbaum (France) studied several parameters concerning hatha-yoga and concluded that it provides a regular functioning of the main bodily functions fostering thus a psycho-physical balance. Wallace and Benson (U.S.A.) proved that transcendental meditation increases aerobic metabolism, counteracting anaerobic metabolism which is related to mental distress. Etevenon (Paris) investigated neurophysiological effects of yoga in connection to ancient Indian concepts (Upanishads) on sleeping, meditation and degree of consciousness. Dr.

Etevenon has studied the phylogenetic evolution of waking-sleeping cycles, focusing on phylogenetic and ontongenetic appearances of REM cycles (activated sleep). A correlation has been made with EEG studies during states of concentration (yoga, transcendental meditation, Zen). These states have been found to be specific brain activities, and different from deep sleep, in spite of certain similarities in the EEG. Several hypothesis are set forth to explain brain activities underlying sites of concentration. The possibilities of developing a conscious mastering of dreams are also under research, and special attention is paid to the works of Saint Denys (1867), and hindu tradition. This paper discusses also the psychological, therapeutic and anthropological implications of recent discoveries in the field.

Atmung

Thorax. 2003 Aug;58(8):674-9.

Effect of two breathing exercises (Buteyko and pranayama) in asthma: a randomised controlled trial.

Cooper S, Oborne J, Newton S, Harrison V, Thompson Coon J, Lewis S, Tattersfield A. Division of Respiratory Medicine, City Hospital, Nottingham NG5 1PB, UK. sue.cooper@nottingham.ac.uk

BACKGROUND: Patients with asthma are interested in the use of breathing exercises but their role is uncertain. The effects of the Buteyko breathing technique, a device which mimics pranayama (a yoga breathing technique), and a dummy pranayama device on bronchial responsiveness and symptoms were compared over 6 months in a parallel group study. METHODS: Ninety patients with asthma taking an inhaled corticosteroid were randomised after a 2 week run in period to Eucapnic Buteyko breathing, use of a Pink City Lung Exerciser (PCLE) to mimic pranayama, or a PCLE placebo device. Subjects practised the techniques at home

twice daily for 6 months followed by an optional steroid reduction phase. Primary outcome measures were symptom scores and change in the dose of methacholine provoking a 20% fall in FEV(1) (PD(20)) during the first 6 months. RESULTS: Sixty nine patients (78%) completed the study. There was no significant difference in PD(20) between the three groups at 3 or 6 months. Symptoms remained relatively stable in the PCLE and placebo groups but were reduced in the Buteyko group. Median change in symptom scores at 6 months was 0 (interquartile range -1 to 1) in the placebo group, -1 (-2 to 0.75) in the PCLE group, and -3 (-4 to 0) in the Buteyko group (p=0.003 for difference between groups). Bronchodilator use was reduced in the Buteyko group by two puffs/day at 6 months; there was no change in the other two groups (p=0.005). No difference was seen between the groups in FEV(1), exacerbations, or ability to reduce inhaled corticosteroids. CONCLUSION: The Buteyko breathing technique can improve symptoms and reduce bronchodilator use but does not appear to change bronchial responsiveness or lung function in patients with asthma. No benefit was shown for the Pink City Lung Exerciser.

Percept Mot Skills. 2003 Feb;96(1):79-80.

Effect of yoga-based and forced uninostril breathing on the autonomic nervous system.

Raghuraj P, Telles S.

Vivekananda Yoga Research Foundation, Chamarajpet, Bangalore, India.

Some reports have described the effects of forced uninostril breathing on autonomic activity as sex-specific, while other reports described selective effects of breathing through a specific nostril on the two divisions of the utonomic nervous system, irrespective of sex. There are also yoga breathing techniques which involve voluntary uninostril breathing. These techniques also influenced the autonomic activity based on the patent nostril rather than sex. These descriptions were in line with experiential observations of the ancient sages described in classical yoga texts. This paper summarizes these perspectives on uninostril breathing.

Indian J Med Res 2001 Dec;114:215-21

Aerobic capacity & perceived exertion after practice of Hatha yogic exercises.

Ray US, Sinha B, Tomer OS, Pathak A, Dasgupta T, Selvamurthy W.

Exercise Physiology Laboratory, Defence Institute of Physiology & Allied Sciences, Lucknow Road, Timarpur, Delhi 110054, India.

BACKGROUND & OBJECTIVES: Reports on the effect of yogic exercises on aerobic capacity are few. There is also no literature available on the effect of yogic exercise on perceived exertion (PE) after maximal exercise. In this study the effect of training in Hatha yogic exercises on aerobic capacity and PE after maximal exercise was observed. METHODS: Forty men from the Indian army (aged 19-23 yr) were administered maximal exercise on a bicycle ergometer in a graded work load protocol. The oxygen consumption, carbon dioxide output, pulmonary ventilation, respiratory rate, heart rate (HR) etc., at maximal exercise and PE score immediately thereafter were recorded. The subjects were divided into two equal groups. Twelve subjects dropped out during the course of study. One group (yoga, n = 17) practiced Hatha yogic exercises for 1 h every morning (6 days in a week) for six months. The other group (PT, n = 11) underwent conventional physical exercise training during the same period. Both groups participated daily in different games for 1 h in the afternoon. In the 7th month, tests for maximal oxygen consumption (VO2Max) and PE were repeated on both groups of subjects. RESULTS: Absolute value of VO2Max increased significantly ($P < 0.05$) in the yoga group after 6 months of training. The PE score after maximal exercise decreased significantly ($P < 0.001$) in the yoga group after 6 months but the PT group showed no change. INTERPRETATION & CONCLUSION: The practice of Hatha yogic exercises along with games helps to improve aerobic capacity

like the practice of conventional exercises (PT) along with games. The yoga group performed better than the PT group in terms of lower PE after exhaustive exercise.

Indian J Physiol Pharmacol 2001 Oct;45(4):493-6

Effect of yogic practice on pulmonary functions in young females.

Yadav RK, Das S.

Department of Physiology, Lady Hardinge Medical College, New Delhi-110 001.

During recent years, a lot of research work has been done to show the beneficial effects of yoga training. The present study was undertaken to assess the effects of yogic practice on some pulmonary functions. Sixty healthy young female subjects (age group 17-28 yrs.) were selected. They had to do the yogic practices daily for about one hour. The observations were recorded by MEDSPIROR, in the form of FVC, FEV-1 and PEFR on day-1, after 6 weeks and 12 weeks of their yogic practice. There was significant increase in FVC, FEV-1 and PEFR at the end of 12 weeks.

Behav Modif 2001 Sep;25(4):640-66

Relaxation therapy in adult asthma. Is there new evidence for its effectiveness?

Ritz T.

Department of Psychiatry and Behavioral Sciences, Stanford University, Veteran's Administration Palo Alto Health Care System, USA.

Studies of relaxation training for adult asthma patients were reviewed for the period between 1980 and 2000. Six controlled and three uncontrolled studies were identified, employing a variety of methods, such as progressive relaxation, functional relaxation, autogenic training, or yoga. Most studies had low sample sizes and suffered from one or more methodological deficiencies, such as suboptimal data analysis, high dropout rates, problematic measurement procedures, or insufficient descriptions of methodology and results. Overall effects on parameters of lung function, symptoms, medication consumption, and health care use were generally negligible. Problems with the underlying rationale of relaxation therapy in asthma are discussed from a psychophysiological viewpoint. Examples are given of potential beneficial and detrimental effects of these techniques on lung function with respect to emotional processes, the musculoskeletal system, and ventilation as targets of a relaxation intervention. It remains to be demonstrated that relaxation training can significantly contribute to the standard treatment of asthma in adult patients.

J Hypertens 2001 May;19(5):947-58

Breathing patterns and cardiovascular autonomic modulation during hypoxia induced by simulated altitude.

Bernardi L, Passino C, Wilmerding V, Dallam GM, Parker DL, Robergs RA, Appenzeller O.

Department of Internal Medicine, University of Pavia and IRCCS S. Matteo, Italy.

OBJECTIVE: To assess the influence of different breathing patterns on autonomic cardiovascular modulation during acute exposure to altitude-induced hypoxia. DESIGN: We measured relative changes in minute ventilation (VE), oxygen saturation (%SaO2), spectral analysis of RR interval and blood pressure, and response to stimulation of carotid baroreceptors (neck suction) at baseline and after acute (1 h) hypobaric hypoxia (equivalent to 5,000 m, in a hypobaric chamber). METHODS: We studied 19 human subjects: nine controls and 10 Western yoga trainees of similar age, while breathing spontaneously, at 15 breaths/min (controlled breathing) and during 'complete yogic breathing' (slow diaphragmatic + thoracic breathing, approximately 5 breaths/min) in yoga trainees, or simple slow breathing in controls. RESULTS: At baseline %SaO2, VE and autonomic pattern were similar in both groups; simulated altitude increased VE in controls but not in yoga trainees; %SaO2 decreased in all subjects ($P< 0.0001$), but more in controls than in yoga trainees (17 versus 12%, 14 versus 9%, 14 versus 8%, all $P< 0.05$ or better, during spontaneous breathing, controlled breathing and yogic or slow breathing, respectively). Simulated altitude decreased RR interval (from 879 +/- 45 to 770 +/- 39, $P < 0.01$) and increased indices deducted from spectral analysis of heart rate variability (low frequency/high frequency (LF/HF) ratio from 1.6 +/- 0.5 to 3.2 +/- 1.1, $P < 0.05$) and systolic blood pressure (low-frequency fluctuations from 2.30 +/- 0.31 to 3.07 +/- 0.24 In-mmHg2, $P< 0.05$) in controls, indicating sympathetic activation; these changes were blunted in yoga trainees, and in both groups during slow or yogic breathing. No effect of altitude was seen on stimulation of carotid baroreceptors in both groups. CONCLUSIONS: Well-performed slow yogic breathing maintains better blood oxygenation without increasing VE (i.e. seems to be a more efficient breathing) and reduces sympathetic activation during altitude-induced hypoxia.

Indian J Physiol Pharmacol 2001 Jan;45(1):80-6

Efficacy of naturopathy and yoga in bronchial asthma--a self controlled matched scientific study.

Sathyaprabha TN, Murthy H, Murthy BT.

Department of Physiology, St. John's Medical College, Bangalore-560 034.

Asthma is one of the common psychosomatic illness influenced by many factors.

Bronchodilators give temporary relief and have side effects. The present study is aimed at finding the efficacy of a non-pharmacological approach of naturopathy and Yoga in bronchial asthma. A total no of 37 patients (19 men, 18 women) with mean age 35.06 yrs (men), 40.74 yrs (women) admitted to INYS, Bangalore, for the period of 21 days. The treatment included 1. Diet therapy 2. Nature cure treatment and 3. Yoga therapy. The various parameters including lung function test were measured on admission and once a week. Results showed the significant improvement in PEFR, VC, FVC, FEV1, FEV/FEC %, MVV, ESR and absolute eosinophil count. The patients reported a feeling of well being, freshness and comfortable breathing. Naturopathy and yoga helps in inducing positive health, alleviating the symptoms of disease by acting at physical and mental levels.

Appl Psychophysiol Biofeedback 2000 Dec;25(4):221-7

Oxygen consumption and respiration following two yoga relaxation techniques.

Telles S, Reddy SK, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, No. 9, 1st Main, Appajappa Agrahara, Chamarajpet, Bangalore 560 018, India. anvesana@vsnl.com

The present study was conducted to evaluate a statement in ancient yoga texts that suggests that a combination of both "calming" and "stimulating" measures may be especially helpful in reaching a state of mental equilibrium. Two yoga practices, one combining "calming and stimulating" measures (cyclic meditation) and the other, a "calming" technique (shavasan), were compared. The oxygen consumption, breath rate, and breath volume of 40 male volunteers (group mean +/- SD, 27.0 +/- 5.7 years) were assessed before and after sessions of cyclic meditation (CM) and before and after sessions of shavasan (SH). The 2 sessions (CM, SH) were 1 day apart. Cyclic meditation includes the practice of yoga postures interspersed with periods of supine relaxation. During SH the subject lies in a supine position throughout the practice. There was a significant decrease in the amount of oxygen consumed and in breath rate and an increase in breath volume after both types of sessions (2-factor ANOVA, paired t test). However, the magnitude of change on all 3 measures was greater after CM: (1) Oxygen consumption decreased 32.1% after CM compared with 10.1% after SH; (2) breath rate decreased 18.0% after CM and 15.2% after SH; and (3) breath volume increased 28.8% after CM and 15.9% after SH. These results support the idea that a combination of yoga postures interspersed with relaxation reduces arousal more than relaxation alone does.

Altern Ther Health Med 2000 Nov;6(6):55-63

Hatha yoga: improved vital capacity of college students.

Birkel DA, Edgren L.

School of Physical Education, Ball State University, Muncie, USA.

CONTEXT: The vital capacity of the lungs is a critical component of good health. Vital capacity is an important concern for those with asthma, heart conditions, and lung ailments; those who smoke; and those who have no known lung problems. OBJECTIVE: To determine the effects of yoga postures and breathing exercises on vital capacity. DESIGN: Using the Spiropet spirometer, researchers measured vital capacity. Vital capacity determinants were taken near the beginning and end of two 17-week semesters. No control group was used. SETTING: Midwestern university yoga classes taken for college credit. PARTICIPANTS: A total of 287 college students, 89 men and 198 women. INTERVENTION: Subjects were taught yoga poses, breathing techniques, and relaxation in two 50-minute class meetings for 15 weeks. MAIN OUTCOME MEASURES: Vital capacity over time for smokers, asthmatics, and those with no known lung disease. RESULTS: The study showed a statistically significant ($P < .001$) improvement in vital capacity across all categories over time. CONCLUSIONS: It is not known whether these findings were the result of yoga poses, breathing techniques, relaxation, or other aspects of exercise in the subjects' life. The subjects' adherence to attending class was 99.96%. The large number of 287 subjects is considered to be a valid number for a study of this type. These findings are consistent with other research studies reporting the positive effect of yoga on the vital capacity of the lungs.

Lancet 2000 Oct 28;356(9240):1495-6

Yoga and chemoreflex response to hypoxia and hypercapnia.

Spicuzza L, Gabutti A, Porta C, Montano N, Bernardi L.

We tested whether chemoreflex sensitivity could be affected by the practice of yoga, and whether this is specifically because of a slow breathing rate obtained during yoga or as a general consequence of yoga. We found that slow breathing rate per se substantially reduced chemoreflex sensitivity, but long-term yoga practice was responsible for a generalised reduction in chemoreflex.

J Assoc Physicians India 2000 Mar;48(3):343-5

The role of cough and hyperventilation in perpetuating airway inflammation in asthma.

Singh V, Chowdhary R, Chowdhary N.
Department of Pulmonary Medicine, SMS Medical College, Jaipur-302 016, India.

Air flowing through a pipe exerts frictional stress on the walls of the pipe. Frictional

stress of more than 40 N/m2 (velocity equivalent of air 113 m/s) is known to cause acute endothelial damage in blood vessels. The frictional stress in airways during coughing may be much greater, however, since the velocity of air may be as high as speed of sound in air. We suggest that high levels of frictional stress perpetuate airway inflammation in airways which are already inflamed and vulnerable to frictional stress-induced trauma in patients with asthma. Activities associated with rapid ventilation and higher frictional stress (e.g. exercise, hyperventilation, coughing, sneezing and laughing) cause asthma to worsen whilst activities that reduce frictional stress (Yoga 'Pranayama', breathing a helium-oxygen mixture and nasal continuous positive airway pressure) are beneficial. Therefore control of cough may have anti-inflammatory benefits in patients with asthma.

J Assoc Physicians India 1998 Feb;46(2):207-8

Yoga therapy in chronic bronchitis.

Behera D.

Department of Pulmonary Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh, 160 012.

Fifteen patients of chronic bronchitis received yoga therapy in the form of pranayam and 8 types of 'asans' for a period of 4 weeks. They had a perceptible improvement in dyspnoea as was measured by visual analog. Lung function parameters (VC, FEV1, and PEFR) also improved after the practice of yoga. This preliminary study indicates that, yoga may be an useful adjunct to other conventional form of therapy for COPD.

Allergy Asthma Proc 1998 Jan-Feb;19(1):3-9

Clinical study of yoga techniques in university students with asthma: a controlled study.

Vedanthan PK, Kesavalu LN, Murthy KC, Duvall K, Hall MJ, Baker S, Nagarathna S.

Northern Colorado Allergy Asthma Clinic, Fort Collins 80524, USA.

Adult asthmatics, ranging from 19 to 52 years from an asthma and allergy clinic in a university setting volunteered to participate in the study. The 17 students were randomly divided into yoga (9 subjects) and nonyoga control (8 subjects) groups. The yoga group was taught a set of breathing and relaxation techniques including breath slowing exercises (pranayama), physical postures (yogasanas), and meditation. Yoga techniques were taught at the university health center, three times a week for 16 weeks. All the subjects in both groups maintained daily symptom and medication diaries, collected A.M. and P.M. peak flow readings, and completed weekly questionnaires. Spirometry was performed on each subject every week. Analysis of

the data showed that the subjects in the yoga group reported a significant degree of relaxation, positive attitude, and better yoga exercise tolerance. There was also a tendency toward lesser usage of beta adrenergic inhalers. The pulmonary functions did not vary significantly between yoga and control groups. Yoga techniques seem beneficial as an adjunct to the medical management of asthma.

Laryngorhinootologie 1997 Oct;76(10):577-82

Changes in body equilibrium response caused by breathing. A posturographic study with visual feedback

Article in German

Aust G, Fischer K.

Beratungsstelle fur Horbehinderte Berlin Neukolln.

BACKGROUND: Therapeutical methods involving holistic medicine are of increasing interest. The present study deals with the psychophysical breath work by Middendorf and examines whether it has an effect on reactions of the body's equilibrium system. METHODS: Different optical patterns were projected on a video screen to the test subject standing on a modified posturographic platform. Subjects were instructed to shift their center of gravity according to the patterns projected on the video screen. The patterns consisted of a line that had to be followed in the anterior-posterior and in the lateral plane, and of a circle which had to be followed clockwise and counterclockwise. PATIENTS: Three groups each consisting of 17 healthy persons were tested; group 1: advanced in breath training, group 2: beginners in breath training, group 3: no experience in breath work at all. RESULTS: Group 1 und 2 show significantly better results in the posturographic test with visual feedback than subjects without experience in breast work (group 3). Furthermore, posturographic results immediately after one hour of breath work reveal clear improvements in the body equilibrium. CONCLUSIONS: Psychophysical breath work by Middendorf leads to a general improvement of the body equilibrium which is stable over time. The positive results of this study lead to the assumption that breath work by Middendorf is a valuable method for treatment and rehabilitation of balance disorders.

Psychol Rep 1997 Oct;81(2):555-61

Yoga breathing through a particular nostril increases spatial memory scores without lateralized effects.

Naveen KV, Nagarathna R, Nagendra HR, Telles S.

Vivekananda Kendra Yoga Research Foundation, Bangalore, India.

Uninostril breathing facilitates the performance on spatial and verbal cognitive tasks,

said to be right and left brain functions, respectively. Since hemispheric memory functions are also known to be lateralized, the present study assessed the effects of uninostril breathing on the performance in verbal and spatial memory tests. School children (N = 108 whose ages ranged from 10 to 17 years) were randomly assigned to four groups. Each group practiced a specific yoga breathing technique: (i) right nostril breathing, (ii) left nostril breathing, (iii) alternate nostril breathing, or (iv) breath awareness without manipulation of nostrils. These techniques were practiced for 10 days. Verbal and spatial memory was assessed initially and after 10 days. An age-matched control group of 27 were similarly assessed. All 4 trained groups showed a significant increase in spatial test scores at retest, but the control group showed no change. Average increase in spatial memory scores for the trained groups was 84%. It appears yoga breathing increases spatial rather than verbal scores, without a lateralized effect.

J Altern Complement Med 1997 Fall;3(3):291-5

Influence of intensive yoga training on physiological changes in 6 adult women: a case report.

Raju PS, Prasad KV, Venkata RY, Murthy KJ, Reddy MV.

Department of Work-Physiology, Govt. Vemana Yoga Research Institute, Ameerpet, Hyderabad, India.

The short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers were measured using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre- and post-yoga exercise performance was compared. Maximal work output (Wmax) for the group increased by 21%, with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 Wmin(-1) (corresponding to Wmax of the pre-yoga maximal exercise test) participants could exercise more comfortably, with a significantly lower heart rate ($p < 0.05$), reduced minute ventilation ($p < 0.05$), reduced oxygen consumption per unit work ($p < 0.05$), and a significantly lower respiratory quotient ($p < 0.05$). The implications for the effect of intensive yoga on cardiorespiratory efficiency are discussed, with the suggestion that yoga has some transparently different quantifiable physiological effects to other exercises.

Indian J Physiol Pharmacol 1996 Oct;40(4):318-24

Study of pulmonary and autonomic functions of asthma patients after yoga training.

Khanam AA, Sachdeva U, Guleria R, Deepak KK.

Department of Physiology, All India Institute of Medical Science, New Delhi.

"The concept of yoga is helpful for the treatment of Bronchial Asthma", has created a great interest in the medical research field. In order to investigate whether autonomic functions and pulmonary functions are improved in asthma patients after short term yoga training, a study was conducted with nine diagnosed bronchial asthma patients. Yoga training was given for seven days in a camp in Adhyatma Sadhna Kendra, New Delhi. The autonomic function tests to measure the parasympathetic reactivity (Deep Breathing test, Valsalva Manouever), Sympathetic reactivity (Hand Grip test, Cold Pressure test), and pulmonary function tests FVC, FEV1, PEFR, PIF, BHT and CE were recorded before and after yoga training. The resting heart rate after yoga training ($P < 0.05$) was significantly decreased (89.55 +/- 18.46/min to 76.22 +/- 16.44/min). The sympathetic reactivity was reduced following yoga training as indicated by significant ($P < 0.01$) reduction in DBP after HGT. There was no change in parasympathetic reactivity. The FVC, FEV1, PEFR did not show any significant change. The PIF ($P < 0.01$), BHT ($P < 0.01$) and CE ($P < 0.01$) showed significant improvement. The results closely indicated the reduction in sympathetic reactivity and improvement in the pulmonary ventilation by way of relaxation of voluntary inspiratory and expiratory muscles. The "comprehensive yogic life style change programme for patients of Bronchial Asthma" have shown significant benefit even within a short period.

J Altern Complement Med 1996 Winter;2(4):479-84

Physiological measures of right nostril breathing.

Telles S, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Bangalore, India.

This study was conducted to assess the physiological effects of a yoga breathing practice that involves breathing exclusively through the right nostril. This practice is called surya anuloma viloma pranayama (SAV). Twelve volunteers (average age 27.2 years +/- 3.3 years, four males) were assessed before and after test sessions conducted on two consecutive days. On one day the test session involved practicing SAV pranayama for 45 minutes (SAV session). During the test period of the other day, subjects were asked to breathe normally for 45 minutes (NB session). For half the patients (randomly chosen) the SAV session was on the first day and the NB session on the next day. For the remaining six patients, the order of the two sessions was reversed. After the SAV session (but not after the NB) there was a significant ($P < .05$, paired t test) increase in oxygen consumption (17%) and in systolic blood pressure (mean increase 9.4 mm Hg) and a significant decrease in digit pulse volume (45.7%). The latter two changes are interpreted to be the result of increased cutaneous vasoconstriction. After both SAV and NB sessions, there was a significant decrease in skin resistance (two factor ANOVA, Tukey test). These findings show that SAV has a sympathetic stimulating effect. This technique and other variations of unilateral forced nostril breathing deserve further study regarding therapeutic merits in a wide range of disorders.

Rev Mal Respir 1995;12(3):241-56

Respiratory re-training in asthma. Theoretical basis and results

Article in French

Vandevenne A.

Service de Pneumologie, Hopitaux Universitaires de Strasbourg, Hopital de Hautepierre, Strasbourg.

The treatment of asthma is medical. The prescription of respiratory physiotherapy should not be routine. It only appears to be indicated in asthmatics with continuous dyspnoea or hypersecretion who are unstable, despite medical treatment which is both correctly prescribed and properly taken. Bronchial drainage, on condition that certain technical precautions are taken, is only useful in asthma with hypersecretion. Asthmatic crises are not relieved by physiotherapy. Standard respiratory exercises could have a certain value on hyperinflation in the chronic asthma of childhood. They are generally without effect on airways resistance or expiratory flow. Likewise, there are reflex massages for relaxation, posture, and respiratory exercises which are borrowed from yoga. Techniques for correction of posture, used preventively, are only of value in chronic asthma of childhood. Respiratory muscle training, in spite of a few successes, is not justified on a theoretical basis, at least in those subjects who have not been subjected to long-term steroid therapy. Overall, exercise training is useful from both the physiological and the psychological point of view. The anaerobic threshold would seem to be the ideal level of intensity for exercise on the basis of 30 minutes, three times a week for subjects who are moderately or severely affected. The rest on condition of certain precautions, can participate in the sport of their choice (or more or less) without any training in the medical milieu beforehand. However, in a minority of these patients the physiotherapists, by their individualised approach and their techniques, sometimes represent a useful transition towards participating in sports. There is no cost benefit study available.

Int J Psychophysiol 1994 Oct;18(1):75-9

EEG changes during forced alternate nostril breathing.

Stancak A Jr, Kuna M.

Department of Physiology and Clinical Physiology, Charles IV University, Prague, Czech Republic.

The effects of 10 min forced alternate nostril breathing (FANB) on EEG topography were studied in 18 trained subjects. One type of FANB consisted in left nostril inspiration and right nostril expiration and the other type in right nostril inspiration and left nostril expiration. Mean power in the beta bands and partially in the alpha band increased during FANB irrespective of the type of nostril breathing. In addition, hemisphere asymmetry in the beta 1 band decreased in the second half of FANB suggesting that FANB has a balancing effect on the functional activity of the left and

right hemisphere.

Indian J Med Res 1994 Aug;100:81-6

Comparison of effects of yoga & physical exercise in athletes.

Raju PS, Madhavi S, Prasad KV, Reddy MV, Reddy ME, Sahay BK, Murthy KJ.

Govt. Vemana Yoga Research Institute, Secunderabad.

The effect of pranayama a controlled breathing practice, on exercise tests was studied in athletes in two phases; sub-maximal and maximal exercise tests. At the end of phase I (one year) both the groups (control and experimental) achieved significantly higher work rate and reduction in oxygen consumption per unit work. There was a significant reduction in blood lactate and an increase in P/L ratio in the experimental group, at rest. At the end of phase II (two years), the oxygen consumption per unit work was found to be significantly reduced and the work rate significantly increased in the experimental group. Blood lactate decreased significantly at rest in the experimental group only. Pyruvate and pyruvate-lactate ratio increased significantly in both the groups after exercise and at rest in the experimental group. The results in both phases showed that the subjects who practised pranayama could achieve higher work rates with reduced oxygen consumption per unit work and without increase in blood lactate levels. The blood lactate levels were significantly low at rest.

Pneumologie 1994 Jul;48(7):484-90

Long-term effects of breathing exercises and yoga in patients with bronchial asthma

Article in German

Fluge T, Richter J, Fabel H, Zysno E, Weller E, Wagner TO.

Abteilung Pneumologie, Medizinischen Hochschule Hannover.

To compare the effects of breathing exercises (BE) or Yoga (Y) on the course of bronchial asthma we studied 36 subjects with a mild disease. The patients were randomly divided into 3 groups. 2 of them participated in a 3 weeks training program of BE or Y while the third group rested without any additional treatment (control group, C). At the end of the training period the patients were asked to practise BE or Y on their own. Drug therapy and lung function parameters before and after a beta 2-agonist metered dose inhaler (albuterol, ALB) were recorded prior to the training program and in 4 weeks intervals for 4 months thereafter. The response to the beta 2-agonist was documented continuously in 28 patients. The mental state of the patients was elucidated by questionnaires.--Prior to the study a significant effect of inhaled ALB on the FEV1 was shown without any significant between group differences. Both, BE and Y, caused a significant amelioration of the mental state but only the BE induced a significant improvement of lung function parameters compared to the individual baseline values. The FEV1 increased significantly by 356.3 +/- 146.2 ml ($p < 0.05$) and the VC by 225.0 +/- 65.5 ml ($p < 0.01$). These long-term changes were not

significantly different from the actual response to ALB. BE decreased the RV significantly by 306.3 +/- 111.6 ml ($p < 0.05$), an effect significantly higher compared to the beta 2-agonist ($p < 0.01$). BE in combination with ALB caused an additive effect.

Indian J Physiol Pharmacol 1994 Apr;38(2):133-7

Breathing through a particular nostril can alter metabolism and autonomic activities.

Telles S, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Chamarajpet, Bangalore.

There is increasing interest in the fact that breathing exclusively through one nostril may alter the autonomic functions. The present study aimed at checking whether such changes actually do occur, and whether breathing is consciously regulated. 48 male subjects, with ages ranging from 25 to 48 years were randomly assigned to different groups. Each group was asked to practice one out of three pranayamas (viz. right nostril breathing, left nostril breathing or alternate nostril breathing). These practices were carried out as 27 respiratory cycles, repeated 4 times a day for one month. Parameters were assessed at the beginning and end of the month, but not during the practice. The 'right nostril pranayama' group showed a significant increase, of 37% in baseline oxygen consumption. The 'alternate nostril' pranayama group showed an 18% increase, and the left nostril pranayama group also showed an increase, of 24%. This increase in metabolism could be due to increased sympathetic discharge to the adrenal medulla. The 'left nostril Pranayama' group showed an increase in volar galvanic skin resistance, interpreted as a reduction in sympathetic nervous system activity supplying the sweat glands. These results suggest that breathing selectively through either nostril could have a marked activating effect or a relaxing effect on the sympathetic nervous system. The therapeutic implications of being able to alter metabolism by changing the breathing pattern have been mentioned.

Indian J Physiol Pharmacol 1994 Jan;38(1):29-33

Energy expenditure and ventilatory responses during Siddhasana--a yogic seated posture.

Rai L, Ram K, Kant U, Madan SK, Sharma SK.

Central Research Institute for Yoga, New Delhi.

Reports of energy expenditure and ventilatory responses to yogic seated posture of Siddhasana are lacking in literature. Various cardio-ventilatory responses were studied in states of the horizontal supine, chair-sitting and Siddhasana. It was observed that sitting in Siddhasana posture was characterised by greater minute ventilation, larger tidal volume, higher oxygen consumption, greater CO_2 elimination, higher heart frequency greater oxygen pulse and lesser as compared with other two postures.

These observations suggest that Siddhasana is a mild type of exercise and may have its application in conditions of low cardio-respiratory reserves especially in individuals in whom heavy exercises are contra-indicated.

Int J Neurosci 1993 Nov;73(1-2):47-60

The effects of unilateral forced nostril breathing on the heart.

Shannahoff-Khalsa DS, Kennedy B.

Department of Medicine, University of California, San Diego 92103-8341.

Three experiments are described that employ impedance cardiography to monitor the effects of unilateral forced nostril breathing (UFNB) on the heart. Experiment 1 includes 7 subjects (4 males, 3 females) with a respiratory rate of 6 breaths/min (BPM). Experiment 2 includes 16 trials using one subject to examine the intraindividual variability, at 6 BPM. Experiment 3 includes 10 trials with the same subject in experiment 2, but with a respiratory rate of 2-3 breaths/s. This rapid rate of respiration is a yogic breathing technique called "breath of fire" or "kapalabhatti" and employs a very shallow but rapid breath in which the abdominal region acts like a bellows. All 3 experiments demonstrated that right UFNB increases heart rate (HR) compared to left. Experiment 1 gave 7 negative slopes, or lowering in HR with left nostril breathing and 7 positive slopes, or increases in HR with right nostril breathing, $p = .001$. The second and third experiments showed differences in HR means in which right UFNB increases HR more than left, $p = .013$, $p = .001$, respectively. In experiment 2 stroke volume was higher with left UFNB, $p = .045$, compensating for lower HR. Left UFNB increased end diastolic volume as measured in both experiments 1 and 2, $p = .006$, $p = .001$, respectively. These results demonstrate a unique unilateral effect on sympathetic stimulation of the heart that may have therapeutic value.

Int J Neurosci 1993 Nov;73(1-2):61-8

The effects of unilateral forced nostril breathing on cognitive performance.

Jella SA, Shannahoff-Khalsa DS.

Department of Psychiatry University of California, Davis 95817.

This study describes the effects of 30 minutes of unilateral forced nostril breathing on cognitive performance in 51 right-handed undergraduate psychology students (25 males and 26 females). A verbal analogies task modeled after the Miller Analogies and SAT Tests was used as a test of left-hemispheric performance and mental rotation tasks based on the Vandenburg and Kuse adaptation of Shepard and Metzler's tests were used as spatial tasks for testing right-hemispheric performance. Spatial task performance was significantly enhanced during left nostril breathing in both males and

females, p = .028. Verbal task performance was greater during right nostril breathing, but not significantly p = .14. These results are discussed in comparison to other cognitive and physiological studies using unilateral forced nostril breathing. This yogic breathing technique may have useful application in treating psychophysiological disorders with hemispheric imbalances and disorders with autonomic abnormalities.

Singapore Med J 1993 Aug;34(4):306-8

Evaluation of yoga therapy programme for patients of bronchial asthma.

Jain SC, Talukdar B.

Central Research Institute for Yoga, (Under Ministry of Health & Family Welfare, Government of India), New Delhi.

A study of the effect of yoga therapy programme on 46 indoor patients of chronic bronchial asthma on exercise capacity, pulmonary functions and blood gases was conducted. Exercise capacity was measured by 3 tests: (i) 12 min walk test (12-md); (ii) physical fitness index (PFI) by modified Harvard step test; and (iii) Exercise-Liability index (ELI). Yoga therapy programme resulted in a significant increase in the pulmonary functions and exercise tolerance. A one-year follow-up study showed a good to fair response with reduced symptoms score and drug requirements in these subjects. It is concluded that yoga therapy is beneficial for bronchial asthma.

Indian J Physiol Pharmacol 1992 Oct;36(4):229-33

Effect of yoga training on reaction time, respiratory endurance and muscle strength.

Madanmohan, Thombre DP, Balakumar B, Nambinarayanan TK, Thakur S, Krishnamurthy N, Chandrabose A.

Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry.

There is evidence that the practice of yoga improves physical and mental performance. The present investigation was undertaken to study the effect of yoga training on visual and auditory reaction times (RTs), maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP), 40 mmHg test, breath holding time after expiration (BHTexp), breath holding time after inspiration (BHTinsp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 weeks. There was a significant (P < 0.001) decrease in visual RT (from 270.0 +/- 6.20 (SE) to 224.81 +/- 5.76 ms) as well as auditory RT (from 194.18 +/- 6.00 to 157.33 +/- 4.85 ms). MEP increased from 92.61 +/- 9.04 to 126.46 +/- 10.75 mmHg, while MIP increased from 72.23 +/- 6.45 to 90.92 +/- 6.03 mmHg, both these changes being statistically significant (P < 0.05). 40 mmHg test and HGS increased significantly (P < 0.001) from 36.57 +/- 2.04 to 53.36 +/- 3.95 s and 13.78 +/- 0.58

to 16.67 +/- 0.49 kg respectively. BHTexp increased from 32.15 +/- 1.41 to 44.53 +/- 3.78s (P < 0.01) and BHTinsp increased from 63.69 +/- 5.38 to 89.07 +/- 9.61 s (P < 0.05). Our results show that yoga practice for 12 weeks results in significant reduction in visual and auditory RTs and significant increase in respiratory pressures, breath holding times and HGS.

Indian J Physiol Pharmacol 1992 Apr;36(2):105-8

Effect of short term 'Pranayam' practice on breathing rate and ventilatory functions of lung.

Joshi LN, Joshi VD, Gokhale LV.

Department of Physiology, L.T.M. Medical College, Bombay.

Thirty three normal male and forty two normal female subjects, of average age of 18.5 years, underwent six weeks course in 'Pranayam' and their ventilatory lung functions were studied before and after this practice. They had improved ventilatory functions in the form of lowered respiratory rate (RR), and increases in the forced vital capacity (FVC), forced expiratory volume at the end of 1st second (FEV1%), maximum voluntary ventilation (MVV), peak expiratory flow rate (PEFR-lit/sec), and prolongation of breath holding time.

Homeost Health Dis 1991 Oct;33(3):126-34

Kapalabhati--yogic cleansing exercise. I. Cardiovascular and respiratory changes.

Stancak A Jr, Kuna M, Srinivasan, Vishnudevananda S, Dostalek C.

Institute of Physiological Regulations, Czechoslovak Academy of Sciences, Praha.

We studied cardiovascular and respiratory changes during yogic breathing exercise kapalabhati (KB) in 17 advanced yoga practitioners. The exercise consisted in fast shallow abdominal respiratory movements at about 2 Hz frequency. Blood pressure, ECG and respiration were recorded continuously during three 5 min periods of KB and during pre- and post-KB resting periods. The beat-to-beat series of systolic blood pressure (SBP) and diastolic blood pressure (DBP), R-R intervals and respiration were analysed by spectral analysis of time series. The mean absolute power was calculated in three frequency bands--band of spontaneous respiration, band of 0.1 Hz rhythm and the low-frequency band greater than 15 s in all spectra. The mean modulus calculated between SBP and R-R intervals was used as a parameter of baroreceptor-cardiac reflex sensitivity (BRS). Heart rate increased by 9 beats per min during KB. SBP and DBP increased during KB by 15 and 6 mmHg respectively. All frequency bands of R-R interval variability were reduced in KB. Also the BRS parameter was reduced in KB. The amplitude of the high-frequency oscillations in SBP and DBP

increased during KB. The low-frequency blood pressure oscillations were increased after KB. The results point to decreased cardiac vagal tone during KB which was due to changes in respiratory pattern and due to decreased sensitivity of arterial baroreflex. Decreased respiratory rate and increased SBP and low-frequency blood pressure oscillations after KB suggest a differentiated pattern of vegetative activation and inhibition associated with KB exercise

---

Indian J Med Res 1991 Oct;94:357-63

Oxygen consumption during pranayamic type of very slow-rate breathing.

Telles S, Desiraju T.

Department of Neurophysiology, National Institute of Mental Health & Neuro Sciences, Bangalore.

To determine whether the yogic Ujjayi pranayamic type of breathing that involves sensory awareness and consciously controlled, extremely slow-rate breathing including at least a period of end-inspiration breath holding in each respiratory cycle would alter oxygen consumption or not, ten males with long standing experience in pranayama, and volunteering to participate in the laboratory study were assessed. These subjects aged 28-59 yr, had normal health appropriate to their age. Since kumbhak (timed breath holding) is considered as an important phase of the respiratory cycle in the pranayama, they were categorised into two groups of five each, one group practising the short kumbhak varieties of pranayama, and the other the long kumbhak varieties of pranayama. The duration of kumbhak phase was on an average 22.2 percent of the respiratory cycle in the short kumbhak group, and 50.4 per cent in the long kumbhak group. The oxygen consumption was measured in test sessions using the closed circuit method of breathing oxygen through the Benedict-Roth spirometer. Each subject was tested in several repeat sessions. Values of oxygen consumption of the period of pranayamic breathing, and of post-pranayamic breathing period, were compared to control value of oxygen consumption of the prepranayamic breathing period of each test session. The results revealed that the short kumbhak pranayamic breathing caused a statistically significant increase (52%) in the oxygen consumption (and metabolic rate) compared to the pre-pranayamic base-line period of breathing. In contrast to the above, the long kumbhak pranayamic breathing caused a statistically significant lowering (19% of the oxygen consumption (and metabolic rate).

J Asthma 1991;28(6):437-42

Effect of yoga training on exercise tolerance in adolescents with childhood asthma.

Jain SC, Rai L, Valecha A, Jha UK, Bhatnagar SO, Ram K.

Laboratory Division, Central Research Institute for Yoga, New Delhi, India.

Forty six young asthmatics with a history of childhood asthma were admitted for yoga training. Effects of training on resting pulmonary functions, exercise capacity, and exercise-induced bronchial lability index were measured. Yoga training resulted in a significant increase in pulmonary function and exercise capacity. A follow-up study spanning two years showed a good response with reduced symptom score and drug requirements in these subjects. It is concluded that yoga training is beneficial for young asthmatics.

Physiol Res 1991;40(3):345-54

Observations on respiratory and cardiovascular rhythmicities during yogic high-frequency respiration.

Stancak A Jr, Kuna M, Novak P, Srinivasan MA, Dostalek C, Vishnudevananda S.

Institute of Physiological Regulations, Czechoslovak Academy of Sciences, Prague.

Yogic high-frequency respiration--kapalabhati (KB)--was studied in 24 subjects from a point of rhythmicity. Respiratory movements, blood pressure and R-R intervals of ECG were recorded in parallel and evaluated by spectral analysis of time series. Respiratory signals during KB were modulated by 0.1 Hz rhythm in 82% of experiments. This component was also present in R-R intervals and blood pressure during KB. Frequency (0.2-0.3 Hz) was observed in 67% of respiratory records. The presence of the component 0.2-0.3 Hz in respiration was dependent on resting respiratory frequency. This frequency component was reduced in R-R intervals but increased in blood pressure during kapalabhati as compared to that at rest. The occurrence of both frequency components in respiration during KB supports the hypothesis about the integrative role of cardiovascular and respiratory rhythms in physiological states characterized by altered respiratory frequency.

Lancet 1990 Jun 9;335(8702):1381-3

Effect of yoga breathing exercises (pranayama) on airway reactivity in subjects with asthma.

Singh V, Wisniewski A, Britton J, Tattersfield A.

Respiratory Medicine Unit, City Hospital, Nottingham, UK.

The effects of two pranayama yoga breathing exercises on airway reactivity, airway calibre, symptom scores, and medication use in patients with mild asthma were assessed in a randomised, double-blind, placebo-controlled, crossover trial. After baseline assessment over 1 week, 18 patients with mild asthma practised slow deep breathing for 15 min twice a day for two consecutive 2-week periods. During the

active period, subjects were asked to breathe through a Pink City lung (PCL) exerciser--a device which imposes slowing of breathing and a 1:2 inspiration:expiration duration ratio equivalent to pranayama breathing methods; during the control period, subjects breathed through a matched placebo device. Mean forced expiratory volume in 1 s (FEV1), peak expiratory flow rate, symptom score, and inhaler use over the last 3 days of each treatment period were assessed in comparison with the baseline assessment period; all improved more with the PCL exerciser than with the placebo device, but the differences were not significant. There was a statistically significant increase in the dose of histamine needed to provoke a 20% reduction in FEV1 (PD20) during pranayama breathing but not with the placebo device. The usefulness of controlled ventilation exercises in the control of asthma should be further investigated.

Act Nerv Super (Praha) 1990 Jun;32(2):99-114

Hathayogic exercise jalandharabandha in its effect on cardiovascular response to apnoea.

Lepicovska V, Dostalek C, Kovarova M.

Institute of Physiological Regulations, Czechoslovak Academy of Sciences, Praha.

Jalandharabandha (JB) is the important constituent of apnoea (kumbhaka) in hathayogic breathing exercises. It is performed by pressing the chin into the jugular notch and creating thus the positive pressure on the neck region. The influence of JB on the heart rate and vasomotor response was studied in relationship to different lung volumes. The course of R-R intervals is highly significantly different according to the type of apnoea. JB leads to the diminution of bradycardia, but does not change the position of the maximum and minimum in comparison to the apnoea without JB. Application of JB increases the number of vasodilatations and shortens the latencies of vasodilatations, duration and amplitude of reactions. JB during breath holding decreases the vagal reflex changes and may thus work as a stabilizing component in yogic breathing exercises.

Act Nerv Super (Praha) 1990 Jun;32(2):95-8

Effect of Kapalabhati on blood urea, creatinine and tyrosine.

Desai BP, Gharote ML.

Scientific Research Dept., Kaivalyadhama, Lonavla.

The present study conducted on twelve normal healthy male subjects showed decrease in blood urea, increase in creatinine and tyrosine after one minute of Kapalabhati, a fast-breathing technique of Hatha Yoga (120 respiratory strokes (min.). From biochemical point of view the practice of Kapalabhati seems to promote

decarboxylation and oxidation mechanisms due to which quieting of respiratory centres is achieved, which is also the prerequisite for the practice of Pranayama, another important technique of Yoga.

Thorax 1988 Sep;43(9):731-2

Increased muscle enzyme activity after yoga breathing during an exacerbation of asthma.

Tamarin FM, Conetta R, Brandstetter RD, Chadow H.

Division of Pulmonary Diseases, New Rochelle Hospital Medical Center, New York.

The case is reported of a yoga practitioner who, during an exacerbation of asthma, developed a substantial increase in serum muscle enzymes. This was related to his yoga breathing exercises, which he used to enhance the delivery of aerosolised bronchodilators. As his condition improved and the use of these yoga manoeuvres diminished, the muscle enzyme levels fell to normal.

Indian J Physiol Pharmacol 1988 Jul-Sep;32(3):202-8

Effect of short term yoga practice on ventilatory function tests.

Makwana K, Khirwadkar N, Gupta HC.

Department of Physiology, M.G.M. Medical College, Indore.

Twentyfive normal male volunteers undergoing a ten weeks course in the practice of yoga have been studied by some parameters of ventilatory functions tests. The observations recorded at the end of ten weeks of the course have shown improved ventilatory functions in the form of lowered respiratory rate, increased forced vital capacity, FEV1, maximum breathing capacity and breath holding time, while tidal volume and %FEV1, did not reveal any significant change. Thus, a combined practice of yoga seems to be beneficial on respiratory efficiency.

J Asthma 1987;24(3):183-6

Kunjal: a nonspecific protective factor in management of bronchial asthma.

Singh V.

Department of Medicine, S.M.S. Medical College, Jaipur, India.

Seven asthmatic patients having nocturnal symptoms performed a yogic maneuver called Kunjal. Definite improvement was noticed subjectively and objectively in six patients during the week Kunjal was performed, and improvement in symptoms persisted into the third week in five patients.

Indian J Physiol Pharmacol 1986 Oct-Dec;30(4):334-40

Effect of yoga type breathing on heart rate and cardiac axis of normal subjects.

Mohan M, Saravanane C, Surange SG, Thombre DP, Chakrabarty AS.

Effect of inspiratory and expiratory phases of normal quiet breathing, deep breathing and savitri pranayam type breathing on heart rate and mean ventricular QRS axis was investigated in young, healthy untrained subjects. Pranayam type breathing produced significant cardioacceleration and increase in QRS axis during the inspiratory phase as compared to eupnea. On the other hand, expiratory effort during pranayam type breathing did not produce any significant change in heart rate or QRS axis. The changes in heart rate and QRS axis during the inspiratory and expiratory phases of pranayam type breathing were similar to the changes observed during the corresponding phases of deep breathing.

Indian J Physiol Pharmacol 1986 Apr-Jun;30(2):121-32

Effect of yoga on exercise tolerance in normal healthy volunteers.

Raju PS, Kumar KA, Reddy SS, Madhavi S, Gnanakumari K, Bhaskaracharyulu C, Reddy MV, Annapurna N, Reddy ME, Girijakumari D, et al.

Twelve normal healthy volunteers (6 males and 6 females) undergoing yoga training for 90 days were studied for the effect of yoga on exercise tolerance. Their ages ranged from 18 to 28 years. The volunteers were taught only Pranayama for the first 20 days and later on yogic asanas were added. Sub-maximal exercise tolerance test was done on a motorized treadmill by using Balke's modified protocol, initially, after 20 days (Phase-I) and after 90 days of yoga training (Phase-II). Pyruvate and lactate in venous blood and blood gases in capillary blood were estimated immediately before and after the exercise. Minute ventilation and oxygen consumption were estimated before and during the test. Post exercise blood lactate was elevated significantly during initial and Phase-I, but not in Phase-II. There was significant reduction of minute ventilation and oxygen consumption only in males in Phase-I and II at the time when the volunteers reached their 80% of the predicted heart rate. Female volunteers were able to go to higher loads of exercise in Phase-I and II.

J Asthma 1986;23(3):123-37

An integrated approach of yoga therapy for bronchial asthma: a 3-54-month prospective study.

Nagendra HR, Nagarathna R.

After an initial integrated yoga training program of 2 to 4 weeks, 570 bronchial asthmatics were followed up for 3 to 54 months. The training consisted of yoga practices--yogasanas, Pranayama, meditation, and kriyas--and theory of yoga. Results show highly significant improvement in most of the specific parameters. The regular practitioners showed the greatest improvement. Peak expiratory flow rate (PFR) values showed significant movement of patients toward normalcy after yoga, and 72, 69, and 66% of the patients have stopped or reduced parenteral, oral, and cortisone medication, respectively. These results establish the long-term efficacy of the integrated approach of yoga therapy in the management of bronchial asthma.

Br Med J (Clin Res Ed) 1985 Oct 19;291(6502):1077-9

Yoga for bronchial asthma: a controlled study.

Nagarathna R, Nagendra HR.

Fifty three patients with asthma underwent training for two weeks in an integrated set of yoga exercises, including breathing exercises, suryanamaskar, yogasana (physical postures), pranayama (breath slowing techniques), dhyana (meditation), and a devotional session, and were told to practise these exercises for 65 minutes daily. They were then compared with a control group of 53 patients with asthma matched for age, sex, and type and severity of asthma, who continued to take their usual drugs. There was a significantly greater improvement in the group who practised yoga in the weekly number of attacks of asthma, scores for drug treatment, and peak flow rate. This study shows the efficacy of yoga in the long term management of bronchial asthma, but the physiological basis for this beneficial effect needs to be examined in more detail.

J Adv Nurs 1984 Mar;9(2):127-33

A study of yoga as a nursing intervention in the care of patients with pleural effusion.

Prakasamma M, Bhaduri A.

'Pranayama' or yogic breathing as a method of re-expansion of lungs in patients with pleural effusion was studied. Ten patients with pleural effusion practised alternate nostril breathing for 20 days after aspiration of fluid. An equal number matched for

age and smoking habits underwent routine physiotherapy of the hospital for the same period. Lung function was measured: before aspiration; immediately after aspiration; and, 5, 10, 15 and 20 days after aspiration. The FVC, FEV1, MVV, PEFR, CE and RS, were used to measure lung function. The difference between the two groups in the gain in lung expansion as assessed by the above measures was tested for significance with appropriate nonparametric statistical tests at 0.1 level of significance. The results revealed that the patients practising Pranayama demonstrated a quicker re-expansion of the lungs in most of the measures of lung function. The findings are discussed in relation to implications for nursing care.

J Appl Physiol 1983 Dec;55(6):1854-61

Effects of high-frequency breathing on pulmonary ventilation and gas exchange.

Frostell C, Pande JN, Hedenstierna G.

The effects of spontaneous high-frequency breathing (HFB) on lung function were evaluated in three subjects highly trained in the practice of yoga. Transpulmonary pressure was measured by an esophageal balloon catheter and gas flow by pneumotachography. The abdominal and rib cage contributions to tidal breathing were measured separately by respiratory inductive plethysmography. Gas exchange was studied by the conventional technique and by multiple inert gas elimination. During HFB, respiratory rate increased to 232 cycles/min with a tidal volume of 0.35 liter. This resulted in a more than 10-fold increase in expired minute ventilation to approximately 90 1/min. The transpulmonary pressure varied by 20 cmH2O, with the calculated elastic, resistive, and accelerative components varying by 2, 20, and 8 cmH2O, respectively. Respiratory work increased more than 200-fold in comparison with resting ventilation. A phase shift between thoracic and abdominal breathing was observed and was interpreted as a volume displacement of approximately 30 1/min between the two parts of the respiratory system. Arterial oxygen and carbon dioxide tension remained normal. Bohr dead space increased, while acetone dead space remained unaltered. A bimodal distribution of ventilation-perfusion ratios (VA/Q) was observed, with one mode in normal and another in "high" VA/Q regions.

J Asthma 1982;19(3):189-201

Asthma: the yoga perspective. Part II: Yoga therapy in the treatment of asthma.

Goyeche JR, Abo Y, Ikemi Y.

The integral yoga approach to asthma (and other psychosomatic disorders) is briefly outlined as meeting all of the requirements for an optimal, holistic, somatopsychic therapy (as outlined in Part I), including correction of distorted posture and faulty breathing habits, teaching a system of general muscle relaxation, techniques for the release of suppressed emotion and for reducing anxiety and self-conscious awareness,

as well as special methods for the expectoration of mucus. Yoga practices are described in detail and the available psychophysiological research on yoga practice, as well as clinical-therapeutic studies on yoga as asthmatic therapy, are reviewed. It can therefore be concluded that yoga therapy is most effective with asthma.

J Appl Physiol 1981 Dec;51(6):1625-9

Pattern of breathing and ventilatory response to CO2 in subjects practicing hatha-yoga.

Stanescu DC, Nemery B, Veriter C, Marechal C.

WE studied eight Belgian subjects well advanced in the practice of hatha-yoga and compared them with eight sex-, age-, and height-matched control subjects. Practice of yoga (range 4-12 yr) involves control of posture and manipulation of breathing, including slow near-vital capacity maneuvers accompanied by apnea at end inspiration and end expiration. Average values for the yoga and the control group (in parentheses) are as follows: ventilation (VE) 5.53 1 X min-1 (7.07); tidal volume (VT), 1.03 liters (0.56); rate of breathing, 5.5 min-1 (13.4); end-tidal PCO2, 39.0 Torr (35.3). All differences are significant (P less than 0.05). Ventilatory response to CO2 (rebreathing technique) was significantly lower in the yoga group (P less than 0.01). The regression relating VE to VT during rebreathing of CO2 was VE = 8.1 (VT - 0.23) for the yoga group and VE = 15.8 (VT - 0.16) for the control group (P less than 0.005). We attribute these changes to chronic manipulation of respiration.

J Asthma Res 1980 Apr;17(3):111-21

Asthma: The yoga perspective. Part I. The somatopsychic imbalance in asthma: towards a holistic therapy.

Goyeche JR, Ago Y, Ikemi Y.

While the standard physiological and even certain psychological characteristics of asthmatic patients are well known, the current diagnostic and therapeutic approach to asthma remains inadequate, as it neglects certain interrelated somatopsychic factors vital to an optimal diagnostic-therapeutic programme. These include the role of skeletal muscle tension and posture, the role of the 'voluntary' respiratory musculature, especially the diaphragm, as well as anxiety, emotional suppression and excessive self-consciousness, all of which may be precipitants rather than the outcome of the onset of asthma. On the basis of these neglected factors and others, implications for an optimally effective therapy are discussed. The physical medicine or physiotherapeutic, as well as other recent therapeutic approaches, are reviewed and evaluated. It is concluded that all of these therapies are too "specific," and that a more holistic approach is necessary (which is provided in 'Asthma: The Yoga Perspective,' Part II-"Yoga Therapy in the Treatment of Asthma").

Thorax 1978 Aug;33(4):514-7

Adjunct treatment with yoga in chronic severe airways obstruction.

Tandon MK.

Eleven patients with severe chronic airways obstruction were given training in yogic breathing exercises and postures. A matched group of 11 patients were given physiotherapy breathing exercises. Both groups of patients were followed up at monthly intervals for nine months with pulmonary function tests, tests of exercise tolerance, and inquiry into their symptoms. After training in yoga the mean maximum work increased significantly by 60.55 kpm; whereas no such rise occurred after training in physiotherapy. This objective improvement was associated with symptomatic improvement in a significantly higher number of patients given training in yoga.

Percept Mot Skills 1978 Feb;46(1):171-4

Arterial blood gases in Pranayama practice.

Pratap V, Berrettini WH, Smith C.

Pranayama is a Yogic breathing practice which is known experientially to produce a profound calming effect on the mind. In an experiment designed to determine whether the mental effects of this practice were accompanied by changes in the arterial blood gases, arterial blood was drawn from 10 trained individuals prior to and immediately after Pranayama practice. No significance changes in arterial blood gases were noted after Pranayama. A neural mechanism for the mental effects of this practice is proposed.

Respiration 1975;32(1):74-80

Transcendental meditation and asthma.

Wilson AF, Honsberger R, Chiu JT, Novey HS.

A 6-month study with crossover at 3 months was designed to evaluate the possible beneficial effects of transcendental meditation upon bronchial asthma. 21 patients kept daily diaries of symptoms and medications and answered questionnaires at the

end of the study and 6 months later. Other measurements included physician evaluation, pulmonary function testing, and galvanic skin resistance. The results indicated that transcendental meditation is a useful adjunct in treating asthma.

Gehirn

Non-linear dynamic complexity of the human EEG during meditation.

Aftanas LI, Golocheikine SA.

Psychophysiology Laboratory, State-Research Institute of Physiology, Siberian Branch, Russian Academy of Medical Sciences, Timakova str. 4, 630117, Novosibirsk, Russia. aftanas@iph.ma.nsc.ru

We used non-linear analysis to investigate the dynamical properties underlying the EEG in the model of Sahaja Yoga meditation. Non-linear dimensional complexity (DCx) estimates, indicating complexity of neuronal computations, were analyzed in 20 experienced meditators during rest and meditation using 62-channel EEG. When compared to rest, the meditation was accompanied by a focused decrease of DCx estimates over midline frontal and central regions. By contrast, additionally computed linear measures exhibited the opposite direction of changes: power in the theta-1 (4-6 Hz), theta-2 (6-8 Hz) and alpha-1 (8-10 Hz) frequency bands was increased over these regions. The DCx estimates negatively correlated with theta-2 and alpha-1 and positively with beta-3 (22-30 Hz) band power. It is suggested that meditative experience, characterized by less complex dynamics of the EEG, involves 'switching off' irrelevant networks for the maintenance of focused internalized attention and inhibition of inappropriate information. Overall, the results point to the idea that dynamically changing inner experience during meditation is better indexed by a combination of non-linear and linear EEG variables.

Brain Res Cogn Brain Res 2002 Apr;13(2):255-9

Increased dopamine tone during meditation-induced change of consciousness.

Kjaer TW, Bertelsen C, Piccini P, Brooks D, Alving J, Lou HC.

John F. Kennedy Institute, Gl. Landevej 7, 2600, Glostrup, Denmark

This is the first in vivo demonstration of an association between endogenous neurotransmitter release and conscious experience. Using 11C-raclopride PET we demonstrated increased endogenous dopamine release in the ventral striatum during

Yoga Nidra meditation. Yoga Nidra is characterized by a depressed level of desire for action, associated with decreased blood flow in prefrontal, cerebellar and subcortical regions, structures thought to be organized in open loops subserving executive control. In the striatum, dopamine modulates excitatory glutamatergic synapses of the projections from the frontal cortex to striatal neurons, which in turn project back to the frontal cortex via the pallidum and ventral thalamus. The present study was designed to investigate whether endogenous dopamine release increases during loss of executive control in meditation. Participants underwent two 11C-raclopride PET scans: one while attending to speech with eyes closed, and one during active meditation. The tracer competes with endogenous dopamine for access to dopamine D2 receptors predominantly found in the basal ganglia. During meditation, 11C-raclopride binding in ventral striatum decreased by 7.9%. This corresponds to a 65% increase in endogenous dopamine release. The reduced raclopride binding correlated significantly with a concomitant increase in EEG theta activity, a characteristic feature of meditation. All participants reported a decreased desire for action during meditation, along with heightened sensory imagery. The level of gratification and the depth of relaxation did not differ between the attention and meditation conditions. Here we show increased striatal dopamine release during meditation associated with the experience of reduced readiness for action. It is suggested that being in the conscious state of meditation causes a suppression of cortico-striatal glutamatergic transmission. To our knowledge this is the first time in vivo evidence has been provided for regulation of conscious states at a synaptic level.

Seizure 2001 Jan;10(1):3-6

Yoga for epilepsy: methodological issues.

Ramaratnam S.

Apollo Hospital, Madras, 600006, India. rsridharan@vsnl.com

This article deals with the methodological issues that might be encountered in designing and conducting a randomized controlled study of the efficacy of yoga in the treatment of epilepsy. Methodological issues relating to patient selection, randomization, blinding, type of intervention, outcome measures and analysis are highlighted.

Seizure 2001 Jan;10(1):7-12

Yoga for control of epilepsy.

Yardi N.

Yardi Epilepsy Clinic, Kothrud, Pune, India. nyardi@hotmail.com

Yoga is an age-old traditional Indian psycho-philosophical-cultural method of leading one's life, that alleviates stress, induces relaxation and provides multiple health benefits to the person following its system. It is a method of controlling the mind through the union of an individual's dormant energy with the universal energy. Commonly practiced yoga methods are 'Pranayama' (controlled deep breathing), 'Asanas' (physical postures) and 'Dhyana' (meditation) admixed in varying proportions with differing philosophic ideas. A review of yoga in relation to epilepsy encompasses not only seizure control but also many factors dealing with overall quality-of-life issues (QOL). This paper reviews articles related to yoga and epilepsy, seizures, EEG, autonomic changes, neuro-psychology, limbic system, arousal, sleep, brain plasticity, motor performance, brain imaging studies, and rehabilitation. There is a dearth of randomized, blinded, controlled studies related to yoga and seizure control. A multi-centre, cross-cultural, preferably blinded (difficult for yoga), well-randomized controlled trial, especially using a single yogic technique in a homogeneous population such as Juvenile myoclonic epilepsy is justified to find out how yoga affects seizure control and QOL of the person with epilepsy.

Percept Mot Skills 2000 Jun;90(3 Pt 1):1027-32

Decrease in serum cortisol during yoga exercise is correlated with alpha wave activation.

Kamei T, Toriumi Y, Kimura H, Ohno S, Kumano H, Kimura K.

Shimane Institute of Health Science, Izumo, Japan.

We examined changes in brain waves and blood levels of serum cortisol during yoga exercise in 7 yoga instructors and found that alpha waves increased and serum cortisol decreased. These two measures were negatively correlated (r = -.83). Comparison with a control group of nonpractitioners is desirable.

Indian J Physiol Pharmacol 2000 Apr;44(2):197-201

Effect of yoga training on maze learning.

Telles S, Ramaprabhu V, Reddy SK.

Vivekananda Kendra Yoga Research Foundation, Appajappa Agrahara.

The performance in a maze learning task was assessed in adults of either sex (n = 31) before and after 30 days of yoga training and in an age and gender matched control

group of subjects who did not receive training in yoga. Subjects were blind folded and used the dominant hand to trace the path in a wooden pencil maze. At each assessment, subjects were given 5 trials, without a gap between them. Performance was based on the time taken to complete the maze and the number of blind alleys taken. The time and error scores of Trial 1 were significantly less after yoga (two-factor ANOVA, Tukey test). Repeating trials significantly decreased time scores at Trial 5 versus Trial 1, for both groups on Day 1 and for the control group on Day 30. Hence the yoga group showed improved performance in maze tracing at retest 30 days later, which may be related to this group being faster learners and also the effect of yoga itself. Yoga training did not influence maze learning, based on the performance in 5 repeat trials.

Appl Psychophysiol Biofeedback 2000 Mar;25(1):1-12

Effect of Sahaja yoga meditation on auditory evoked potentials (AEP) and visual contrast sensitivity (VCS) in epileptics.

Panjwani U, Selvamurthy W, Singh SH, Gupta HL, Mukhopadhyay S, Thakur L.

Defence Institute of Physiology and Allied Sciences, Delhi, India.

The effect of Sahaja yoga meditation on 32 patients with primary idiopathic epilepsy on regular and maintained antiepileptic medication was studied. The patients were randomly divided into 3 groups: group I practiced Sahaja Yoga meditation twice daily for 6 months under proper guidance; group II practiced postural exercises mimicking the meditation for the same duration; and group III was the control group. Visual Contrast Sensitivity (VCS), Auditory Evoked Potentials (AEP), Brainstem Auditory Evoked Potentials (BAEP), and Mid Latency Responses (MLR) were recorded initially (0 month) and at 3 and 6 months for each group. There was a significant improvement in VCS following meditation practice in group I participants. Na, the first prominent negative peak of MLR and Pa, the positive peak following Na did not register changes in latency. The Na-Pa amplitude of MLR also showed a significant increase. There were no significant changes in the absolute and interpeak latencies of BAEP. The reduced level of stress following meditation practice may make patients more responsive to specific stimuli. Sahaja Yoga meditation appears to bring about changes in some of the electrophysiological responses studied in epileptic patients.

Cochrane Database Syst Rev 2000;(3):CD001524

Yoga for epilepsy.

Ramaratnam S, Sridharan K.

Department of Neurology, Apollo Hospitals, 21 Greams Lane, Off Greams Road, Madras, Tamil Nadu, India, 600006. rsridharan@vsnl.com

BACKGROUND: Stress is considered an important precipitating factor for seizures. Yoga is believed to induce relaxation and stress reduction. The effect of yoga on the EEG and the autonomic nervous system have been reported. Yoga would be an attractive therapeutic option for epilepsy (if proved effective), in view of its nonpharmacological nature, minimal side effects and international acceptance. OBJECTIVES: To assess the efficacy of yoga in the treatment of patients with epilepsy. SEARCH STRATEGY: We searched the Cochrane Epilepsy Group trial register, the Cochrane Controlled Trials Register (The Cochrane Library Issue 4, 1998), MEDLINE for articles published up to the middle of 1998, and also registries of the research council for complimentary medicine were searched. In addition, we searched the references of all the identified studies. Finally, we contacted the members of the Neurological Society of India, several neurophysiology institutions and yoga institutes to seek any ongoing studies or studies published in nonindexed journals or unpublished studies. SELECTION CRITERIA: Randomized control trials and controlled clinical trials of treatment of epilepsy with yoga. DATA COLLECTION AND ANALYSIS: The data were extracted independently by both reviewers and any discrepancies were resolved by discussion. The main outcomes assessed were percentage of patients rendered seizure free, number of patients with more than 50% reduction in seizure frequency or seizure duration and the overall reduction in seizure frequency. Analyses were on an intention to treat basis. MAIN RESULTS: Only one study met the selection criteria, and recruited a total of 32 patients, 10 to sahaja yoga and 22 to control treatments. Antiepileptic drugs were continued in all. Randomization was by roll of a dice. The results of this study are as follows: (i) Four patients treated with yoga were seizure free for six months compared to none in the control groups. The Odds Ratio (OR) (95% Confidence Interval (CI)) for yoga versus sham yoga group was 14.5 (0.7, 316.7) and for yoga versus no treatment group 17.3 (0.8, 373.5). (ii) Nine patients in the yoga group had more than 50% reduction in seizure frequency compared to only one among the controls. The OR (95% CI) for yoga versus sham yoga group was 81 (4.4, 1504.5) and for the yoga versus no treatment group was 158.3 (5.8, 4335.9). (iii) There was a decline in the average number of attacks per month compared to the baseline frequency among the patients treated with yoga. The weighted mean difference (95% CI) between yoga versus sham yoga group was -2.1 (-3.1, -1.0) and for the yoga versus no treatment group -1.1 (-1.8, -0.4). (iv) More than 50% reduction in seizure duration was found in seven of the 10 patients treated with yoga, compared to none among the 22 controls. The OR (95%CI) for yoga versus sham yoga group was 45 (2.0, 1006.8) and for yoga versus no treatment group 53.57 (2.4, 1187.3). REVIEWER'S CONCLUSIONS: No reliable conclusions can be drawn regarding the efficacy of yoga as a treatment for epilepsy. Further studies are necessary to evaluate the efficacy of yoga in the treatment of epilepsy.

Hum Brain Mapp 1999;7(2):98-105

A 15O-H2O PET study of meditation and the resting state of normal consciousness.

Lou HC, Kjaer TW, Friberg L, Wildschiodtz G, Holm S, Nowak M.

Kennedy Institute, Glostrup, Denmark. hcl@kennedy.dk

The aim of the present study was to examine whether the neural structures subserving meditation can be reproducibly measured, and, if so, whether they are different from those supporting the resting state of normal consciousness. Cerebral blood flow distribution was investigated with the 15O-H20 PET technique in nine young adults, who were highly experienced yoga teachers, during the relaxation meditation (Yoga Nidra), and during the resting state of normal consciousness. In addition, global CBF was measured in two of the subjects. Spectral EEG analysis was performed throughout the investigations. In meditation, differential activity was seen, with the noticeable exception of V1, in the posterior sensory and associative cortices known to participate in imagery tasks. In the resting state of normal consciousness (compared with meditation as a baseline), differential activity was found in dorso-lateral and orbital frontal cortex, anterior cingulate gyri, left temporal gyri, left inferior parietal lobule, striatal and thalamic regions, pons and cerebellar vermis and hemispheres, structures thought to support an executive attentional network. The mean global flow remained unchanged for both subjects throughout the investigation (39+/-5 and 38+/-4 ml/100 g/min, uncorrected for partial volume effects). It is concluded that the (H2)15O PET method may measure CBF distribution in the meditative state as well as during the resting state of normal consciousness, and that characteristic patterns of neural activity support each state. These findings enhance our understanding of the neural basis of different aspects of consciousness.

Indian J Physiol Pharmacol 1997 Apr;41(2):179-82

A combination of focusing and defocusing through yoga reduces optical illusion more than focusing alone.

Telles S, Nagarathna R, Vani PR, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Bangalore.

The degree of optical illusion was assessed using standard Muller-Lyer lines in two groups (yoga and control) of thirty subjects each. All subjects were between eighteen and forty two years of age. The difference between the reading at which the lines were actually equal and the reading at which the subject felt them to be equal, was noted as the degree of illusion ("di"). Each subject was assessed at the beginning and end of a month. During the month the yoga group received training in yoga, while the control group carried on with their usual routine. At the end of the month the yoga group showed a significant (two factor ANOVA, Tukey test, $P < .001$) decrease in the "di" (86%), whereas the control group showed no change. The improvement following yoga could be attributed to the combination of focusing and defocusing involved in

yoga practice, as these factors are known to influence the "di". Previous results which mentioned a 79% decrease in "di" with focusing alone, provided a comparison.

Indian J Physiol Pharmacol 1997 Jan;41(1):71-4

Progressive increase in critical flicker fusion frequency following yoga training.

Vani PR, Nagarathna R, Nagendra HR, Telles S.

Vivekananda Kendra Yoga Research Foundation, K. G. Nagar, Bangalore.

The critical flicker fusion frequency (CFF) is the frequency at which a flickering stimulus is perceived to be steady, with higher values suggesting greater perceptual accuracy. The CFF was measured in two age-matched groups of healthy male volunteers whose ages ranged from 25 to 39 years, with 18 subjects in each group. After baseline assessments one group (yoga group) received yoga training, while the other group (control group) carried on with their routine activities. Yoga practices included asanas, pranayamas, kriyas, meditation, devotional sessions and lectures on the theory of yoga. After 10 days neither group showed a change in CFF. However, at 20 and at 30 days the yoga group showed significant increases in CFF by 11.1% and 14.9%, respectively (two factor ANOVA, Tukey multiple comparison test). The control group showed no change at the day 20 and day 30 followup.

Indian J Med Res 1996 Mar;103:165-72

Effect of Sahaja yoga practice on seizure control & EEG changes in patients of epilepsy.

Panjwani U, Selvamurthy W, Singh SH, Gupta HL, Thakur L, Rai UC.

Defence Institute of Physiology & Allied Sciences, New Delhi.

The effect of Sahaja yoga meditation on seizure control and electroencephalographic alterations was assessed in 32 patients of idiopathic epilepsy. The subjects were randomly divided into 3 groups. Group I (n = 10) practised Sahaja yoga for 6 months, Group II (n = 10) practised exercises mimicking Sahaja yoga for 6 months and Group III (n = 12) served as the epileptic control group. Group I subjects reported a 62 per cent decrease in seizure frequency at 3 months and a further decrease of 86 per cent at 6 months of intervention. Power spectral analysis of EEG showed a shift in frequency from 0-8 Hz towards 8-20 Hz. The ratios of EEG powers in delta (D), theta (T), alpha (A) and beta (B) bands i.e., A/D, A/D + T, A/T and A + B/D + T were increased. Per cent D power decreased and per cent A increased. No significant changes in any of the parameters were found in Groups II and III, indicating that

Sahaja yoga practice brings about seizure reduction and EEG changes. Sahaja yoga could prove to be beneficial in the management of patients of epilepsy.

Psychiatry Clin Neurosci 1995 May;49(2):107-10

The fourth state of consciousness: the Thuriya Avastha.

Ramamurthi B.

Neurosurgical Centre, Voluntary Health Services, Madras, India.

Present day neurophysiology stops with attributing thinking processes as the highest level of function of the brain. It has been common knowledge to oriental thinkers for many centuries, that there are many further states of the human mind, culminating in the state of thoughtless awareness; the fourth state of consciousness. This state must have a physiological basis. The complicated structure of the brain, the extravagant abundance of neural and glial elements in the brain, the infinite possibilities of synaptic junctions and synaptic transmission, and the multitude of neurotransmitters and neuromodulators; all these point to the definite possibility of a much greater level of performance and achievement for the human brain than has been apparent so far. Not only the theories but also the experience of Eastern seers have shown that the brain can transcend the boundaries of logic and reason, and experience states of awareness, commonly unrecognized. In the past few decades, knowledge about the functioning of the human brain has been growing exponentially and scientists of diverse disciplines are concentrating on unraveling its mysteries. It is necessary for scientists to investigate this state with all available tools and find the neurophysiological basis of this state.

Indian J Physiol Pharmacol 1995 Apr;39(2):111-6

Effect of Sahaja yoga practice on stress management in patients of epilepsy.

Panjwani U, Gupta HL, Singh SH, Selvamurthy W, Rai UC.

Defence Institute of Physiology and Allied Sciences, Delhi.

An attempt was made to evaluate the effect of Sahaja yoga meditation in stress management in patients of epilepsy. The study was carried out on 32 patients of epilepsy who were rendomly divided into 3 groups: group I subjects practised Sahaja yoga meditation for 6 months, group II subjects practised postural exercises mimicking Sahaja yoga and group III served as the epileptic control group. Galvanic skin resistance (GSR), blood lactate and urinary vinyl mandelic acid (U-VMA) were recorded at 0, 3 and 6 months. There were significant changes at 3 & 6 months as

compared to 0 month values in GSR, blood lactate and U-VMA levels in group I subjects, but not in group II and group III subjects. The results indicate that reduction in stress following Sahaja yoga practice may be responsible for clinical improvement which had been earlier reported in patients who practised Sahaja yoga.

Int J Psychophysiol 1994 Oct;18(1):75-9

EEG changes during forced alternate nostril breathing.

Stancak A Jr, Kuna M.

Department of Physiology and Clinical Physiology, Charles IV University, Prague, Czech Republic.

The effects of 10 min forced alternate nostril breathing (FANB) on EEG topography were studied in 18 trained subjects. One type of FANB consisted in left nostril inspiration and right nostril expiration and the other type in right nostril inspiration and left nostril expiration. Mean power in the beta bands and partially in the alpha band increased during FANB irrespective of the type of nostril breathing. In addition, hemisphere asymmetry in the beta 1 band decreased in the second half of FANB suggesting that FANB has a balancing effect on the functional activity of the left and right hemisphere.

Nurs Times 1994 Jul 20-26;90(29):35-6

Acute and prophylactic treatment of migraine.

Reilly R.

Migraine affects one in 10 adults and is a debilitating condition. The symptoms and pathogenesis of migraine are discussed, including known triggers. Acute and prophylactic treatments currently available are described, as are alternative treatments such as acupuncture and yoga.

Int J Neurosci 1993 Nov;73(1-2):61-8

The effects of unilateral forced nostril breathing on cognitive performance.

Jella SA, Shannahoff-Khalsa DS.

Department of Psychiatry University of California, Davis 95817.

This study describes the effects of 30 minutes of unilateral forced nostril breathing on cognitive performance in 51 right-handed undergraduate psychology students (25 males and 26 females). A verbal analogies task modeled after the Miller Analogies and SAT Tests was used as a test of left-hemispheric performance and mental rotation tasks based on the Vandenburg and Kuse adaptation of Shepard and Metzler's tests were used as spatial tasks for testing right-hemispheric performance. Spatial task performance was significantly enhanced during left nostril breathing in both males and females, p = .028. Verbal task performance was greater during right nostril breathing, but not significantly p = .14. These results are discussed in comparison to other cognitive and physiological studies using unilateral forced nostril breathing. This yogic breathing technique may have useful application in treating psychophysiological disorders with hemispheric imbalances and disorders with autonomic abnormalities.

Int J Psychophysiol 1993 Sep;15(2):147-52

Autonomic changes in Brahmakumaris Raja yoga meditation.

Telles S, Desiraju T.

Department of Neurophysiology, National Institute of Mental Health and Neurosciences, Bangalore, India.

This report presents the changes in various autonomic and respiratory variables during the practice of Brahmakumaris Raja yoga meditation. This practice requires considerable commitment and involves concentrated thinking. 18 males in the age range of 20 to 52 years (mean 34.1 +/- 8.1), with 5-25 years experience in mediation (mean 10.1 +/- 6.2), participated in the study. Each subject was assessed in three test sessions which included a period of meditation, and also in three control (non-mediation) sessions, which included a period of random thinking. Group analysis showed that the heart rate during the meditation period was increased compared to the preceding baseline period, as well as compared to the value during the non-meditation period of control sessions. In contrast to the change in the heart rate, there was no significant change during meditation, for the group as a whole, in palmar GSR, finger plethysmogram amplitude, and respiratory rate. On an individual basis, changes which met the following criteria were noted: (1), changes which were greater during meditation (compared to its preceding baseline) than changes during post meditation or non-meditation periods (also compared to their preceding baseline); (2), Changes which occurred consistently during the three repeat sessions of a subject and (3), changes which exceeded arbitrarily-chosen cut-off points (described at length below). This individual level analysis revealed that changes in autonomic variables suggestive of both activation and relaxation occurred simultaneously in different subdivisions of the autonomic nervous system in a subject. Apart from this, there were differences in patterns of change among the subjects who practised the same meditation.

Int J Psychophysiol 1993 May;14(3):189-98

Alterations of auditory middle latency evoked potentials during yogic consciously regulated breathing and attentive state of mind.

Telles S, Joseph C, Venkatesh S, Desiraju T.

Department of Neurophysiology, National Institute of Mental Health and Neuro Sciences, Bangalore, India.

Middle latency auditory-evoked potentials (AEP-MLRs) of 10 healthy male subjects in the age range of 21-33 years, were assessed to determine whether yogic pranayamic practice would cause changes in them. The pranayama type assessed here is an exercise of consciously-controlled rhythmic breathing involving timed breath-holding in each cycle of breathing, while the subject holds utmost attention and experiences the touch of inhaled air in the nasal passage. The results revealed that the Na-wave amplitude increased and latency decreased during the period of pranayamic practice, whereas the Pa-wave was not significantly altered. The change is interpreted as an indication of a generalized alteration cause in information processing at the primary thalamo-cortical level during the concentrated mental exercise of inducing modifications in neural mechanisms regulating a different functional system (respiratory). Further researches are required to understand the operational significances of such changes.

Homeost Health Dis 1991 Dec;33(4):182-9

Kapalabhati--yogic cleansing exercise. II. EEG topography analysis.

Stancak A Jr, Kuna M, Srinivasan, Dostalek C, Vishnudevananda S.

Institute of Physiological Regulations, Czechoslovak Academy of Sciences, Praha.

Topography of brain electrical activity was studied in 11 advanced yoga practitioners during yogic high-frequency breathing kapalabhati (KB). Alpha activity was increased during the initial five min of KB. Theta activity mostly in the occipital region was increased during later stages of 15 min KB compared to the pre-exercise period. Beta 1 activity increased during the first 10 min of KB in occipital and to a lesser degree in parietal regions. Alpha and beta 1 activity decreased and theta activity was maintained on the level of the initial resting period after KB. The score of General Deactivation factor from Activation Deactivation Adjective Checklist was higher after KB exercise than before the exercise. The results suggest a relative increase of slower EEG frequencies and relaxation on a subjective level as the after effect of KB exercise.

Neuropsychobiology 1990-91;23(4):182-7

Changed pattern of regional glucose metabolism during yoga meditative relaxation.

Herzog H, Lele VR, Kuwert T, Langen KJ, Kops ER, Feinendegen LE.

Institute of Medicine, Research Center Julich, FRG.

Using positron emission tomography (PET), measurements of the regional cerebral metabolic rate of glucose (rCMRGlc) are able to delineate cerebral metabolic responses to external or mental stimulation. In order to examine possible changes of brain metabolism due to Yoga meditation PET scans were performed in 8 members of a Yoga meditation group during the normal control state (C) and Yoga meditative relaxation (YMR). Whereas there were intraindividual changes of the total CMRGlc, the alterations were not significant for intergroup comparison; specific focal changes or changes in the interhemispheric differences in metabolism were also not seen; however the ratios of frontal vs. occipital rCMRGlc were significantly elevated (p less than 0.05) during YMR. These altered ratios were caused by a slight increase of frontal rCMRGlc and a more pronounced reduction in primary and secondary visual centers. These data indicate a holostic behavior of the brain metabolism during the time of altered state of consciousness during YMR.

Act Nerv Super (Praha) 1985 Jun;27(2):81-8

EEG patterns suggestive of shifted levels of excitation effected by hathayogic exercises.

Roldan E, Dostalek C.

Concurrent with the performance of hathayogic exercises such as Nauli, Bhastrika and Suryabhedana, three characteristic EEG patterns were identified: a "wicket" rhythm at a frequency wave of 12 to 17 Hz, recordable from para-Rolandic areas, which we have called Xi rhythm; a 26-33 Hz sinusoidal activity, confined to the mid-sagittal parietooccipital region; and paroxysmal activity localized in the lateral boundaries of parieto-temporo-occipital regions, bilaterally. - The expectation that hathayogic exercises would affect the electrical activity of circumscribed, relatively well defined areas of the brain was based on the fact that these exercises imply a strong stimulation of somatic and splanchnic receptors, the afferent impulses of which are fed into specific cortical representation areas localized for the most part around central and anterior parietal areas.

Arch Gen Psychiatry 1978 May;35(5):571-7

Psychophysiological correlates of the practice of Tantric Yoga meditation.

Corby JC, Roth WT, Zarcone VP Jr, Kopell BS.

Autonomic and electroencephalographic (EEG) correlates of Tantric Yoga meditation were studied in three groups of subjects as they progressed from normal consciousness into meditation. Groups differed in their level of meditation proficiency. Measures of skin resistance, heart rate, respiration, autonomic orienting responses, resting EEG, EEG alpha and theta frequencies, sleep-scored EEG, averaged evoked responses, and subjective experience were employed. Unlike most previously reported meditation studies, proficient meditators demonstrated increased autonomic activation during meditation while unexperienced meditators demonstrated autonomic relaxation. During meditation, proficient meditators demonstrated increased alpha and theta power, minimal evidence of EEG-defined sleep, and decreased autonomic orienting to external stimulation. An episode of sudden autonomic activation was observed that was characterized by the meditator as an approach to the Yogic ecstatic state of intense concentration. These findings challenge the current "relaxation" model of meditative states.

Herz

Altern Ther Health Med 2002 Jul-Aug;8(4):64-6, 68-70, 72-3

Changes in spirituality and well-being in a retreat program for cardiac patients.

Kennedy JE, Abbott RA, Rosenberg BS.

University of Wisconsin, Stevens Point, USA.

CONTEXT: Many epidemiological studies indicate that spirituality or religion are positively correlated with health measures, but research is needed on interventions that change spirituality to verify that it actually affects health and to justify suggestions that changes in spiritual practices or beliefs may have health benefits. However, it is not clear that health interventions can influence spirituality or which techniques are effective.

OBJECTIVE: To evaluate whether participation in a retreat program for cardiac patients and their partners resulted in changes in spirituality and whether changes in spirituality were related to changes in well-being meaning in life, anger, and confidence in handling problems.

DESIGN: Participants filled out questionnaires before and after participating in the retreat.

SETTING: Retreats were sponsored by the Health Promotion and Wellness Program, University of Wisconsin-Stevens Point, and were held in a remote training center.
PARTICIPANTS: Notices were sent to cardiac rehabilitation programs and directly to heart patients, resulting in the enrollment of 72 first-time participants.
INTERVENTION: The 2.5-day educational retreats included discussion and opportunities to experience healthy lifestyle options. Exercise, nutrition, stress management techniques, communication skills that enhance social support, and spiritual principles of healing were incorporated. Experiential practices included yoga, meditation, visualization, and prayer.

RESULTS: Of the participants, 78% reported increased spirituality after the retreat. Changes in spirituality were positively associated with increased well-being meaning in life, confidence in handling problems, and decreased tendency to become angry.
CONCLUSIONS: Programs that explore spirituality in a health context can result in increased spirituality that is associated with increased well-being and related measures. Many patients and their families want to integrate the spiritual and health dimensions of their lives. Further work is needed to develop healthcare settings that can support this integration.

Jpn J Physiol 2002 Jun;52(3):313-6

Is man able to breathe once a minute for an hour?: the effect of yoga respiration on blood gases.

Miyamura M, Nishimura K, Ishida K, Katayama K, Shimaoka M, Hiruta S.

Research Center of Health, Physical Fitness and Sports, Nagoya University, Nagoya 464-8601, Japan. miyamura@htc.nagoya-u.ac.jp

The ventilatory response to hypercapnia and arterial blood gases during ujjai respiration of once per minute for an hour were determined in a professional hatha yogi. The results suggest that lower chemosensitivity to hypercapnia in yoga practitioners may be due to an adaptation to low arterial pH and high PaCO(2) for long periods.

J Assoc Physicians India 2002 May;50(5):633-40

Therapeutic potential of yoga practices in modifying cardiovascular risk profile in middle aged men and women.

Damodaran A, Malathi A, Patil N, Shah N, Suryavansihi, Marathe S.

Bhabha Atomic Research Centre, Medical Division Mumbai.

AIMS OF STUDY: To study effect of yoga on the physiological, psychological well being, psychomotor parameter and modifying cardiovascular risk factors in mild to moderate hypertensive patients.

METHODS: Twenty patients (16 males, 4 females) in the age group of 35 to 55 years with mild to moderate essential hypertension underwent yogic practices daily for one hour for three months. Biochemical, physiological and psychological parameters were studied prior and following period of three months of yoga practices, biochemical parameters included, blood glucose, lipid profile, catecholmines, MDA, Vit. C cholinesterase and urinary VMA. Psychological evaluation was done by using personal orientation inventory and subjective well being.

RESULTS: Results showed decrease in blood pressure and drug score modifying risk factors, i.e. blood glucose, cholesterol and triglycerides decreased overall improvement in subjective well being and quality of life. There was decrease in VMA catecholamine, and decrease MDA level suggestive decrease sympathetic activity and oxidant stress.

CONCLUSION: Yoga can play an important role in risk modification for cardiovascular diseases in mild to moderate hypertension.

BMJ 2001 Dec 22-29;323(7327):1446-9

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

Bernardi L, Sleight P, Bandinelli G, Cencetti S, Fattorini L, Wdowczyc-Szulc J, Lagi A.

Dipartimento di Medicina Interna, University of Pavia, 27100 Pavia, Italy.

OBJECTIVE: To test whether rhythmic formulas such as the rosary and yoga mantras can synchronise and reinforce inherent cardiovascular rhythms and modify baroreflex sensitivity.

DESIGN: Comparison of effects of recitation of the Ave Maria (in Latin) or of a mantra, during spontaneous and metronome controlled breathing, on breathing rate and on spontaneous oscillations in RR interval, and on blood pressure and cerebral circulation. SETTING: Florence and Pavia, Italy. PARTICIPANTS: 23 healthy adults. MAIN OUTCOME MEASURES: Breathing rate, regularity of breathing, baroreflex sensitivity, frequency of cardiovascular oscillations.

RESULTS: Both prayer and mantra caused striking, powerful, and synchronous increases in existing cardiovascular rhythms when recited six times a minute. Baroreflex sensitivity also increased significantly, from 9.5 (SD 4.6) to 11.5 (4.9) ms/mm Hg, $P<0.05$. CONCLUSION: Rhythm formulas that involve breathing at six breaths per minute induce favourable psychological and possibly physiological effects.

Indian J Physiol Pharmacol 2000 Oct;44(4):392-400

Cardiovascular responses to head-down-body-up postural exercise (Sarvangasana).

Konar D, Latha R, Bhuvaneswaran JS.

Department of Physiology, PSG Institute of Medical Sciences & Research, Peelamedu, Coimbatore-641 004.

Sarvangasana (SVGN) is a head-down-body-up postural exercise in a 'negative g' condition. Though highly recommended as one of the three best of all the asanas it has not yet been studied for its very obvious effects on the cardiovascular (CV) functions. This paper reports the results of the first systematic investigation on SVGN employing echocardiographic analysis in eight healthy male subjects before and after a practice of this asana twice daily for two weeks. The resting heart rate (HR) and left ventricular end-diastolic volume (LVEDV) were significantly reduced ($P < 0.02$, $P < 0.01$ respectively) after practising this asana. A tendency toward a mild regression of the left ventricular mass was noticed, though it was not statistically significant. The CV responses to acute 45 degrees head-down tilt (HDT) in a tilt table was not altered after practising this asana. Also there was no orthostatic intolerance during the 3-5 min period of 70 degrees head-up tilt (HUT). These results strongly indicate that further studies of this asana performed for a longer period is most likely to yield very significant observations of applied value.

J Assoc Physicians India 2000 Jul;48(7):687-94

Retardation of coronary atherosclerosis with yoga lifestyle intervention.

Manchanda SC, Narang R, Reddy KS, Sachdeva U, Prabhakaran D, Dharmanand S, Rajani M, Bijlani R.

All India Institute of Medical Sciences, New Delhi, India.

BACKGROUND: Yoga has potential for benefit for patients with coronary artery disease though objective, angiographic studies are lacking. MATERIAL AND METHODS: We evaluated possible role of lifestyle modification incorporating yoga, on retardation of coronary atherosclerotic disease. In this prospective, randomized, controlled trial, 42 men with angiographically proven coronary artery disease (CAD) were randomized to control (n = 21) and yoga intervention group (n = 21) and were followed for one year. The active group was treated with a user-friendly program consisting of yoga, control of risk factors, diet control and moderate aerobic exercise. The control group was managed by conventional methods i.e. risk factor control and American Heart Association step I diet. RESULTS: At one year, the yoga groups showed significant reduction in number of anginal episodes per week, improved exercise capacity and

decrease in body weight. Serum total cholesterol, LDL cholesterol and triglyceride levels also showed greater reductions as compared with control group. Revascularisation procedures (coronary angioplasty or bypass surgery) were less frequently required in the yoga group (one versus eight patients; relative risk = 5.45; P = 0.01). Coronary angiography repeated at one year showed that significantly more lesions regressed (20% versus 2%) and less lesions progressed (5% versus 37%) in the yoga group (chi-square = 24.9; P < 0.0001). The compliance to the total program was excellent and no side effects were observed. CONCLUSION: Yoga lifestyle intervention retards progression and increases regression of coronary atherosclerosis in patients with severe coronary artery disease. It also improves symptomatic status, functional class and risk factor profile.

Indian J Physiol Pharmacol 2000 Apr;44(2):207-10

Effect of selected yogic practices on the management of hypertension.

Murugesan R, Govindarajulu N, Bera TK.

Department of Physical Education, Pondicherry University.

On the basis of medical officers diagnosis, thirty three (N = 33) hypertensives, aged 35-65 years, from Govt. General Hospital, Pondicherry, were examined with four variables viz, systolic and diastolic blood pressure, pulse rate and body weight. The subjects were randomly assigned into three groups. The exp. group-I underwent selected yoga practices, exp. group-II received medical treatment by the physician of the said hospital and the control group did not participate in any of the treatment stimuli. Yoga imparted in the morning and in the evening with 1 hr/session. day-1 for a total period of 11-weeks. Medical treatment comprised drug intake every day for the whole experimental period. The result of pre-post test with ANCOVA revealed that both the treatment stimuli (i.e., yoga and drug) were effective in controlling the variables of hypertension.

J Indian Med Assoc 2000 Apr;98(4):176-9

The problems of hypertension in the elderly.

Arya SN.

IMA College of General Practitioners, New Delhi.

The cut off age for elderly person in India is 60-65 years, in the USA is 75-80 years and 6th Joint Committee on Detection, Evaluation and Treatment of High Blood

Pressure (JNC-VI) has identified it as above 60 years. Elderly people may have (i) systolic-diastolic hypertension, (ii) isolated systolic hypertension or (iii) pseudohypertension. JNC-VI has classified hypertension in stage 1, stage 2 and stage 3 according to its severity. Hypertension is confirmed when BP measured on three separate occasions over 1-2 weeks and when consistently it is raised above 140/90 mm Hg. The management includes lifestyle modification and drug treatment. Lifestyle modification includes rationality of diet, regular exercise, stop smoking, stoppage of alcohol or moderation and yoga. Drugs commonly used are diureties and beta-blockers. Other antihypertensive drugs are calcium channel blockers, ACE-inhibitors, alpha-blockers and vasodilators.

Int J Cardiol 1999 Jul 31;70(2):101-7

Exaggerated heart rate oscillations during two meditation techniques.

Peng CK, Mietus JE, Liu Y, Khalsa G, Douglas PS, Benson H, Goldberger AL.

Margaret and H.A. Rey Laboratory for Nonlinear Dynamics in Medicine, Beth Israel Deaconess Medical Center, Boston, MA 02215, USA.

We report extremely 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 analytic 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: i) elite athletes during sleep, ii) healthy young adults during metronomic breathing, and iii) healthy young adults during spontaneous nocturnal breathing. This finding, along with the marked variability of the beat-to-beat heart rate dynamics during such profound meditative states, challenges the notion of meditation as only an autonomically quiescent state.

Compr Ther 1999 May;25(5):283-93

Mind-body therapy in the management and prevention of coronary disease.

Pandya DP, Vyas VH, Vyas SH.

Cancer Institute of New Jersey, New Brunswick, USA.

Conventional mind-body therapy has been proven a valuable non invasive way to manage coronary disease. Yoga practice, especially, has been found to be valuable in

preventing adverse outcomes of coronary disease by improving resistance to stress.

Indian Heart J 1999 Jan-Feb;51(1):37-40

Lipid profile of coronary risk subjects following yogic lifestyle intervention.

Mahajan AS, Reddy KS, Sachdeva U.

Department of Physiology, All India Institute of Medical Sciences, New Delhi.

The effect of yogic lifestyle on the lipid status was studied in angina patients and normal subjects with risk factors of coronary artery disease. The parameters included the body weight, estimation of serum cholesterol, triglycerides, HDL, LDL and the cholesterol - HDL ratio. A baseline evaluation was done and then the angina patients and risk factors subjects were randomly assigned as control (n = 41) and intervention (yoga) group (n = 52). Lifestyle advice was given to both the groups. An integrated course of yoga training was given for four days followed by practice at home. Serial evaluation of both the groups was done at four, 10 and 14 weeks. Dyslipidemia was a constant feature in all cases. An inconsistent pattern of change was observed in the control group of angina (n = 18) and risk factor subjects (n = 23). The subjects practising yoga showed a regular decrease in all lipid parameters except HDL. The effect started from four weeks and lasted for 14 weeks. Thus, the effect of yogic lifestyle on some of the modifiable risk factors could probably explain the preventive and therapeutic beneficial effect observed in coronary artery disease.

Indian J Physiol Pharmacol 1998 Oct;42(4):467-72

Effect of two selected yogic breathing techniques of heart rate variability.

Raghuraj P, Ramakrishnan AG, Nagendra HR, Telles S.

Vivekananda Kendra Yoga Research Foundation, Bangalore.

The heart rate variability (HRV) is an indicator of the cardiac autonomic control. Two spectral components are usually recorded, viz. high frequency (0.15-0.50 Hz), which is due to vagal efferent activity and a low frequency component (0.05-0.15 Hz), due to sympathetic activity. The present study was conducted to study the HRV in two yoga practices which have been previously reported to have opposite effects, viz, sympathetic stimulation (kapalabhati, breathing at high frequency, i.e., 2.0 Hz) and reduced sympathetic activity (nadisuddhi, alternate nostril breathing). Twelve male volunteers (age range, 21 to 33 years) were assessed before and after each practice on separate days. The electrocardiogram (lead I) was digitized on-line and off-line analysis was done. The results showed a significant increase in low frequency (LF)

power and LF/HF ratio while high frequency (HF) power was significantly lower following kapalabhati. There were no significant changes following nadisuddhi. The results suggest that kapalabhati modifies the autonomic status by increasing sympathetic activity with reduced vagal activity. The study also suggests that HRV is a more useful psychophysiological measure than heart rate alone.

Indian J Physiol Pharmacol 1998 Apr;42(2):205-13

A new physiological approach to control essential hypertension.

Selvamurthy W, Sridharan K, Ray US, Tiwary RS, Hegde KS, Radhakrishan U, Sinha KC.

Defence Institute of Physiology and Allied Sciences, Timarpur, Delhi.

This study was conducted on 20 male patients of Essential Hypertension (EH) in order to explore the possible role of baroreflex mechanism in the etiology of EH and also to find out whether by restoration of baroreflex sensitivity to normal level either by postural tilt stimulus on a tilt table or by the equivalent yogic postural exercise (Yogic asanas), the EH could be cured or controlled. Patients on therapeutic regime were gradually withdrawn from drug therapy, and later divided into two groups of 10 each. Group-I (age 34 +/- 1.7 years) was subjected to a 3 week course of 70 degrees head-up tilt for 30 min daily, while in group-II (age 50 +/- 3.3 years), specific yogic exercises equivalent to head-up or head-down tilt were administered for the same duration. The progressive autonomic readjustments were assessed by a battery of tests including cardiovascular responses to head up tilt, cold pressor response at 4 degrees C water (CPR), alpha index of EEG (AI), level of blood catecholamines (CA) and plasma renin activity (PRA). At the end of 3 weeks, there was a significant reduction ($P < 0.001$) in blood pressure in both the groups. Progressive changes in BP and HR response to tilt during 3 weeks course of tilt and yogic exercise clearly indicated gradual improvement in baroreflex sensitivity. Likewise, changes in other indices like CPR, AI, CA and PRA indicated progressive attenuation of sypatho-adrenal and renin-angiotensin activity. All these changes together with the reduction in BP strongly suggest a close link between the etiology of EH and baroreflexes on the one hand and controlling influence of the latter on sympatho-adrenal and renin-angiotensin systems on the other. It also throws light on the physiological mechanism underlying the effects of selected yogic exercises in the treatment of EH.

J Altern Complement Med 1997 Fall;3(3):291-5

Influence of intensive yoga training on physiological changes in 6 adult women: a case report.

Raju PS, Prasad KV, Venkata RY, Murthy KJ, Reddy MV.

Department of Work-Physiology, Govt. Vemana Yoga Research Institute, Ameerpet, Hyderabad, India.

The short-term effects of 4 weeks of intensive yoga practice on physiological responses in six healthy adult female volunteers were measured using the maximal exercise treadmill test. Yoga practice involved daily morning and evening sessions of 90 minutes each. Pre- and post-yoga exercise performance was compared. Maximal work output (Wmax) for the group increased by 21%, with a significantly reduced level of oxygen consumption per unit work but without a concomitant significant change in heart rate. After intensive yoga training, at 154 Wmin(-1) (corresponding to Wmax of the pre-yoga maximal exercise test) participants could exercise more comfortably, with a significantly lower heart rate ($p < 0.05$), reduced minute ventilation ($p < 0.05$), reduced oxygen consumption per unit work ($p < 0.05$), and a significantly lower respiratory quotient ($p < 0.05$). The implications for the effect of intensive yoga on cardiorespiratory efficiency are discussed, with the suggestion that yoga has some transparently different quantifiable physiological effects to other exercises.

Indian J Med Res 1994 Aug;100:81-6

Comparison of effects of yoga & physical exercise in athletes.

Raju PS, Madhavi S, Prasad KV, Reddy MV, Reddy ME, Sahay BK, Murthy KJ.

Govt. Vemana Yoga Research Institute, Secunderabad.

The effect of pranayama a controlled breathing practice, on exercise tests was studied in athletes in two phases; sub-maximal and maximal exercise tests. At the end of phase I (one year) both the groups (control and experimental) achieved significantly higher work rate and reduction in oxygen consumption per unit work. There was a significant reduction in blood lactate and an increase in P/L ratio in the experimental group, at rest. At the end of phase II (two years), the oxygen consumption per unit work was found to be significantly reduced and the work rate significantly increased in the experimental group. Blood lactate decreased significantly at rest in the experimental group only. Pyruvate and pyruvate-lactate ratio increased significantly in both the groups after exercise and at rest in the experimental group. The results in both phases showed that the subjects who practised pranayama could achieve higher work rates with reduced oxygen consumption per unit work and without increase in blood lactate levels. The blood lactate levels were significantly low at rest.

Indian J Physiol Pharmacol 1994 Jan;38(1):29-33

Energy expenditure and ventilatory responses during Siddhasana--a yogic seated

posture.

Rai L, Ram K, Kant U, Madan SK, Sharma SK.

Central Research Institute for Yoga, New Delhi.

Reports of energy expenditure and ventilatory responses to yogic seated posture of Siddhasana are lacking in literature. Various cardio-ventilatory responses were studied in states of the horizontal supine, chair-sitting and Siddhasana. It was observed that sitting in Siddhasana posture was characterised by greater minute ventilation, larger tidal volume, higher oxygen consumption, greater CO2 elimination, higher heart frequency greater oxygen pulse and lesser as compared with other two postures. These observations suggest that Siddhasana is a mild type of exercise and may have its application in conditions of low cardio-respiratory reserves especially in individuals in whom heavy exercises are contra-indicated.

Int J Neurosci 1993 Nov;73(1-2):47-60

The effects of unilateral forced nostril breathing on the heart.

Shannahoff-Khalsa DS, Kennedy B.

Department of Medicine, University of California, San Diego 92103-8341.

Three experiments are described that employ impedance cardiography to monitor the effects of unilateral forced nostril breathing (UFNB) on the heart. Experiment 1 includes 7 subjects (4 males, 3 females) with a respiratory rate of 6 breaths/min (BPM). Experiment 2 includes 16 trials using one subject to examine the intraindividual variability, at 6 BPM. Experiment 3 includes 10 trials with the same subject in experiment 2, but with a respiratory rate of 2-3 breaths/s. This rapid rate of respiration is a yogic breathing technique called "breath of fire" or "kapalabhatti" and employs a very shallow but rapid breath in which the abdominal region acts like a bellows. All 3 experiments demonstrated that right UFNB increases heart rate (HR) compared to left. Experiment 1 gave 7 negative slopes, or lowering in HR with left nostril breathing and 7 positive slopes, or increases in HR with right nostril breathing, $p = .001$. The second and third experiments showed differences in HR means in which right UFNB increases HR more than left, $p = .013$, $p = .001$, respectively. In experiment 2 stroke volume was higher with left UFNB, $p = .045$, compensating for lower HR. Left UFNB increased end diastolic volume as measured in both experiments 1 and 2, $p = .006$, $p = .001$, respectively. These results demonstrate a unique unilateral effect on sympathetic stimulation of the heart that may have therapeutic value.

Vopr Kurortol Fizioter Lech Fiz Kult 1993 Jul-Aug;(4):7-9

Elements of yoga therapy in the combined rehabilitation of myocardial infarct patients in the functional recovery period

Article in Russian

Bulavin VV, Kliuzhev VM, Kliachkin LM, Lakshmankumar, Zuikhin ND, Vlasova TN.

Fifty-nine postmyocardial infarction patients received combined therapy involving chemotherapy, physiotherapy, therapeutic exercises and yoga therapy. Thirty-seven controls received the same treatment without yoga exercise. The yoga complex implied elementary simple positions, relaxation exercise and respiratory exercise. A clinical response evident in both the groups appeared more pronounced in the test group as shown by marked improvement in external respiration and blood counts, in exercise tolerance and psychosomatic condition of the patients.

Homeost Health Dis 1991 Oct;33(3):126-34

Kapalabhati--yogic cleansing exercise. I. Cardiovascular and respiratory changes.

Stancak A Jr, Kuna M, Srinivasan, Vishnudevananda S, Dostalek C.

Institute of Physiological Regulations, Czechoslovak Academy of Sciences, Praha.

We studied cardiovascular and respiratory changes during yogic breathing exercise kapalabhati (KB) in 17 advanced yoga practitioners. The exercise consisted in fast shallow abdominal respiratory movements at about 2 Hz frequency. Blood pressure, ECG and respiration were recorded continuously during three 5 min periods of KB and during pre- and post-KB resting periods. The beat-to-beat series of systolic blood pressure (SBP) and diastolic blood pressure (DBP), R-R intervals and respiration were analysed by spectral analysis of time series. The mean absolute power was calculated in three frequency bands--band of spontaneous respiration, band of 0.1 Hz rhythm and the low-frequency band greater than 15 s in all spectra. The mean modulus calculated between SBP and R-R intervals was used as a parameter of baroreceptor-cardiac reflex sensitivity (BRS). Heart rate increased by 9 beats per min during KB. SBP and DBP increased during KB by 15 and 6 mmHg respectively. All frequency bands of R-R interval variability were reduced in KB. Also the BRS parameter was reduced in KB. The amplitude of the high-frequency oscillations in SBP and DBP increased during KB. The low-frequency blood pressure oscillations were increased after KB. The results point to decreased cardiac vagal tone during KB which was due to changes in respiratory pattern and due to decreased sensitivity of arterial baroreflex. Decreased respiratory rate and increased SBP and low-frequency blood pressure oscillations after KB suggest a differentiated pattern of vegetative activation and inhibition associated with KB exercise.

Physiol Res 1991;40(3):345-54

Observations on respiratory and cardiovascular rhythmicities during yogic high-frequency respiration.

Stancak A Jr, Kuna M, Novak P, Srinivasan MA, Dostalek C, Vishnudevananda S.

Institute of Physiological Regulations, Czechoslovak Academy of Sciences, Prague.

Yogic high-frequency respiration--kapalabhati (KB)--was studied in 24 subjects from a point of rhythmicity. Respiratory movements, blood pressure and R-R intervals of ECG were recorded in parallel and evaluated by spectral analysis of time series. Respiratory signals during KB were modulated by 0.1 Hz rhythm in 82% of experiments. This component was also present in R-R intervals and blood pressure during KB. Frequency (0.2-0.3 Hz) was observed in 67% of respiratory records. The presence of the component 0.2-0.3 Hz in respiration was dependent on resting respiratory frequency. This frequency component was reduced in R-R intervals but increased in blood pressure during kapalabhati as compared to that at rest. The occurrence of both frequency components in respiration during KB supports the hypothesis about the integrative role of cardiovascular and respiratory rhythms in physiological states characterized by altered respiratory frequency.

J Hypertens Suppl 1990 Sep;8(4):S21-6

Non-pharmacological treatment of hypertension.

Silverberg DS.

Public Health Department, Tel-Aviv-Yafo, Israel.

Weight reduction, alcohol restriction, mild salt restriction, eating a vegetarian diet and increasing aerobic exercise will generally lower the blood pressure in patients with essential hypertension. Eating a diet rich in potassium and reducing caffeine intake may also be helpful in reducing the pressure, but increasing the fiber or calcium intake will generally be ineffective. Reducing fat intake from the usual 40% of total calories to 25-30% may reduce hypertension directly or by weight reduction. Smoking, when combined with excessive caffeine or alcohol intake may have an additive effect on blood pressure. Monotherapy with such behavioral techniques as self-monitoring of blood pressure, biofeedback, meditation, yoga, progressive muscular relaxation or cognitive therapy may reduce the blood pressure to a variable degree, and combinations of these treatments may be even more successful.

Act Nerv Super (Praha) 1990 Jun;32(2):99-114

Hathayogic exercise jalandharabandha in its effect on cardiovascular response to apnoea.

Lepicovska V, Dostalek C, Kovarova M.

Institute of Physiological Regulations, Czechoslovak Academy of Sciences, Praha.

Jalandharabandha (JB) is the important constituent of apnoea (kumbhaka) in hathayogic breathing exercises. It is performed by pressing the chin into the jugular notch and creating thus the positive pressure on the neck region. The influence of JB on the heart rate and vasomotor response was studied in relationship to different lung volumes. The course of R-R intervals is highly significantly different according to the type of apnoea. JB leads to the diminution of bradycardia, but does not change the position of the maximum and minimum in comparison to the apnoea without JB. Application of JB increases the number of vasodilatations and shortens the latencies of vasodilatations, duration and amplitude of reactions. JB during breath holding decreases the vagal reflex changes and may thus work as a stabilizing component in yogic breathing exercises.

Aviat Space Environ Med 1989 Jul;60(7):684-7

Treatment of essential hypertension with yoga relaxation therapy in a USAF aviator: a case report.

Brownstein AH, Dembert ML.

Flight Medicine Department, Regional Medical Center, Clark Air Base, Luzon, Republic of the Philippines.

A 46-year-old Caucasian male USAF aviator with a 6-year history of mild essential hypertension (medical waiver for flight duty) under unsuccessful treatment with hydrochlorothiazide, dietary modification, and exercise, was subsequently trained in yoga relaxation. After 6 weeks, medication had been discontinued, and his diastolic blood pressure remained within normal levels. The patient was subsequently returned to full flight status without recurrence of diastolic hypertension at followup 6 months later. Relaxation training, of which yoga is one type, has been reported in the medical literature to have wide clinical application. It should be considered as a nonpharmacological therapy adjunct or alternative for medical disorders among personnel in occupations (e.g., aviation) where the side effects from medications are of great concern and could be disqualifying from those duties.

Indian J Physiol Pharmacol 1986 Oct-Dec;30(4):334-40

Effect of yoga type breathing on heart rate and cardiac axis of normal subjects.

Mohan M, Saravanane C, Surange SG, Thombre DP, Chakrabarty AS.

Effect of inspiratory and expiratory phases of normal quiet breathing, deep breathing and savitri pranayam type breathing on heart rate and mean ventricular QRS axis was investigated in young, healthy untrained subjects. Pranayam type breathing produced significant cardioacceleration and increase in QRS axis during the inspiratory phase as compared to eupnea. On the other hand, expiratory effort during pranayam type breathing did not produce any significant change in heart rate or QRS axis. The changes in heart rate and QRS axis during the inspiratory and expiratory phases of pranayam type breathing were similar to the changes observed during the corresponding phases of deep breathing.

J Physiol Pharmacol 1986 Apr-Jun;30(2):121-32

Effect of yoga on exercise tolerance in normal healthy volunteers.

Raju PS, Kumar KA, Reddy SS, Madhavi S, Gnanakumari K, Bhaskaracharyulu C, Reddy MV, Annapurna N, Reddy ME, Girijakumari D, et al.

Twelve normal healthy volunteers (6 males and 6 females) undergoing yoga training for 90 days were studied for the effect of yoga on exercise tolerance. Their ages ranged from 18 to 28 years. The volunteers were taught only Pranayama for the first 20 days and later on yogic asanas were added. Sub-maximal exercise tolerance test was done on a motorized treadmill by using Balke's modified protocol, initially, after 20 days (Phase-I) and after 90 days of yoga training (Phase-II). Pyruvate and lactate in venous blood and blood gases in capillary blood were estimated immediately before and after the exercise. Minute ventilation and oxygen consumption were estimated before and during the test. Post exercise blood lactate was elevated significantly during initial and Phase-I, but not in Phase-II. There was significant reduction of minute ventilation and oxygen consumption only in males in Phase-I and II at the time when the volunteers reached their 80% of the predicted heart rate. Female volunteers were able to go to higher loads of exercise in Phase-I and II.

Thromb Haemost 1984 Apr 30;51(2):196-7

Influence of yoga on blood coagulation.

Chohan IS, Nayar HS, Thomas P, Geetha NS.

Yoga is known to induce beneficial effects on physiological, biochemical and mental functions in man. Its effects on blood coagulation are not known. A study was conducted in seven previously untrained male adults who underwent a combination of yogic exercises, daily for one hour, over a period of four months. Parameters of blood coagulation were estimated before and after the end of yoga training. The following changes were observed: Fibrinolytic activity increased significantly with a concomitant fall in fibrinogen; activated partial thromboplastin time and platelet aggregation time were prolonged; blood and plasma platelets showed a rise; and both haemoglobin and heamatocrit were raised at the end of the training. These findings suggest that yoga induces a state of blood hypocoagulability. The impact of yoga on prevention of cardiovascular and thrombotic disorders is obvious.

Acta Cardiol 1984;39(3):203-8

Role of yoga in management of essential hypertension.

Sundar S, Agrawal SK, Singh VP, Bhattacharya SK, Udupa KN, Vaish SK.

Twenty five patients of essential hypertension were studied. Of these, 20 patients were not given any antihypertensive drug treatment (Group A); other 5 had to be put on antihypertensive drugs before including them in the study (Group B). These patients were demonstrated "Shavasana" and trained to perform it correctly. Shavasana therapy was continued for six months. There was a statistically significant fall in both mean systolic and diastolic pressure of both groups. Further, there was a significant reduction in doses of antihypertensive drugs, being given to patients of group B. In 65% patients of group A, blood pressure could be controlled with Shavasana only and no drug was needed in them at all. Blood pressure rose significantly to pre-Shavasana levels in patients who left practising yoga. Thus, with use of yoga (Shavasana) in therapy of hypertension, requirement of antihypertensive drugs may be significantly decreased and in some cases may be totally dispensed with and it may be an useful adjunct in treatment of hypertension.

Lancet 1975 Jul 19;2(7925):93-5

Randomised controlled trial of yoga and bio-feedback in management of hypertension.

Patel C, North WR.

34 hypertensive patients were assigned at random either to six weeks' treatment by yoga relaxation methods with bio-feedback or to placebo therapy (general relaxation). Both groups showed a reduction in blood-pressure (from 168/100 to 141/84 mm. Hg

in the treated group and from 169/101 to 160/96 mm Hg in the control group). The difference was highly significant. The control group was then trained in yoga relaxation, and their blood-pressure fell to that of the other group (now used as controls).

Lancet 1975 Jan 11;1(7898):62-4

12-month follow-up of yoga and bio-feedback in the management of hypertension.

Patel C.

Twenty hypertensive patients treated by psychophysical relaxation exercises were followed up monthly for 12 months. Age and sex matched hypertensive controls were similarly followed up for 9 months. Statistically significant reductions in blood-pressure (BP) and antihypertensive drug requirements were satisfactorily maintained in the treatment group. Mere repetition of B.P. measurements and increased medical attention did not in themselves reduce B.P. significantly in control patients.

Immunsystem

Psychosom Med. 2003 Jul-Aug;65(4):571-81.

Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer outpatients.

Carlson LE, Speca M, Patel KD, Goodey E.

Department Psychosocial Resources, Tom Baker Cancer Centre (L.E.C., M.S., E.G.), Calgary, Alberta, Canada.

OBJECTIVES: This study investigated the relationships between a mindfulness-based stress reduction meditation program for early stage breast and prostate cancer patients and quality of life, mood states, stress symptoms, lymphocyte counts, and cytokine production. METHODS: Forty-nine patients with breast cancer and 10 with prostate cancer participated in an 8-week MBSR program that incorporated relaxation, meditation, gentle yoga, and daily home practice. Demographic and health behavior variables, quality of life (EORTC QLQ C-30), mood (POMS), stress (SOSI), and counts of NK, NKT, B, T total, T helper, and T cytotoxic cells, as well as NK and T cell production of TNF, IFN-gamma, IL-4, and IL-10 were assessed pre- and post intervention. RESULTS: Fifty-nine and 42 patients were assessed pre- and postintervention, respectively. Significant improvements were seen in overall quality of life, symptoms of stress, and sleep quality. Although there were no significant changes

in the overall number of lymphocytes or cell subsets, T cell production of IL-4 increased and IFN-gamma decreased, whereas NK cell production of IL-10 decreased. These results are consistent with a shift in immune profile from one associated with depressive symptoms to a more normal profile.

CONCLUSIONS: MBSR participation was associated with enhanced quality of life and decreased stress symptoms in breast and prostate cancer patients. This study is also the first to show changes in cancer-related cytokine production associated with program participation.

Drüsensystem

J Indian Med Assoc 2002 Mar;100(3):178-80

Lifestyle modification in management of diabetes mellitus.

Sahay BK, Sahay RK.

Department of Medicine, Osmania Medical College, Hyderabad.

India has the largest diabetic population in the world. Change in eating habits, increasing weight and decreased physical activity are major factors leading to increased incidence of type 2 diabetes. Obesity is the most important modifiable risk factor. Smoking is an independent risk factor for type 2 diabetes mellitus. Diet and exercise are primary therapeutic options for its management. Dietary management should not only aim to achieve glycaemic control but to normalise dyslipidaemia. Smoking cessation reduces the risk of morbidity and mortality in CAD. Exercise improves the condition of a diabetic patient. Exercise includes yoga practices which have a role to play in the prevention of type 2 diabetes.

Biol Psychol 2000 May;53(1):69-78

Acute increases in night-time plasma melatonin levels following a period of meditation.

Tooley GA, Armstrong SM, Norman TR, Sali A.

School of Psychology, La Trobe University, Victoria, Bundoora, Australia.
greggo@deakin.edu.au

To determine whether a period of meditation could influence melatonin levels, two groups of meditators were tested in a repeated measures design for changes in

plasma melatonin levels at midnight. Experienced meditators practising either TM-Sidhi or another internationally well known form of yoga showed significantly higher plasma melatonin levels in the period immediately following meditation compared with the same period at the same time on a control night. It is concluded that meditation, at least in the two forms studied here, can affect plasma melatonin levels. It remains to be determined whether this is achieved through decreased hepatic metabolism of the hormone or via a direct effect on pineal physiology. Either way, facilitation of higher physiological melatonin levels at appropriate times of day might be one avenue through which the claimed health promoting effects of meditation occur.

Semin Urol Oncol 1999 May;17(2):111-8

Meditation and prostate cancer: integrating a mind/body intervention with traditional therapies.

Coker KH.

Robert W. Woodruff Health Sciences Center, Emory University, The Emory Clinic Inc., Atlanta, GA 30022, USA.

There is growing attention to the health benefits of mind/body interventions, particularly relaxation and meditation. Biomedical research has provided undeniable evidence of the interconnectedness of the mind and body. The field of psychoneuroimmunology has defined the role of stress in reducing effectiveness of the immune system in combating infection and growth of malignant tumors. This article explains the development of meditation practice and explores the indications that the practice of meditation is effective reducing the harmful effects of stress. In addition, there are encouraging reports of studies citing the influence of melatonin on breast and prostate tumors. A preliminary study finds an association between meditation practice and levels of melatonin produced by the pineal gland.

Acta Physiol Scand Suppl 1997;640:158-62

Changes in cardiovascular risk factors and hormones during a comprehensive residential three month kriya yoga training and vegetarian nutrition.

Schmidt T, Wijga A, Von Zur Muhlen A, Brabant G, Wagner TO.

Department of Epidemiology & Social Medicine, Hannover Medical University, Germany.

In participants of a comprehensive residential three month yoga and mediation training programme living on a low fat lacto-vegetarian diet changes in cardiovascular

risk factors and hormones were studied. Substantial risk factor reduction was found. Body mass index, total serum and LDL cholesterol, fibrinogen, and blood pressure were significantly reduced especially in those with elevated levels. Urinary excretion of adrenaline, noradrenaline, dopamine, aldosterone, as well as serum testosterone and luteinizing hormone levels were reduced, while cortisol excretion increased significantly.

Biol Psychol 1995 Jun;40(3):251-65

The effects of running and meditation on beta-endorphin, corticotropin-releasing hormone and cortisol in plasma, and on mood.

Harte JL, Eifert GH, Smith R.

School of Behavioral Sciences, James Cook University of North Queensland, Townsville, Australia.

The relations between three hormones of the hypothalamic-pituitary-adrenocortical (HPA) axis, beta-endorphin (beta-EP), corticotropin-releasing hormone (CRH) and cortisol, and mood change were examined in 11 elite runners and 12 highly trained mediators matched in age, sex, and personality. Despite metabolic differences between running and meditation, we predicted that mood change after these activities would be similar when associated with similar hormonal change. Compared to pre-test and control values, mood was elevated after both activities but not significantly different between the two groups at post-test. There were significant elevations of beta-EP and CRH after running and of CRH after meditation, but no significant differences in CRH increases between groups. CRH was correlated with positive mood changes after running and mediation. Cortisol levels were generally high but erratic in both groups. We conclude that positive affect is associated with plasma CRH immunoreactivity which itself is significantly associated with circulating beta-EP supporting a role for CRH in the release of beta-EP. Increased CRH immunoreactivity following meditation indicates, however, that physical exercise is not an essential requirement for CRH release.

Int J Biometeorol 1994 May;38(1):44-7

Effect of yogic exercises on thyroid function in subjects resident at sea level upon exposure to high altitude.

Rawal SB, Singh MV, Tyagi AK, Selvamurthy W, Chaudhuri BN.

Defence Institute of Physiology and Allied Sciences, Delhi Cantonment, India.

Using radioactive iodine, the effect of 1 month's yogic exercises has been investigated on the thyroid function of subjects resident at sea level (SL) specially after their exposure to high altitude (HA). The results have been compared with a group of SL subjects who underwent physical training (PT) exercises for the same duration. Ten healthy male volunteers in the age range of 20-30 years were used as test subjects in this study with each serving as his own control. The subjects were randomly divided into two groups of 5 each. One group practised hatha yogic exercises, while the other group performed the regular PT exercises. The thyroidal accumulation and release of radioactive iodine have been measured in each of the subjects of both groups before and after 1 month of their respective exercises at SL. One month of yogic exercises at SL has been observed to cause a significant reduction in the trans-thyroidal availability of radioiodine. The thyroid radioactivity in this group of subjects was always below normal levels with the exception of two peaks of radioactive iodine uptake, when the levels of radioactivity in the thyroid were similar to the control values of pre-yogic exercises. The release of radiolabel at 24-48 h was significantly increased after yogic exercises. In contrast, the subjects performing PT exercises for the same duration at SL showed significant thyroid uptake of radioactive iodine at 24 h. Subsequently their 131I uptake continued to rise slowly until 72 h without any demonstrable thyroidal release of radiolabel. This indicated that increased thyroid activity was induced by conventional PT exercises.

Diabetes Res Clin Pract 1993 Jan;19(1):69-74

A study of response pattern of non-insulin dependent diabetics to yoga therapy.

Jain SC, Uppal A, Bhatnagar SO, Talukdar B.

Laboratory Division, Central Research Institute for Yoga, Delhi, India.

Changes in blood glucose and glucose tolerance by oral glucose tolerance test (OGTT) after 40 days of yoga therapy in 149 non-insulin-dependent diabetics (NIDDM) were investigated. The response to yoga in these subjects was categorized according to a severity scale index (SSI) based on area index total (AIT) under OGTT curve. One hundred and four patients showed a fair to good response to the yoga therapy. There was a significant reduction in hyperglycemia and AIT with decrease in oral hypoglycemia and AIT with decrease in oral hypoglycemic drugs required for maintenance of normoglycemia. It is concluded that yoga, a simple and economical therapy, may be considered a beneficial adjuvant for NIDDM patients.

Med Hypotheses 1990 Nov;33(3):155-8

Seasonal affective disorder and the yoga paradigm: a reconsideration of the role of the pineal gland.

Leskowitz E.

Department of Psychiatry, VA Outpatient Clinic, Boston, MA 02108.

Seasonal Affective Disorder is a psychiatric disorder whose pathophysiology and clinical presentation are poorly understood. By applying the ancient paradigm of yoga psychology to this subject, new understandings of the syndrome emerge regarding the possible role of the pineal gland, the clinical presentation of the syndrome, and the possible mechanism of action of phototherapy. The energy depletion model presented here ties together such diverse elements as: dose-response aspects of phototherapy, anergia as a primary symptom of SAD, 'spring fever', myofascial pain disorder, the anti-gonadotrophic effect of melatonin, and pineal supersensitivity in bipolar patients. Clinical predictions are made, and simple research protocols are suggested which can directly test the hypotheses generated by this paradigm.

Horm Behav 1978 Feb;10(1):54-60

Adrenocortical activity during meditation.

Jevning R, Wilson AF, Davidson JM.

We studied acute plasma cortisol and testosterone concentration changes during the practice known as "transcendental meditation" (TM) and during control rest. Three groups of normal, young adult volunteers were studied: a group of controls, these same controls restudied as practitioners after 3 to 4 months of TM practice, and a group of long-term, regular TM practitioners (3 to 5 years of practice). No change was found in controls during rest. Cortisol declined, but not significantly, in restudied controls, while cortisol decreased significantly in long-term practitioners during meditation and remained somewhat low afterward. No change in testerone concentration was noted during either rest or TM. Apparently, the practice of TM becomes associated with psychophysiologic response(s) which acutely inhibit pituitary-adrenal activity.

Gelenke

Cochrane Database Syst Rev. 2003;(1):CD003219.

Non-surgical treatment (other than steroid injection) for carpal tunnel syndrome.

O'Connor D, Marshall S, Massy-Westropp N.

School of Occupational Therapy, University of South Australia, City East Campus, North Terrace, Adelaide, South Australia, Australia. Denise.OConnor@unisa.edu.au

BACKGROUND: Non-surgical treatment for carpal tunnel syndrome is frequently offered to those with mild to moderate symptoms. The effectiveness and duration of benefit from non-surgical treatment for carpal tunnel syndrome remain unknown. OBJECTIVES: To evaluate the effectiveness of non-surgical treatment (other than steroid injection) for carpal tunnel syndrome versus a placebo or other non-surgical, control interventions in improving clinical outcome. SEARCH STRATEGY: We searched the Cochrane Neuromuscular Disease Group specialised register (searched March 2002), MEDLINE (searched January 1966 to February 7 2001),

EMBASE (searched January 1980 to March 2002), CINAHL (searched January 1983 to December 2001), AMED (searched 1984 to January 2002), Current Contents (January 1993 to March 2002), PEDro and reference lists of articles. SELECTION CRITERIA: Randomised or quasi-randomised studies in any language of participants with the diagnosis of carpal tunnel syndrome who had not previously undergone surgical release. We considered all non-surgical treatments apart from local steroid injection. The primary outcome measure was improvement in clinical symptoms after at least three months following the end of treatment. DATA COLLECTION AND ANALYSIS: Three reviewers independently selected the trials to be included. Two reviewers independently extracted data. Studies were rated for their overall quality. Relative risks and weighted mean differences with 95% confidence intervals were calculated for the primary and secondary outcomes in each trial. Results of clinically and statistically homogeneous trials were pooled to provide estimates of the efficacy of non-surgical treatments. MAIN RESULTS: Twenty-one trials involving 884 people were included. A hand brace significantly improved symptoms after four weeks (weighted mean difference (WMD) -1.07; 95% confidence interval (CI) -1.29 to -0.85) and function (WMD -0.55; 95% CI -0.82 to -0.28). In an analysis of pooled data from two trials (63 participants) ultrasound treatment for two weeks was not significantly beneficial. However one trial showed significant symptom improvement after seven weeks of

ultrasound (WMD -0.99; 95% CI -1.77 to - 0.21) which was maintained at six months (WMD -1.86; 95% CI -2.67 to -1.05). Four trials involving 193 people examined various oral medications (steroids, diuretics, nonsteroidal anti-inflammatory drugs) versus placebo. Compared to placebo, pooled data for two-week oral steroid treatment demonstrated a significant improvement in symptoms (WMD -7.23; 95% CI -10.31 to -4.14). One trial also showed improvement after four weeks (WMD -10.8; 95% CI -15.26 to -6.34). Compared to placebo, diuretics or nonsteroidal anti-inflammatory drugs did not demonstrate significant benefit.

In two trials involving 50 people, vitamin B6 did not significantly improve overall symptoms. In one trial involving 51 people yoga significantly reduced pain after eight weeks (WMD -1.40; 95% CI -2.73 to -0.07) compared with wrist splinting. In one trial involving 21 people carpal bone mobilisation significantly improved symptoms after three weeks (WMD -1.43; 95% CI -2.19 to -0.67) compared to no treatment. In one trial involving 50 people with diabetes, steroid and insulin injections significantly improved symptoms over eight weeks compared with steroid and placebo injections. Two trials involving 105 people compared ergonomic keyboards versus control and demonstrated equivocal results for pain and function. Trials of magnet therapy, laser acupuncture, exercise or chiropractic care did not demonstrate symptom benefit when compared to placebo or control. REVIEWER'S CONCLUSIONS: Current evidence shows significant short-term benefit from oral steroids, splinting, ultrasound, yoga and carpal bone mobilisation. Other non-surgical treatments do not produce significant benefit.

More trials are needed to compare treatments and ascertain the duration of benefit.

JAMA 1998 Nov 11;280(18):1601-3

Yoga-based intervention for carpal tunnel syndrome: a randomized trial.

Garfinkel MS, Singhal A, Katz WA, Allan DA, Reshetar R, Schumacher HR Jr.

Department of Medicine, University of Pennsylvania School of Medicine, Philadelphia, USA.

mariang102@aol.com

CONTEXT: Carpal tunnel syndrome is a common complication of repetitive activities and causes significant morbidity. OBJECTIVE: To determine the effectiveness of a yoga-based regimen for relieving symptoms of carpal tunnel syndrome. DESIGN: Randomized, single-blind, controlled trial. SETTING: A geriatric center and an industrial site in 1994-1995. PATIENTS: Forty-two employed or retired individuals with carpal tunnel syndrome (median age, 52 years; range, 24-77 years). INTERVENTION: Subjects assigned to the yoga group received a yoga-based intervention consisting of 11 yoga postures designed for strengthening, stretching, and balancing each joint in the upper body along with relaxation given twice weekly for 8 weeks. Patients in the control group were offered a wrist splint to supplement their current treatment. MAIN OUTCOME MEASURES: Changes from baseline to 8 weeks in grip strength, pain intensity, sleep disturbance, Phalen sign, and Tinel sign, and in median nerve motor and sensory conduction time. RESULTS: Subjects in the yoga groups had significant improvement in grip strength (increased from 162 to 187 mm Hg; P = .009) and pain reduction (decreased from 5.0 to 2.9 mm; P = .02), but changes in grip strength and pain were not significant for control subjects. The yoga group had significantly more improvement in Phalen sign (12 improved vs 2 in control group; P = .008), but no significant differences were found in sleep disturbance, Tinel sign, and median nerve motor and sensory conduction time.

CONCLUSION: In this preliminary study, a yoga-based regimen was more effective than wrist splinting or no treatment in relieving some symptoms and signs of carpal tunnel syndrome.

J Rheumatol 1994 Dec;21(12):2341-3

Evaluation of a yoga based regimen for treatment of osteoarthritis of the hands.

Garfinkel MS, Schumacher HR Jr, Husain A, Levy M, Reshetar RA.

Division of Rheumatology, University of Pennsylvania School of Medicine, Philadelphia.

OBJECTIVE. Yoga and relaxation techniques have traditionally been used by nonmedical practitioners to help alleviate musculoskeletal symptoms. The objective of this study was to collect controlled observations of the effect of yoga on the hands of patients with osteoarthritis (OA). METHODS. Patients with OA of the hands were randomly assigned to receive either the yoga program or no therapy. Yoga techniques were supervised by one instructor once/week for 8 weeks. Variables assessed were pain, strength, motion, joint circumference, tenderness, and hand function using the Stanford Hand Assessment questionnaire. RESULTS. The yoga treated group improved significantly more than the control group in pain during activity, tenderness and finger range of motion. Other trends also favored the yoga program.

CONCLUSION. This yoga derived program was effective in providing relief in hand OA. Further studies are needed to compare this with other treatments and to examine longterm effects.

Muskeln/Motorik

Indian J Physiol Pharmacol 2001 Jul;45(3):351-4

Improved performance in the Tower of London test following yoga.

Manjunath NK, Telles S.

Swami Vivekananda Yoga Research Foundation, City Office, # 9, 1st Main, Chamarajpet, Bangalore-560 018.

Twenty girls between 10 and 13 years of age, studying at a residential school were randomly assigned to two groups. One group practiced yoga for one hour fifteen minutes per day, 7 days a week, while the other group was given physical training for the same time. Time for planning and for execution and the number of moves required to complete the Tower of London task were assessed for both groups at the beginning and end of a month. These three assessments were separately tested in increasingly complex tasks requiring 2-moves, 4-moves and 5-moves. The pre-post data were compared using the Wilcoxon paired signed ranks test. The yoga group showed a significant reduction in planning time for both 2-moves and 4-moves tasks (53.9 and 59.1 percent respectively), execution time in both 4-moves and 5-moves tasks (63.7 and 60.3 percent respectively), and in the number of moves in the 4-moves tasks (20.9 percent). The physical training group showed no change. Hence yoga training for a month reduced the planning and execution time in simple (2-moves) as well as complex tasks (4, 5-moves) and facilitated reaching the target with a smaller number of moves in a complex task (4-moves).

Indian J Physiol Pharmacol 2001 Jul;45(3):355-60

Improvement in hand grip strength in normal volunteers and rheumatoid arthritis patients following yoga training.

Dash M, Telles S.

Swami Vivekananda Yoga Research Foundation, No. # 9, 1st Main, Chamarajpet, Bangalore-560 018.

The present study aimed at assessing the effects of a set of yoga practices on normal adults (n = 37), children (n = 86), and patients with rheumatoid arthritis (n = 20). An equal number of normal adults, children, and patients with rheumatoid arthritis who did not practice yoga were studied under each category, forming respective control groups. Yoga and control group subjects were assessed at baseline and after varying intervals, as follows, adults after 30 days, children after 10 days and patients after 15 days, based on the duration of the yoga program, which they attended, which was already fixed. Hand grip strength of both hands, measured with a grip dynamometer, increased in normal adults and children, and in rheumatoid arthritis patients, following yoga, but not in the corresponding control groups, showing no re-test effect. Adult female volunteers and patients showed a greater percentage improvement than corresponding adult males. This gender-based difference was not observed in children. Hence yoga practice improves hand grip strength in normal persons and in patients with rheumatoid arthritis, though the magnitude of improvement varies with factors such as gender and age.

Indian J Physiol Pharmacol 1999 Oct;43(4):458-62

Yoga training and motor speed based on a finger tapping task.

Dash M, Telles S.

Vivekananda Kendra Yoga Research Foundation, Chamarajpet, Bangalore.

A finger tapping task was used to assess motor speed (MS) of both hands in 53 adults and 152 children before and after yoga training and in 38 adults of a non-yoga (control) group. All subjects were right hand dominant. The 30-second tapping speed (TS) test was considered as three time intervals, i.e. 0-10 second (TS1), 10-20 seconds (TS2) and 20-30 seconds (TS3). There was a significant (Student's t-test) increase in all three TS values following 10 days of yoga in children and 30 days of yoga in adults. However for both groups at baseline and final assessments, TS2 and TS3 were significantly lower than TS1. Hence the TS was increased after yoga training during the first 10-seconds of the test but not during the next 20 seconds. These results suggest an increase in motor speed for repetitive finger movements following yoga training, but not in strength or endurance, as the increase was not sustained over 30 sec.

Indian J Physiol Pharmacol 1999 Apr;43(2):225-9

Factors influencing changes in tweezer dexterity scores following yoga training.

Manjunath NK, Telles S.

Vivekananda Kendra Yoga Research Foundation, K. G. Nagar, Bangalore.

Yoga has already been shown to improve perceptual-motor skills, but the factors which influence its effects are not well defined. This study correlates age, gender, and motivation to learn yoga with the performance in a dexterity task following yoga. Tweezer dexterity was recorded in eighty subjects belonging to four groups. Two groups were given a month of yoga training. One group consisted of subjects who had volunteered to join for the training and the other group were deputed for the training as part of their job. The two remaining groups did not receive yoga training and were selected to match the respective groups receiving yoga, for age and sex, but not for their motivation to learn yoga. The test involved using a tweezer to place metal pins in evenly spaced holes in a metal plate within four minutes. Following yoga the scores of the volunteers who learnt yoga increased significantly, whereas there was no change in scores of deputed subjects and non-yoga groups. For reasons described in detail, factors such as age and gender did not appear to contribute to the difference in performance. Hence motivation to learn yoga appeared to influence the magnitude of increase.

Indian J Physiol Pharmacol 1997 Apr;41(2):129-33

Pranayama increases grip strength without lateralized effects.

Raghuraj P, Nagarathna R, Nagendra HR, Telles S.

Vivekananda Kendra Yoga Research Foundation, Bangalore.

The present study was conducted to determine whether breathing through a particular nostril has a lateralized effect on hand grip strength. 130 right hand dominant, school children between 11 and 18 yrs of age were randomly assigned to 5 groups. Each group had a specific yoga practice in addition to the regular program for a 10 day yoga camp. The practices were: (1) right-, (2) left-, (3) alternate- nostril breathing (4), breath awareness and (5) practice of mudras. Hand grip strength of both hands was assessed initially and at the end of 10 days for all 5 groups. The right-, left- and alternate-nostril breathing groups had a significant increase in grip strength of both hands, ranging from 4.1% to 6.5%, at the end of the camp though without any

lateralization effect. The breath awareness and mudra groups showed no change. Hence the present results suggest that yoga breathing through a particular nostril, or through alternate nostrils increases hand grip strength of both hands without lateralization.

Indian J Physiol Pharmacol 1994 Apr;38(2):143-4

Plasticity of motor control systems demonstrated by yoga training.

Telles S, Hanumanthaiah BH, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Chamarajpet, Bangalore.

The static motor performance was tested in two groups with 20 subjects in each (age range 17 to 22 years, and 5 females in each group). Tests were carried out at the beginning and end of a 10 day period. The test required being able to insert and hold a metal stylus within holes of varying sizes for 15 sec. Accidental contacts between the stylus and the sides of the holes, were registered on a counter as errors. During the 10 days one group (the yoga group) practised asanas (physical postures), pranayama (voluntary regulation of breathing), meditation, devotional sessions, and tratakas (visual focussing exercises). The control group followed their usual routine. At the end of 10 days the yoga group showed a significant reduction in number of errors (Wilcoxon paired signed ranks test), while the control group did not change. Our earlier study showed a similar improvement in children (9-13 years). It was interesting to note the same degree of plasticity in motor control systems in young adults. The implications for rehabilitation programmes have been discussed.

Indian J Physiol Pharmacol 1993 Jul;37(3):225-8

Body composition, cardiovascular endurance and anaerobic power of yogic practitioner.

Bera TK, Rajapurkar MV.

Scientific Research Department, Kaivalyadhama, Lonavla.

Forty male high school students, age 12-15 yrs, participated for a study of yoga in relation to body composition, cardiovascular endurance and anaerobic power. Ths Ss were placed into two subsets viz., yoga group and control group. Body composition, cardiovascular endurance anaerobic power were measured using standard method. The duration of experiment was one year. The result of ANCOVA revealed that a significant improvement in ideal body weight, body density, cardiovascular endurance and anaerobic power was observed as a result of yoga training. This study could not

show significant change in body fat (midaxillary), skeletal diameters and most of the body circumferences. It was evident that some of the fat-folds (tricep, subscapular, suprailiac, umbilical, thigh and calf) and body circumferences (waist, umbilical and hip) were reduced significantly.

Percept Mot Skills 1993 Jun;76(3 Pt 2):1264-6

Improvement in static motor performance following yogic training of school children.

Telles S, Hanumanthaiah B, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Bangalore, India.

Two groups of 45 children each, whose ages ranged from 9 to 13 years, were assessed on a steadiness test, at the beginning and again at the end of a 10-day period during which one group received training in yoga, while the other group did not. The steadiness test required insertion of and holding for 15 sec. a metal stylus without touching the sides of holes of decreasing sizes in a metal plate. The contacts were counted as 'errors'. During the 10-day period, one group (the 'Yoga' group) received training in special physical postures (asanas), voluntary regulation of breathing (Pranayama), maintenance of silence, as well as visual focussing exercises (tratakas) and games to improve the attention span and memory. The other group (control) carried out their usual routine. After 10 days, the 'Yoga' group showed a significant (Wilcoxon's paired signed-ranks test) decrease in errors, whereas the 'control' group showed no change.

Indian J Physiol Pharmacol 1992 Oct;36(4):229-33

Effect of yoga training on reaction time, respiratory endurance and muscle strength.

Madanmohan, Thombre DP, Balakumar B, Nambinarayanan TK, Thakur S, Krishnamurthy N, Chandrabose A.

Department of Physiology, Jawaharlal Institute of Postgraduate Medical Education and Research, Pondicherry.

There is evidence that the practice of yoga improves physical and mental performance. The present investigation was undertaken to study the effect of yoga training on visual and auditory reaction times (RTs), maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP), 40 mmHg test, breath holding time after expiration (BHTexp), breath holding time after inspiration (BHTinsp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12

weeks. There was a significant (P < 0.001) decrease in visual RT (from 270.0 +/- 6.20 (SE) to 224.81 +/- 5.76 ms) as well as auditory RT (from 194.18 +/- 6.00 to 157.33 +/- 4.85 ms). MEP increased from 92.61 +/- 9.04 to 126.46 +/- 10.75 mmHg, while MIP increased from 72.23 +/- 6.45 to 90.92 +/- 6.03 mmHg, both these changes being statistically significant (P < 0.05). 40 mmHg test and HGS increased significantly (P < 0.001) from 36.57 +/- 2.04 to 53.36 +/- 3.95 s and 13.78 +/- 0.58 to 16.67 +/- 0.49 kg respectively. BHTexp increased from 32.15 +/- 1.41 to 44.53 +/- 3.78s (P < 0.01) and BHTinsp increased from 63.69 +/- 5.38 to 89.07 +/- 9.61 s (P < 0.05). Our results show that yoga practice for 12 weeks results in significant reduction in visual and auditory RTs and significant increase in respiratory pressures, breath holding times and HGS.

Indian J Physiol Pharmacol 1992 Apr;36(2):88-92

Effect of Santhi Kriya on certain psychophysiological parameters: a preliminary study.

Satyanarayana M, Rajeswari KR, Rani NJ, Krishna CS, Rao PV.

Institute for Yoga & Consciousness, Andhra University, Visakhapatnam.

Santhi Kriya is a mixture of combined yogic practices of breathing and relaxation. Preliminary attempts were made to determine the effect of Santhi Kriya on certain psychophysiological parameters. Eight healthy male volunteers of the age group 25.9 +/- 3 (SD) years were subjected to Santhi Kriya practice daily for 50 minutes for 30 days. The volunteer's body weight, blood pressure, oral temperature, pulse rate, respiration, ECG and EEG were recorded before and after the practice on the 1st day and subsequently on 10th, 20th and 30th day of their practice. They were also given a perceptual acuity test to know their cognitive level on the 1st day and also at the end of the study i.e., on the 30th day. Results indicate a gradual and significant decrease in the body weight from 1st to 30th day (P less than 0.001) and an increase in alpha activity of the brain (P less than 0.001) during the course of 30 days of Santhi Kriya practice. Increase of alpha activity both in occipital and pre-frontal areas of both the hemispheres of the brain denotes an increase of calmness. This study also revealed that Santhi Kriya practice increases oral temperature by 3 degrees F and decreases respiratory rate significantly (P less than 0.05) on all practice days. Other parameters were not found to be altered significantly. It is concluded that the Santhi Kriya practice for 30 days reduces body weight and increases calmness.

Ann Nutr Metab 1992;36(3):141-7

Thermic responses to vegetarian meals and yoga exercise.

Agte V, Chiplonkar S.

Department of Biometry and Nutrition, Maharashtra Association for the Cultivation of Science, Pune, India.

The thermic effect (TEF) of vegetarian meals was measured for breakfast and lunch in 6 lean healthy men (18-25 years) during normal feeding (NF) and with 20% overfeeding (OF) on 28 successive days. The energy contents of breakfast were 223 +/- 10 and 330 +/- 48 kcal, and those of lunch were 1,033 +/- 220 and 1,247 +/- 222 kcal in NF and OF, respectively. In NF, the TEF per 180 min was 32.7 +/- 8.6 and 54.8 +/- 6.3 kcal for breakfast and lunch, respectively. In OF, the TEF was 38.3 +/- 8.3 kcal for breakfast and 57.2 +/- 5.4 kcal for lunch. The increase in total TEF due to OF was nonsignificant (p greater than 0.2). In response to 20% OF, adaptive thermogenesis was manifested mainly through an increase in the resting metabolic rate of 4.9% (p less than 0.001). In both feeding, regimes, the percent TEF was higher for breakfast than for lunch (p less than 0.05). Regression analysis of TEF versus calorie load indicated a stable component of 42 kcal with a 2% rate of increase. Yoga exercises were performed from 16.00 to 17.00 daily. The thermic effect of yoga exercises observed from 17.10 to 18.30 was 21 kcal and persisted beyond 90 min, indicating the role of yoga in energy metabolism.

Indian J Physiol Pharmacol 1991 Oct;35(4):281-2

Effect of yoga on aerobic and anaerobic power of muscles.

Balasubramanian B, Pansare MS.

Department of Physiology, B. J. Medical College, Pune.

Aerobic Power (VO2 max) and anaerobic power were estimated in medical students before and after six weeks of yogic training. A significant increase in aerobic power and a significant decrease in anaerobic power was observed. This may be due to conversion of some of the Fast Twitch (F.T.) muscle fibres into Slow Twitch fibres (S.T.) during yogic training.

Indian J Physiol Pharmacol 1991 Jul;35(3):191-4

A comparative study of the driving effects of dextroamphetamine and yogic meditation on muscle control for the performance of balance on balance board.

Dhume RR, Dhume RA.

Department of Physiology, Goa Medical College, Bambolim.

The work is aimed to compare the relative strength of dextroamphetamine and yogic meditation on the performance of 3 different groups of medical students to

concentrate on the task to balance on a balance board. Group A subjects were mediators, group B subjects were given orally 5 and 10 mg of dextroamphetamine in a capsule, 1 hr prior to the test. Group C subjects were given same capsule but with lactose in place of the drug (placebo). This last groups served as control for the study. The balance index calculated taking into account their balance time and error score at each trial of 5 min duration showed that the performance of the group B (drug) had declined with overall percentile fall of 40.6% as compared to the performance of the controls (placebo) whereas, the performance of Group A (meditators) went on steadily and progressively increasing throughout the period of 10 trial days with overall percentile rise of 27.8%. The results were conclusive to confirm earlier reports that amphetamine is not of use for improvement of task rather, it deteriorates the task performance. Contrary to that, yogic meditation is of merit to achieve concentration for mental as well as physical task.

Indian J Physiol Pharmacol 1990 Oct;34(4):279-81

Quantitative evaluation of muscle relaxation induced by Kundalini yoga with the help of EMG integrator.

Narayan R, Kamat A, Khanolkar M, Kamat S, Desai SR, Dhume RA.

Department of Physiology, Goa Medical College, Bambolim, Santa Cruz.

The present work is aimed to quantify the degree of relaxation of muscle under the effects of Kundalini Yoga with the help of EMG integrator. The data collected from 8 individuals (4 males 4 females) on the degree of muscle relaxation at the end of meditation revealed a significantly decreased muscle activity amounting to 58% of the basal level in both the sexes.

Med Pregl 1990;43(5-6):268-72

The effect of Hatha yoga on poor posture in children and the psychophysiologic condition in adults.

Article in Serbo-Croatian (Roman)

Savic K, Pfau D, Skoric S, Pfau J, Spasojevic N.

Medicinski fakultet, Institut za zdravstvenu zastitu majke i deteta, Novi Sad.

Hatha Yoga's effects on the posture of 15 ten year-old children and also its effects on the psychophysical condition of 15 grown-ups was studied. As symptoms, during the first examination, 12 of the 15 children had head protrusion, 14 had shortened back extensors, all 15 had bent shoulders, relaxation of the frontal abdominal wall and

shortened flexors of both the calf and thigh. The condition of all the children was remarkably better after six months of practice, some of the symptoms having completely disappeared (head protrusion, asymmetry of the shoulders, mamillas and hips, shortening of the pectoralis and back extensors), 9 children still had slight to medium relaxation of the frontal abdominal wall, 8 children still had bent shoulders, and 1 child still had shortened calf and thigh extensors. The adults were in a weak or very weak psychophysical condition, they tired easily, they complained of sleep disturbances, fluctuation of emotional state and irritability. After 3 months of practice, the vital capacity of 8 of the adults tested (53.3%) had increased by 435 ml. The time duration of apnoea had lengthened for all of the practicing adults, but with a truly large variation among them (a median of 14%). The deep waist-bend length of all the practicing adults had lengthened by an average of 9.5 cm, and the average length increase for the 3-minute running test was 42 m. All those who practiced, had experienced an alleviation of psychic difficulties.

J Sports Med Phys Fitness 1989 Jun;29(2):177-8

Effect of yogic training on serum LDH levels.

Pansare MS, Kulkarni AN, Pendse UB.

LDH is a glycolytic enzyme utilised during exercise to provide energy to contracting muscles. Chronic submaximal exercise for a longer duration shows about two-fold increase in LDH levels. Yogic practises might be bringing similar effects. The present work was designed to study effect of yogic training on LDH levels. Fourteen female and six male students of average age or 18 years were subjected to yogic training for six weeks. Serum LDH levels were found before and after the training course by spectrophotometric method of Henry et al. The serum LDH levels were within normal limits and showed significant increase both in females and males after yogic training. It indicates that Yoga has similar effect on LDH levels like endurance training.

Nervensystem

Percept Mot Skills. 2003 Feb;96(1):79-80.

Effect of yoga-based and forced uninostril breathing on the autonomic nervous system.

Raghuraj P, Telles S.

Vivekananda Yoga Research Foundation, Chamarajpet, Bangalore, India.

Some reports have described the effects of forced uninostril breathing on autonomic activity as sex-specific, while other reports described selective effects of breathing through a specific nostril on the two divisions of the utonomic nervous system, irrespective of sex. There are also yoga breathing techniques which involve voluntary uninostril breathing. These techniques also influenced the autonomic activity based on the patent nostril rather than sex. These descriptions were in line with experiential observations of the ancient sages described in classical yoga texts. This paper summarizes these perspectives on uninostril breathing.

Health Technol Assess 2000;4(27):1-61

Treatments for fatigue in multiple sclerosis: a rapid and systematic review.

Branas P, Jordan R, Fry-Smith A, Burls A, Hyde C.

West Midlands Development and Evaluation Service, The University of Birmingham, Birmingham, UK.

BACKGROUND: Multiple sclerosis (MS) is an important problem both for people with the disease and for society. There is no cure, and alleviation of symptoms forms the cornerstone of care. Excessive fatigue that severely limits activity is experienced by at least two-thirds of the estimated 60,000 people with MS in the UK. OBJECTIVES: (1) To identify current treatments for fatigue in MS and their evidence-base. (2) To systematically review the evidence for those treatments that have been investigated in more than one rigorous study, in order to determine their effectiveness and cost-effectiveness. METHODS: The review was carried out in two stages: a formal scoping review (to assess the range of interventions used by people with MS), and a systematic review for treatments that had been identified as promising and that had been investigated in clinical trials (as identified in the scoping review). A systematic review of research on costs and cost-effectiveness of those interventions identified as promising was also performed. Electronic databases, including MEDLINE and EMBASE, were searched for the period 1991-June 1999 (scoping review) and 1966-December 1999 (systematic review). Reference lists from publications were also searched, and experts were contacted for any additional information not already identified. RESULTS: Interventions identified for the treatment of fatigue in MS (1) Behavioural advice. This is the main element of initial clinical management and no rigorous research of its effectiveness was identified. (2) Drugs (amantadine, pemoline, potassium-channel blockers and antidepressants). (3) Training, rehabilitation and devices (cooling vests and electromagnetic fields). (4) Alternative therapies (bee venom, cannabis, acupuncture/acupressure and yoga). Only two drugs, amantadine and pemoline, met the criteria for full systematic review. RESULTS - EFFECTIVENESS OF AMANTADINE: One parallel and three crossover trials were found, involving a total of 236 people with MS. All studies were open to bias. All studies showed a pattern in favour of amantadine compared with placebo, but there is considerable uncertainty about the validity and clinical significance of this finding. This pattern of benefit was considerably undermined when different assumptions were used in the sensitivity analysis. RESULTS - EFFECTIVENESS OF PEMOLINE: One parallel and one crossover trial were

found involving a total of 126 people with MS. Both studies were open to bias. There was no overall tendency in favour of pemoline over placebo and an excess of reports of adverse effects with pemoline. RESULTS - HEALTH ECONOMIC ANALYSIS: The drug costs of amantadine and pemoline are modest (pound 200 and pound 80 per annum, respectively). No economic evaluations were identified in the systematic review, and available data were insufficient to allow modelling of cost-effectiveness in this rapid review. CONCLUSIONS: There is insufficient evidence to allow people with MS, clinicians or policy makers to make informed decisions on the appropriate use of the many treatments on offer. Only amantadine appears to have some proven ability to alleviate the fatigue in MS, though only a proportion of users will obtain benefit and then only some of these patients will benefit sufficiently to take the drug in the long term. CONCLUSIONS - RECOMMENDATIONS FOR RESEARCH: The frequency, severity and impact of fatigue, the poverty of available research, and the absence of any ongoing research, suggest that new research is an urgent priority. People with MS, clinicians and policy makers should work together to ensure that the evidence required is collected as quickly as possible by encouraging involvement in rigorous research. Research should not be restricted to the two drugs reviewed in depth in this report. All interventions identified in the scooping review (see above) should be considered, as should basic scientific research into the underlying mechanism of fatigue in MS.

Fortschr Neurol Psychiatr 1997 Dec;65(12):555-61

The use of alternative medicine by multiple sclerosis patients--patient characteristics and patterns of use

Article in German

Winterholler M, Erbguth F, Neundorfer B.

Neurologische Klinik der Universitat Erlangen-Nurnberg.

The use of alternative medicine is growing in all Western countries. Little is known about the modalities and patterns of use of alternative medicine by patients suffering from multiple sclerosis. PATIENTS AND METHODS: We analysed an anonymous questionnaire that was sent to and answered by 129 former inpatients who had multiple sclerosis diagnosed by typical clinical and laboratory findings. RESULTS: 82 of 129 patients (63.6%) have been using alternative therapies. They were treated with a total of 87 different alternative healing methods or substances. Some patients used up to 9 different methods. The mean duration of the alternative treatment was 2.6 (0-20) years. Most patients used homoeopathy (n = 35), herbs (29 different substances, 32 users), different relaxation methods like yoga (n = 38) and various diets (n = 21). The most important motivation to look for alternative medicine was the aim to participate actively in the healing process. Most patients thought that there was some positive effect from the alternative treatment but did not inform their general practitioner or neurologist about it. DISCUSSION: Like in other chronic diseases many MS-patients use alternative medicine. The experiences of these treatments forms part of the patient's coping with the disease.

Eur J Clin Invest 1997 May;27(5):443-9

Effects of aerobic exercise training and yoga on the baroreflex in healthy elderly persons.

Bowman AJ, Clayton RH, Murray A, Reed JW, Subhan MM, Ford GA.

Department of Pharmacological Sciences, University, Newcastle upon Tyne, UK.

It is unclear whether the age-associated reduction in baroreflex sensitivity is modifiable by exercise training. The effects of aerobic exercise training and yoga, a non-aerobic control intervention, on the baroreflex of elderly persons was determined. Baroreflex sensitivity was quantified by the alpha-index, at high frequency (HF; 0.15-0.35 Hz, reflecting parasympathetic activity) and mid-frequency (MF; 0.05-0.15 Hz, reflecting sympathetic activity as well), derived from spectral and cross-spectral analysis of spontaneous fluctuations in heart rate and blood pressure. Twenty-six (10 women) sedentary, healthy, normotensive elderly (mean 68 years, range 62-81 years) subjects were studied. Fourteen (4 women) of the sedentary elderly subjects completed 6 weeks of aerobic training, while the other 12 (6 women) subjects completed 6 weeks of yoga. Heart rate decreased following yoga (69 +/- 8 vs. 61 +/- 7 min-1, P < 0.05) but not aerobic training (66 +/- 8 vs. 63 +/- 9 min-1, P = 0.29). VO2 max increased by 11% following yoga (P < 0.01) and by 24% following aerobic training (P < 0.01). No significant change in alpha MF (6.5 +/- 3.5 vs. 6.2 +/- 3.0 ms mmHg-1, P = 0.69) or alpha HF (8.5 +/- 4.7 vs. 8.9 +/- 3.5 ms mmHg-1, P = 0.65) occurred after aerobic training. Following yoga, alpha HF (8.0 +/- 3.6 vs. 11.5 +/- 5.2 ms mmHg-1, P < 0.01) but not alpha MF (6.5 +/- 3.0 vs. 7.6 +/- 2.8 ms mmHg-1, P = 0.29) increased. Short-duration aerobic training does not modify the alpha-index at alpha MF or alpha HF in healthy normotensive elderly subjects. alpha HF but not alpha MF increased following yoga, suggesting that these parameters are measuring distinct aspects of the baroreflex that are separately modifiable.

Percept Mot Skills 1997 Feb;84(1):251-7

Comparison of changes in autonomic and respiratory parameters of girls after yoga and games at a community home.

Telles S, Narendran S, Raghuraj P, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Bangalore, India.

The heart rate, breathing rate, and skin resistance were recorded for 20 community home girls (Home group) and for 20 age-matched girls from a regular school (School group). The former group had a significantly higher rate of breathing and a more irregular breath pattern known to correlate with high fear and anxiety, than the School

group. Skin resistance was significantly lower in the School group, which may suggest greater arousal, 28 girls of the Home group formed 14 pairs, matched for age and duration of stay in the home. Subjects of a pair were randomly assigned to either yoga or games groups. For the former emphasis was on relaxation and awareness, whereas for the latter increasing physical activity was emphasized. At the end of an hour daily for six months both groups showed a significant decrease in the resting heart rate relative to initial values (Wilcoxon paired-sample rest), and the yoga group showed a significant decrease in breath rate, which appeared more regular but no significant increase in the skin resistance. These results suggest that a yoga program which includes relaxation, awareness, and graded physical activity is a useful addition to the routine of community home children.

Indian J Physiol Pharmacol 1996 Jan;40(1):58-64

Svara (nostril dominance) and bilateral volar GSR.

Mohan SM.

Institute for Yoga and Consciousness, Andhra University, Visakhapatnam.

The Svara yoga concept of Ida, Pingala and Susumna svara representing rest, active and turbulent states was examined in this study by recording nostril dominance (svara) and bilateral volar GSR (galvanic skin resistance) as an indicator of sympathetic activity under field and laboratory conditions. The sympathetic activity was low in Ida svara, followed by Pingala svara and was maximum in Susumna svara group of subjects under both field and laboratory conditions which agreed with the traditional Svara yoga description. The volar GSR on the right side more readily varied with svara, particularly so in the physically relaxed subjects of laboratory condition than the left volar GSR. The latter observation was worth noting because the subjects were right handed. The right side could be recommended as the standard site for recording volar GSR to closely reflect the sympathetic activity, particularly so when physical rest was given to subjects.

J Altern Complement Med 1996 Winter;2(4):479-84

Physiological measures of right nostril breathing.

Telles S, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Bangalore, India.

This study was conducted to assess the physiological effects of a yoga breathing practice that involves breathing exclusively through the right nostril. This practice is

called surya anuloma viloma pranayama (SAV). Twelve volunteers (average age 27.2 years +/- 3.3 years, four males) were assessed before and after test sessions conducted on two consecutive days. On one day the test session involved practicing SAV pranayama for 45 minutes (SAV session). During the test period of the other day, subjects were asked to breathe normally for 45 minutes (NB session). For half the patients (randomly chosen) the SAV session was on the first day and the NB session on the next day. For the remaining six patients, the order of the two sessions was reversed. After the SAV session (but not after the NB) there was a significant (P < . 05, paired t test) increase in oxygen consumption (17%) and in systolic blood pressure (mean increase 9.4 mm Hg) and a significant decrease in digit pulse volume (45.7%). The latter two changes are interpreted to be the result of increased cutaneous vasoconstriction. After both SAV and NB sessions, there was a significant decrease in skin resistance (two factor ANOVA, Tukey test). These findings show that SAV has a sympathetic stimulating effect. This technique and other variations of unilateral forced nostril breathing deserve further study regarding therapeutic merits in a wide range of disorders.

Indian J Physiol Pharmacol 1995 Oct;39(4):418-20

Autonomic changes during "OM" meditation.

Telles S, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Bangalore.

The autonomic and respiratory variables were studied in seven experienced meditators (with experience ranging from 5 to 20 years). Each subject was studied in two types of sessions--meditation (with a period of mental chanting of "OM") and control (with a period of non-targetted thinking). The meditators showed a statistically significant reduction in heart rate during meditation compared to the control period (paired 't' test). During both types of sessions there was a comparable increase in the cutaneous peripheral vascular resistance. Keeping in mind similar results of other authors, this was interpreted as a sign of increased mental alertness, even while being physiologically relaxed (as shown by the reduced heart rate).

Indian J Physiol Pharmacol 1994 Apr;38(2):133-7

Breathing through a particular nostril can alter metabolism and autonomic activities.

Telles S, Nagarathna R, Nagendra HR.

Vivekananda Kendra Yoga Research Foundation, Chamarajpet, Bangalore.

There is increasing interest in the fact that breathing exclusively through one nostril may alter the autonomic functions. The present study aimed at checking whether such changes actually do occur, and whether breathing is consciously regulated. 48 male subjects, with ages ranging from 25 to 48 years were randomly assigned to different groups. Each group was asked to practice one out of three pranayamas (viz. right nostril breathing, left nostril breathing or alternate nostril breathing). These practices were carried out as 27 respiratory cycles, repeated 4 times a day for one month. Parameters were assessed at the beginning and end of the month, but not during the practice. The 'right nostril pranayama' group showed a significant increase, of 37% in baseline oxygen consumption. The 'alternate nostril' pranayama group showed an 18% increase, and the left nostril pranayama group also showed an increase, of 24%. This increase in metabolism could be due to increased sympathetic discharge to the adrenal medulla. The 'left nostril Pranayama' group showed an increase in volar galvanic skin resistance, interpreted as a reduction in sympathetic nervous system activity supplying the sweat glands. These results suggest that breathing selectively through either nostril could have a marked activating effect or a relaxing effect on the sympathetic nervous system. The therapeutic implications of being able to alter metabolism by changing the breathing pattern have been mentioned.

Holist Nurs Pract 1994 Jan;8(2):36-42

Use of alternative health therapies by people with multiple sclerosis: an exploratory study.

Fawcett J, Sidney JS, Hanson MJ, Riley-Lawless K.

Sixteen people with multiple sclerosis (MS) responded to a semi-structured questionnaire about their experiences with alternative therapies. No definition of alternative therapies was provided. Physical therapy, counseling, nutrition, and massage were the most frequently used alternative therapies. Other therapies included acupuncture, occupational therapy, aquatic therapy, Therapeutic Touch, yoga, passive exercise, and removal of mercury alloy tooth fillings. Almost two thirds of the respondents reported seeking an alternative health practitioner because traditional physicians offered no cure for MS. Just under one third of the respondents stated that the quality of their lives was improved by alternative therapies.

Int J Neurosci 1993 Nov;73(1-2):47-60

The effects of unilateral forced nostril breathing on the heart.

Shannahoff-Khalsa DS, Kennedy B.

Department of Medicine, University of California, San Diego 92103-8341.

Three experiments are described that employ impedance cardiography to monitor the effects of unilateral forced nostril breathing (UFNB) on the heart. Experiment 1 includes 7 subjects (4 males, 3 females) with a respiratory rate of 6 breaths/min (BPM). Experiment 2 includes 16 trials using one subject to examine the intraindividual variability, at 6 BPM. Experiment 3 includes 10 trials with the same subject in experiment 2, but with a respiratory rate of 2-3 breaths/s. This rapid rate of respiration is a yogic breathing technique called "breath of fire" or "kapalabhatti" and employs a very shallow but rapid breath in which the abdominal region acts like a bellows. All 3 experiments demonstrated that right UFNB increases heart rate (HR) compared to left. Experiment 1 gave 7 negative slopes, or lowering in HR with left nostril breathing and 7 positive slopes, or increases in HR with right nostril breathing, $p = .001$. The second and third experiments showed differences in HR means in which right UFNB increases HR more than left, $p = .013$, $p = .001$, respectively. In experiment 2 stroke volume was higher with left UFNB, $p = .045$, compensating for lower HR. Left UFNB increased end diastolic volume as measured in both experiments 1 and 2, $p = .006$, $p = .001$, respectively. These results demonstrate a unique unilateral effect on sympathetic stimulation of the heart that may have therapeutic value.

Int J Neurosci 1993 Nov;73(1-2):61-8

The effects of unilateral forced nostril breathing on cognitive performance.

Jella SA, Shannahoff-Khalsa DS.

Department of Psychiatry University of California, Davis 95817.

This study describes the effects of 30 minutes of unilateral forced nostril breathing on cognitive performance in 51 right-handed undergraduate psychology students (25 males and 26 females). A verbal analogies task modeled after the Miller Analogies and SAT Tests was used as a test of left-hemispheric performance and mental rotation tasks based on the Vandenburg and Kuse adaptation of Shepard and Metzler's tests were used as spatial tasks for testing right-hemispheric performance. Spatial task performance was significantly enhanced during left nostril breathing in both males and females, $p = .028$. Verbal task performance was greater during right nostril breathing, but not significantly $p = .14$. These results are discussed in comparison to other cognitive and physiological studies using unilateral forced nostril breathing. This yogic breathing technique may have useful application in treating psychophysiological disorders with hemispheric imbalances and disorders with autonomic abnormalities.

Indian J Med Sci 1993 Oct;47(10):235-8

Physiological changes in sports teachers following 3 months of training in Yoga.

Telles S, Nagarathna R, Nagendra HR, Desiraju T.

Vivekananda Kendra Yoga Research Foundation, Chamarajpet, Bangalore, India.

1. This report shows that in a group of 40 physical education teachers who already had an average of 8.9 years physical training, 3 months of yogic training produced significant improvement in general health (in terms of body weight and BP reduction and improved lung functions).

2. There was also evidence of decreased autonomic arousal and more of psychophysiological relaxation (heart rate and respiratory rate reduction), and improved somatic steadiness (decreased errors in the steadiness test). 3. The changes at the end of 3 months in volar GSR in different directions (increase/decrease/no change), depending on the initial values, suggests that practising yoga may help to bring about a balance in different autonomic functions, so that functioning is optimised.

Int J Psychophysiol 1993 Sep;15(2):147-52

Autonomic changes in Brahmakumaris Raja yoga meditation.

Telles S, Desiraju T.

Department of Neurophysiology, National Institute of Mental Health and Neurosciences, Bangalore, India.

This report presents the changes in various autonomic and respiratory variables during the practice of Brahmakumaris Raja yoga meditation. This practice requires considerable commitment and involves concentrated thinking. 18 males in the age range of 20 to 52 years (mean 34.1 +/- 8.1), with 5-25 years experience in mediation (mean 10.1 +/- 6.2), participated in the study. Each subject was assessed in three test sessions which included a period of meditation, and also in three control (non-mediation) sessions, which included a period of random thinking. Group analysis showed that the heart rate during the meditation period was increased compared to the preceding baseline period, as well as compared to the value during the non-meditation period of control sessions. In contrast to the change in the heart rate, there was no significant change during meditation, for the group as a whole, in palmar GSR, finger plethysmogram amplitude, and respiratory rate. On an individual basis, changes which met the following criteria were noted: (1), changes which were greater during meditation (compared to its preceding baseline) than changes during post meditation or non-meditation periods (also compared to their preceding baseline); (2), Changes which occurred consistently during the three repeat sessions of a subject and (3), changes which exceeded arbitrarily-chosen cut-off points (described at length below). This individual level analysis revealed that changes in autonomic variables suggestive of both activation and relaxation occurred simultaneously in different subdivisions of the autonomic nervous system in a subject. Apart from this, there were differences in patterns of change among the subjects who practised the same

meditation.

Indian J Physiol Pharmacol 1993 Jan;37(1):45-50

Energy expenditure and ventilatory responses during Virasana--a yogic standing posture.

Rai L, Ram K.

Department of Physiology, Central Research Institute for Yoga, New Delhi.

Energy expenditure and ventilatory responses to yogic standing posture of Virasana were studied on 10 healthy men (25-37 years of age). The results of various responses respectively to the horizontal supine, Chair-sitting and Virasana were: Minute Ventilation (VE) 7.64, 8.61 and 18.67 L/min; Respiratory Frequency (FR) 15.71, 15.70 and 21.45 Breath/min; Tidal Volume (VT) 0.496, 0.544 and 0.827 L/min; Oxygen consumption (VO2) 0.127, 0.234 and 0.573 L/min; Carbondioxide Elimination (VCO2) 0.127, 0.134 and 0.420 L/min; Respiratory Exchange Ratio (RER) 0.58, 0.57 and 0.69; Heart Frequency (FH) 65.2, 74.5 and 104.4 beats/min; Oxygen Pulse (O2P) 3.32, 3.17 and 5.45 ml/beat; Ventilatory Equivalent (VE-EQ) 36.78, 37.12 and 33.85; Multiple of Resting VO2 (METS) 0.96, 1.05 and 2.53 and Metabolic Cost (MC) 1.04, 1.13 and 2.76 Cal/min. Virasana posture was characterised by higher VE, FR, VT, VO2, VCO2, FH and O2P with lesser VE-EQ. The observations suggest that Virasana induces temporarily a hypermetabolic state characterised by enhanced sympathetic nervous system activity which gets inhibited during the adoption of resting supine shavasana posture

---

Indian J Physiol Pharmacol 1989 Apr-Jun;33(2):110-2

Effect of yogasanas on the visual and auditory reaction time.

Malathi A, Parulkar VG.

Department of Physiology, Topiwala National Medical College, Bombay.

Visual and auditory reaction time (VRT, ART) was studied in 83 healthy male subjects of 30-40 years of age who had never practiced yogasanas before. These subjects were divided into two groups viz. Group A whose VRT and ART was determined after 1 hr. yogasanas and Group B whose ART and VRT was determined after 6 weeks yogasanas training programme. VRT and ART showed a significant reduction in Group A (P less than .05) and Group B (P less than .001).

Indian J Physiol Pharmacol 1988 Oct-Dec;32(4):257-64

Autonomic responses to breath holding and its variations following pranayama.

Bhargava R, Gogate MG, Mascarenhas JF.

Department of Physiology, Goa Medical College, Bombolim.

Autonomic responses to breath holding were studied in twenty healthy young men. Breath was held at different phases of respiration and parameters recorded were Breath holding time, heart rate systolic and diastolic blood pressure and galvanic skin resistance (GSR). After taking initial recordings all the subjects practised Nadi-Shodhana Pranayama for a period of 4 weeks. At the end of 4 weeks same parameters were again recorded and the results compared. Baseline heart rate and blood pressure (systolic and diastolic) showed a rendency to decrease and both these autonomic parameters were significantly decreased at breaking point after pranayamic breathing. Although the GSR was recorded in all subjects the observations made were not conclusive. Thus pranayama breathing exercises appear to alter autonomic responses to breath holding probably by increasing vagal tone and decreasing sympathetic discharges.

Psyche/Emotionen/Gefühle

J Affect Disord 2000 Jan-Mar;57(1-3):255-9

Antidepressant efficacy of Sudarshan Kriya Yoga (SKY) in melancholia: a randomized comparison with electroconvulsive therapy (ECT) and imipramine.

Janakiramaiah N, Gangadhar BN, Naga Venkatesha Murthy PJ, Harish MG, Subbakrishna DK, Vedamurthachar A.

Department of Psychiatry, National Institute of Mental Health and Neuro Sciences, Bangalore, India.

BACKGROUND: Sudarshan Kriya Yoga (SKY) is a procedure that involves essentially rhythmic hyperventilation at different rates of breathing. The antidepressant efficacy of SKY was demonstrated in dysthymia in a prospective, open clinical trial. This study compared the relative antidepressant efficacy of SKY in melancholia with two of the current standard treatments, electroconvulsive therapy (ECT) and imipramine (IMN). METHODS: Consenting, untreated melancholic depressives (n=45) were hospitalized and randomized equally into three treatment groups. They were assessed at recruitment and weekly thereafter for four weeks. RESULTS: Significant reductions in

the total scores on Beck Depression Inventory (BDI) and Hamilton Rating Scale for Depression (HRSD) occurred on successive occasions in all three groups. The groups, however, did not differ. Significant interaction between the groups and occasion of assessment occurred. At week three, the SKY group had higher scores than the ECT group but was not different from the IMN group. Remission (total HRSD score of seven or less) rates at the end of the trial were 93, 73 and 67% in the ECT, IMN and SKY groups, respectively. No clinically significant side effects were observed. DISCUSSION: Within the limitations of the design (lack of double blind conditions), it can be concluded that, although inferior to ECT, SKY can be a potential alternative to drugs in melancholia as a first line treatment.

J Affect Disord 1998 Jul;50(1):45-8

P300 amplitude and antidepressant response to Sudarshan Kriya Yoga (SKY).

Naga Venkatesha Murthy PJ, Janakiramaiah N, Gangadhar BN, Subbakrishna DK.

Department of Psychiatry, National Institute of Mental Health and Neurosciences, Bangalore, India.

BACKGROUND: There is evidence that Sudarshan Kriya Yoga (SKY) has significant antidepressant effects. OBJECTIVE: The present study examined whether pretreatment P300 ERP amplitude predicts antidepressant response to SKY. METHODS: Consenting, drug-free depressed patients (n = 30; dysthymics, 15, melancholics, 15) who received SKY as the sole treatment were assessed clinically at pretreatment, 1 month and 3 months. Auditory P300 was recorded before treatment. RESULTS: Twenty-two patients responded favourably to SKY. The pretreatment P300 amplitude neither distinguished responders and non-responders nor was associated with differential rates of response. DISCUSSION: It is concluded that SKY therapy is uniformly effective regardless of the pretreatment P300 amplitude.

Int J Neurosci 1996 Mar;85(1-2):1-17

Clinical case report: efficacy of yogic techniques in the treatment of obsessive compulsive disorders.

Shannahoff-Khalsa DS, Beckett LR.

Research Group for Mind-Body Dynamics, University of California, San Diego, La Jolla 92093-0402, USA.

The aim of this study was to investigate the clinical efficacy of yogic techniques in the treatment of eight adults with obsessive-compulsive disorder (OCD). A specific yogic breathing pattern has been prescribed for the treatment of OCD, as well as others for treating generalized anxiety. A one year course of therapy was followed. Subjects improved on the Yale-Brown Obsessive-Compulsive Scale (Y-BOCS) comparing baseline with three, six, nine, & 12 month results (one-way ANOVA for repeated measures, $F(4,12) = 3.343$, $p < \text{or} = .046$). Five patients completed the study (Y-BOCS results were 83%, 79%, 65%, 61% improvement, and one at-18%), group mean improvement of +54%. The Symptoms Checklist-90-R showed significant improvement comparing baseline and 12 months using two-tailed T-tests for OCD ($t = 13.856$, $p < .001$), anxiety ($t = 3.167$, $p < .051$), and global severity indexes ($t = 7.314$, $p = .005$). Perceived Stress Scale scores showed significant improvement for the five test periods (one-way ANOVA for repeated measures, $F(4,12) = 9.114$, $p < \text{or} = .001$). Five patients were well stabilized on fluoxetine prior to the study, three stopped medication after seven months or less, and two significantly reduced it, one by 25% and the other by 50%. These techniques, merit further study under controlled conditions and could help lead to new approaches for the treatment of OCD and perhaps other impulse control and anxiety-related disorders.

Gen Hosp Psychiatry 1995 May;17(3):192-200

Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders.

Miller JJ, Fletcher K, Kabat-Zinn J.

Department of Psychiatry, University of Massachusetts Medical Center, Worcester 01655, USA.

A previous study of 22 medical patients with DSM-III-R-defined anxiety disorders showed clinically and statistically significant improvements in subjective and objective symptoms of anxiety and panic following an 8-week outpatient physician-referred group stress reduction intervention based on mindfulness meditation. Twenty subjects demonstrated significant reductions in Hamilton and Beck Anxiety and Depression scores postintervention and at 3-month follow-up. In this study, 3-year follow-up data were obtained and analyzed on 18 of the original 22 subjects to probe long-term effects. Repeated measures analysis showed maintenance of the gains obtained in the original study on the Hamilton [$F(2,32) = 13.22$; $p < 0.001$] and Beck [$F(2,32) = 9.83$; $p < 0.001$] anxiety scales as well as on their respective depression scales, on the Hamilton panic score, the number and severity of panic attacks, and on the Mobility Index-Accompanied and the Fear Survey. A 3-year follow-up comparison of this cohort with a larger group of subjects from the intervention who had met criteria for screening for the original study suggests generalizability of the results obtained with the smaller, more intensively studied cohort. Ongoing compliance with the meditation practice was also demonstrated in the majority of subjects at 3 years. We conclude that an intensive but time-limited group stress reduction intervention based on mindfulness meditation can have long-term beneficial effects in the treatment of people diagnosed with anxiety disorders.

Cesk Psychiatr 1994 Jun;90(3):149-57

Approaches in the treatment of pathologic gambling.

Article in Czech

Nespor K.

In the treatment of pathological gambling the diagnosis, treatment of the accessory psychopathology and the somatic condition are important. Motivation training, behavioural and reality-oriented therapy, modification of the lifestyle relaxation techniques and yoga proved useful. There is also experience with dynamically oriented treatment techniques self-esteem reinforcement, training of social skills, strategies which promote impulse control, artetherapy, group therapy, provision of relevant information etc. Family therapy is important both for a pathological gambler and his/her relatives. Very important is contact with the family of the pathological gambler for his own treatment and with regard to the needs of his/her relatives. A therapeutic approach common abroad is participation in a self-help group, Gamblers Anonymous.

Cas Lek Cesk 1994 May 16;133(10):295-7

Use of yoga in psychiatry.

Article in Czech

Nespor K.

Psychiatricka lecebna v Praze 8, Narodni centrum podpory zdravi, Praha.

The author gives an account of his experience with the application of yoga in prevention and treatment of alcohol and drug related problems, in psychosomatic medicine, sexuology, treatment of neuroses, in gerontopsychiatry etc. The problem when using yoga in psychiatry is active cooperation; systemic interactions must be foreseen, it is important to warn against competitiveness and specific indications and contraindications of different yoga exercises must be respected. Yoga is also a suitable element of prevention of professional stress in the health services.

J R Soc Med 1993 May;86(5):254-8

Mood change and perceptions of vitality: a comparison of the effects of relaxation, visualization and yoga.

Wood C.

Department of Experimental Psychology, University of Oxford.

The effects of three different procedures, relaxation, visualization and yogic breathing and stretch (pranayama) on perceptions of physical and mental energy and on positive and negative mood states have been assessed in a group of normal volunteers (N = 71, age range 21-76). Pranayama produced a significantly greater increase in perceptions of mental and physical energy and feelings of alertness and enthusiasm than the other two procedures ($P < 0.5$). Relaxation made subjects significantly more sleepy and sluggish immediately after the session than pranayama ($P < 0.05$). Visualization made them more sluggish but less content than pranayama ($P < 0.05$) and more upset than relaxation after the second session ($P < 0.05$). Thus, a 30 min programme of yogic stretch and breathing exercises which is simple to learn and which can be practised even by the elderly had a markedly 'invigorating' effect on perceptions of both mental and physical energy and increased high positive mood. A more extensive investigation is planned to establish whether such a programme can readily be incorporated into everyday life, and with what long-term results.

Int J Psychosom 1993;40(1-4):105-7

Twelve years of experience with yoga in psychiatry.

Nespor K.

National Center for Health Promotion, Psychiatric Hospital, Prague.

The author describes his experience with the use of yoga in the prevention and treatment of alcohol and drug related problems, in psychosomatics, neuroses, geriatric psychiatry, and in some other areas. He deals with problems of the use of yoga in psychiatry like compliance, systems aspect, competitiveness and respecting specific indications in regard to health status and contraindications with personal differences. The usefulness of yoga in the prevention of stress and burn-out in health care professionals is emphasized.

Percept Mot Skills 1992 Dec;75(3 Pt 2):1331-43

Mood alteration with yoga and swimming: aerobic exercise may not be necessary.

Berger BG, Owen DR.

Department of Physical Education, Brooklyn College, City University of New York 11210.

The mood benefits of Hatha yoga and swimming, two activities that differ greatly in aerobic training benefits, were examined. College students (N = 87) in two swimming classes, a yoga class, and a lecture-control class completed mood and personality inventories before and after class on three occasions. A multivariate analysis of variance indicated that both yoga participants (n = 22) and swimmers (n = 37) reported greater decreases in scores on Anget, Confusion, Tension, and Depression than did the control students (n = 28). The consistent mood benefits of yoga supported our earlier observation that the exercise need not be aerobic to be associated with mood enhancement. However, underlying and causal mechanisms remain uncertain. Among the men, the acute decreases in Tension, Fatigue, and Anger after yoga were significantly greater than those after swimming. Yoga may be even more beneficial than swimming for men who personally select to participate. The women reported fairly similar mood benefits after swimming and yoga. It seems that aerobic exercise may not be necessary to facilitate the mood benefits. Also, students with greater mood changes attended class more regularly than those who reported fewer psychological benefits. Maximizing the immediate psychological benefits of exercise might be one way to encourage adults to be physically active.

Indian J Physiol Pharmacol 1992 Apr;36(2):88-92

Effect of Santhi Kriya on certain psychophysiological parameters: a preliminary study.

Satyanarayana M, Rajeswari KR, Rani NJ, Krishna CS, Rao PV.

Institute for Yoga & Consciousness, Andhra University, Visakhapatnam.

Santhi Kriya is a mixture of combined yogic practices of breathing and relaxation. Preliminary attempts were made to determine the effect of Santhi Kriya on certain psychophysiological parameters. Eight healthy male volunteers of the age group 25.9 +/- 3 (SD) years were subjected to Santhi Kriya practice daily for 50 minutes for 30 days. The volunteer's body weight, blood pressure, oral temperature, pulse rate, respiration, ECG and EEG were recorded before and after the practice on the 1st day and subsequently on 10th, 20th and 30th day of their practice. They were also given a perceptual acuity test to know their cognitive level on the 1st day and also at the end of the study i.e., on the 30th day. Results indicate a gradual and significant decrease in the body weight from 1st to 30th day (P less than 0.001) and an increase in alpha activity of the brain (P less than 0.001) during the course of 30 days of Santhi Kriya practice. Increase of alpha activity both in occipital and pre-frontal areas of both the hemispheres of the brain denotes an increase of calmness. This study also revealed that Santhi Kriya practice increases oral temperature by 3 degrees F and decreases respiratory rate significantly (P less than 0.05) on all practice days. Other parameters were not found to be altered significantly. It is concluded that the Santhi Kriya practice for 30 days reduces body weight and increases calmness.

Acta Paedopsychiatr 1992;55(2):115-20

Relaxation therapy reduces anxiety in child and adolescent psychiatric patients.

Platania-Solazzo A, Field TM, Blank J, Seligman F, Kuhn C, Schanberg S, Saab P.

Department of Psychiatry, University of Miami, School of Medicine, FL 33101.

The immediate effects of relaxation therapy (RT) were assessed in 40 hospitalized children and adolescents with diagnoses of adjustment disorder and depression. These effects were assessed using a within subjects pre-test/post-test design and by comparison with a control group of 20 depressed and adjustment disorder patients who watched a 1-h relaxing videotape. The 1-h RT class consisted of yoga exercise, a brief massage and progressive muscle relaxation. Decreases were noted in both self-reported anxiety and in anxious behavior and fidgeting as well as increases in positive affect in the RT but not the video group. In addition, adjustment disorder patients and a third of the depressed patients showed decreases in cortisol levels following RT, while no changes were noted in the video group. Thus, both diagnostic groups appeared to benefit from the RT class.

Indian J Physiol Pharmacol 1991 Jul;35(3):191-4

A comparative study of the driving effects of dextroamphetamine and yogic meditation on muscle control for the performance of balance on balance board.

Dhume RR, Dhume RA.

Department of Physiology, Goa Medical College, Bambolim.

The work is aimed to compare the relative strength of dextroamphetamine and yogic meditation on the performance of 3 different groups of medical students to concentrate on the task to balance on a balance board. Group A subjects were mediators, group B subjects were given orally 5 and 10 mg of dextroamphetamine in a capsule, 1 hr prior to the test. Group C subjects were given same capsule but with lactose in place of the drug (placebo). This last groups served as control for the study. The balance index calculated taking into account their balance time and error score at each trial of 5 min duration showed that the performance of the group B (drug) had declined with overall percentile fall of 40.6% as compared to the performance of the controls (placebo) whereas, the performance of Group A (meditators) went on steadily and progressively increasing throughout the period of 10 trial days with overall percentile rise of 27.8%. The results were conclusive to confirm earlier reports that amphetamine is not of use for improvement of task rather, it deteriorates the task performance. Contrary to that, yogic meditation is of merit to achieve concentration

for mental as well as physical task.

J Ment Defic Res 1989 Oct;33 (Pt 5):415-21

The integrated approach of yoga: a therapeutic tool for mentally retarded children: a one-year controlled study.

Uma K, Nagendra HR, Nagarathna R, Vaidehi S, Seethalakshmi R.

Vivekanandra Kendra Yoga Research Foundation, Bangalore, India.

Ninety children with mental retardation of mild, moderate and severe degree were selected from four special schools in Bangalore, India. Forty-five children underwent yogic training for one academic year (5 h in every week) with an integrated set of yogic practices, including breathing exercises and pranayama, sithilikarana vyayama (loosening exercises), suryanamaskar, yogasanas and meditation. They were compared before and after yogic training with a control group of 45 mentally retarded children matched for chronological age, sex, IQ, socio-economic status and socio environmental background who were not exposed to yoga training but continued their usual school routine during that period. There was highly significant improvement in the IQ and social adaptation parameters in the yoga group as compared to the control group. This study shows the efficacy of yoga as an effective therapeutic tool in the management of mentally retarded children.

Bull Narc 1988;40(1):43-9

Rehabilitation of drug-addicted persons: the experience of the Nav-Chetna Center in India.

Sharma K, Shukla V.

Nav-Chetna Drug De-addiction and Rehabilitation Center, Varanasi, India.

The Nav-Chetna Drug De-addiction and Rehabilitation Center, Varanasi, India, was established in December 1985. It provides out-patient and residential rehabilitation services, medical treatment, counseling, educational and vocational guidance, yoga therapy and after care. Drug-dependent persons under rehabilitation treatment at the Center are encouraged and helped to promote personal development, to build up and strengthen their initiative and confidence and to bring about improvements in their maturation, attitude and behaviour to overcome drug addiction. This is accomplished through a therapeutic-oriented programme, which creates conditions that optimize the natural tendency of the individual to self-actualize and eventually stabilize. Yoga plays

a crucial role in this programme at both pre- and post-clinical stages. It offers a new avenue for positive mental and physical health and helps to free individuals from drug dependency and its associated problems.

Percept Mot Skills 1985 Aug;61(1):279-84

Systematic changes in perceptual reactance induced by physical fitness training.

Campbell JF, Stenstrom RJ, Bertrand D.

The effect of life-change events on perceptual augmentation-reduction was studied in 72 subjects (40 men, 32 women). In three experiments the kinesthetic figural aftereffect was measured prior to and after either a physical fitness program, a course in yoga, or training in Transcendental Meditation. Each program lasted a minimum of 8 wk. Subjects completing fitness training, all of whom were initially classified as augmenters, became reducers by the end of their program. Subjects enrolled in yoga and meditation courses remained relatively stable in their perceptual tendencies.

Psychother Psychosom 1979;31(1-4):373-81

Yoga as therapy in psychosomatic medicine.

Goyeche JR.

Yoga as therapy with psychosomatic disorders has been practiced for many centuries in India, and only recently has become utilized for this purpose in other countries. The yoga system evolved as a 'system of liberation' to allow man to discriminate between his ego-self and pure consciousness, and as such, its medical benefits are really 'side-effects'. Integral yoga practice, however, with which many other self-regulatory somatopsychic approaches have much in common, consists of a holistic technology which functions to restore optimal homeostatis by a variety of special techniques not found in other approaches. Clinical observations of psychosomatic patients indicate that their distorted somatopsychic functioning necessitates their practice of yoga-like therapy. A review of the clinical evidence available indicates that yoga practice has proven most effective with a wide range of psychosomatic and psychiatric disorders. The effectiveness of yoga can be partially understood in terms of neurophysiological theory.

Rücken

Effect of short-term intensive yoga program on pain, functional disability and spinal flexibility in chronic low back pain: a randomized control study.

Tekur P, Singphow C, Nagendra HR, Raghuram N.

Division of Yoga and Life Sciences, Swami Vivekananda Yoga Research Foundation (SVYASA), Bangalore, India. p_tekur@yahoo.co.in

J Altern Complement Med. 2008 Jul;14(6):637-44

OBJECTIVE: The aim of this study was to compare the effect of a short-term intensive residential yoga program with physical exercise (control) on pain and spinal flexibility in subjects with chronic low-back pain (CLBP). DESIGN: This was a wait-list, randomized controlled study. SETTING: The study was conducted at a residential integrative health center in Bangalore, South India. SUBJECTS: Eighty (80) subjects (females, n = 37) with CLBP, who consented were randomly assigned to receive yoga or physical exercise if they satisfied the selection criteria. Intervention: The intervention consisted of a 1-week intensive residential yoga program comprised of asanas (physical postures) designed for back pain, pranayamas (breathing practices), meditation, and didactic and interactive sessions on philosophical concepts of yoga. The control group practiced physical exercises under a trained physiatrist and also had didactic and interactive sessions on lifestyle change. Both of the groups were matched for time on intervention and attention. OUTCOME MEASURES: Pain-related outcomes were assessed by the Oswestry Disability Index (ODI) and by spinal flexibility, which was assessed using goniometer at pre and post intervention. Data were analyzed using repeated measures analysis of variance (RMANOVA). RESULTS: Data conformed to a Gaussian distribution. There was a significant reduction in ODI scores in the yoga group compared to the control group (p = 0.01; effect size 1.264). Spinal flexibility measures improved significantly in both groups but the yoga group had greater improvement as compared to controls on spinal flexion (p = 0.008; effect size 0.146), spinal extension (p = 0.002; effect size 0.251), right lateral flexion (p = 0.059; effect size 0.006); and left lateral flexion (p = 0.006; effect size 0.171).

CONCLUSIONS: Seven (7) days of a residential intensive yoga-based lifestyle program reduced pain-related disability and improved spinal flexibility in patients with CLBP better than a physical exercise regimen.

Arch Phys Med Rehabil. 2003 Sep;84(9):E19-E20.

The role of backbuilders exercise program in low back pain.

Vijay Vad, MD (Hospital for Special Surgery-Cornell, New York, NY); Ronald Mackenzie, MD; Leon Root, MD, e-mail: vadv@hss.edu.

OBJECTIVE: To evaluate the efficacy of the Back Builders exercise program on patients

with diskogenic low back pain (LBP). Design: Prospective randomized trial. Setting: Outpatient clinical setting at a major university teaching hospital. Participants: Inclusion criteria were documented evidence of disk herniation (by magnetic resonance imaging) with at least 3 months symptoms of LBP and/or leg pain. The exclusion criterion was prior history of back surgery. Interventions: Patients were randomized into 2 groups. Group 1 (n=25) performed, for

15 minutes 3 times weekly, the Back Builders program designed by the principal author, who used the principles of medical yoga and Pilates to minimize disk pressures. In addition to the exercise program, patients took 200mg of celecoxib with hydrocodone and acetaminophen for breakthrough pain. Group 2 (n=25) underwent medication treatment with 200mg of celecoxib with hydrocodone and acetaminophen for breakthrough pain. Both groups were age and sex matched. Main Outcome Measures: Outcome measures included Roland-Morris Disability Questionnaire, numeric pain score, patient satisfaction, and distance from finger to floor (in centimeters). A successful outcome was defined as >50% pain reduction with good or better patient satisfaction. Results: At a minimum of 12 months of follow-up with an average follow-up of 12.3 months (range, 12-14mo), group 1 had 72% (18/25) successful outcomes and group 2 reported 36% (8/22, 3 lost to follow-up) successful outcomes (P=.001). In group 1, 16% (y/25) reported recurrence of acute symptoms versus 50% (11/22) in group 2 (P=.001). Conclusion: A well-designed program for patients with disk problems that minimizes disk pressures while restoring flexibility, strength, endurance, balance, and posture may yield superior results to oral medications with reduction in recurrence of back pain.

J Am Geriatr Soc 1991 Nov;39(11):1065-70

Effects of exercise training on bone density in older men and women.

Blumenthal JA, Emery CF, Madden DJ, Schniebolk S, Riddle MW, Cobb FR, Higginbotham M, Coleman RE.

Department of Psychiatry, Duke University Medical Center, Durham, North Carolina 27710.

OBJECTIVES: To determine the effects of up to 14 months of aerobic exercise on measures of bone density in older adults. DESIGN: Randomized controlled trial with subjects assigned to either an aerobic exercise condition, non-aerobic yoga, or a wait list non-exercise control group for 4 months. Aerobic fitness and bone density were evaluated in all subjects at baseline (Time 1) and after 4 months (Time 2). A semi-crossover design was utilized with all subjects completing 4 months of aerobic exercise, followed by another evaluation (Time 3). All subjects were then given the option of 6 additional months of aerobic exercise, after which they had a fourth evaluation (Time 4). SETTING: An outpatient exercise rehabilitation facility at a large, major medical center. SUBJECTS: One-hundred-one healthy men (n = 50) and women (n = 51) over age 60 (Mean age = 67.0), recruited from the community. INTERVENTION: The exercise program included stretching, cycle ergometry, and walking three times per week for 60 minutes throughout the course of the study. OUTCOME MEASURES: Aerobic fitness (VO2max) as assessed by cycle ergometry, and

bone density (bone mineral content) measured by single photon absorptiometry. RESULTS: Subjects achieved a 10%-15% increase in VO2max after 4 months of exercise training, and 1%-6% further improvement with additional training. Aerobic fitness was associated with significant increases in bone density in men, but not women, who maintained aerobic exercise for 14 months.

Clin Proc NIMS 4:4 160-164: 1989

Effect of Yogic Practices in non-specific low back pain.

J.V.S. Vidyasagar, B.N. Prasad, M. Venkat Reddy, P.S. Raju, Madhavi, Jai Shankar and Kalyani Sampath.

Non-specific low back pain is a common orthopedic problem which defies relief with available modes of treatment. The present study aims at analysis of 33 cases of non-specific low back pain treated by Yoga therapy. A majority of cases (75,8%) showed good response. Those with low back pain alone showed early and better response compared to those who had sciatic radiation. Yoga therapy being a holistic approach helps to strengthen the spinal musculature with relaxation of rest of the body and mind, resulting in better quality of pain relief.

The Journal of The International Association of Yoga Therapists.

Asana-Based Exercises for the Management of Low-Back Pain.

T.V. Ananthanarayanan & T.M. Srinivasan

Low-back pain (LBP) is an endemic disorder afflicting a large percentage of the population. The etiological factors of LBP include psychosomatic factors, postural defects, occupational predispositions and sedentary lifestyles. The present study evaluates a number of simple asanas which may be used as rehabilitative techniques on the basis of biomechanical principles. This study also suggests a set of asanas which work on the back with increasing intensity. A series of tests are presented for assessing the physiological debility of a patient. The assessment results form the basis for the selection of asanas to be prescribed to the patient. A chart is provided to enable the yoga therapist to increase the intensity of asanas so that the muscles of the low-back may be strengthened systematically and progressively. The results of clinical trials on 16 patients using the method of asana selection and rehabilitation indicates the usefulness of this method for the management of LBP. Regular practitioners of these exercises improve while indifferent or improper practice has no rehabilitative value.

Stress

Umgang mit Stress

Stress hat viele Auslöser. Nicht nur mechanische Reize, Umfeldänderungen, Verletzungen oder Infektionen, kritische Lebensereignisse, Arbeitsbelastung und Informationsüberlastung, sondern auch neue Aufgaben, Feste oder Auszeichnungen können ihn herbeiführen. Bei einem Wechsel zwischen Spannung und Entspannung kann man Stress positiv erleben, ohne diesen Wechsel führt er zu Krankheiten oder verstärkt sie.

Nach Ergebnissen einer bayerischen Erhebung sind 40% der Frauen und 45% der Männer bei ihrer Arbeit in Beruf und Haushalt häufiger stark belastenden Situationen ausgesetzt. 19% aller Befragten fühlen sich häufig überanstrengt, 36% sind der Auffassung, man könne bei voller Leistung die eigene Gesundheit nicht immer an die erste Stelle setzen.

Zahlreiche Untersuchungen zeigen, dass man mit Stress am besten umgeht, wenn man die Stressoren vermindert und die persönlichen Ressourcen erhöht (vgl. BZgA [1989]). Bei der Stressbewältigung hilft ausreichender Schlaf - als solcher gelten in Deutschland noch immer acht Stunden. Knapp 10% der Bevölkerung im Alter von 20 bis 50 Jahren schlafen weniger als sieben Stunden.

Weit mehr, nämlich rund ein Drittel, klagt über gestörten Schlaf.

Quelle: Gesundheitsberichtserstattung des Bundes

Rapid stress reduction and anxiolysis among distressed women as a consequenceof a three-month intensive yoga program.

Andreas Michalsen, Paul Grossman, Ayhan Acil, Jost Langhorst, Rainer Lüdtke, Tobias Esch, George Stefano, Gustav Dobos
Med Sci Monit 2005; 11(12):CR555-561

Psychosom Med. 2003 Jul-Aug;65(4):571-81.

Mindfulness-based stress reduction in relation to quality of life, mood, symptoms of stress, and immune parameters in breast and prostate cancer outpatients.

Carlson LE, Speca M, Patel KD, Goodey E.

Department Psychosocial Resources, Tom Baker Cancer Centre (L.E.C., M.S., E.G.), Calgary, Alberta, Canada.

OBJECTIVES: This study investigated the relationships between a mindfulness-based stress reduction meditation program for early stage breast and prostate cancer patients and quality of life, mood states, stress symptoms, lymphocyte counts, and cytokine production. METHODS: Forty-nine patients with breast cancer and 10 with

prostate cancer participated in an 8-week MBSR program that incorporated relaxation, meditation, gentle yoga, and daily home practice. Demographic and health behavior variables, quality of life (EORTC QLQ C-30), mood (POMS), stress (SOSI), and counts of NK, NKT, B, T total, T helper, and T cytotoxic cells, as well as NK and T cell production of TNF, IFN-gamma, IL-4, and IL-10 were assessed pre- and post intervention. RESULTS: Fifty-nine and 42 patients were assessed pre- and postintervention, respectively. Significant improvements were seen in overall quality of life, symptoms of stress, and sleep quality. Although there were no significant changes in the overall number of lymphocytes or cell subsets, T cell production of IL-4 increased and IFN-gamma decreased, whereas NK cell production of IL-10 decreased. These results are consistent with a shift in immune profile from one associated with depressive symptoms to a more normal profile.

CONCLUSIONS: MBSR participation was associated with enhanced quality of life and decreased stress symptoms in breast and prostate cancer patients. This study is also the first to show changes in cancer-related cytokine production associated with program participation.

Altern Ther Health Med 2002 Jan-Feb;8(1):60-2, 64-6

Mindfulness-based stress reduction and healthcare utilization in the inner city: preliminary findings.

Roth B, Stanley TW.

Haight-Ashbury Free Medical Clinic and the Department of Public Health in San Francisco, Calif, USA. bethroth@snet.net

CONTEXT: Research on mindfulness-based stress reduction (MBSR) has focused on measuring symptom reduction in middle-class and working-class populations. The present study examined inner-city patients' healthcare utilization before and after an MBSR intervention. OBJECTIVE: To determine whether completion of an MBSR program resulted in changes in healthcare utilization in an inner-city population. DESIGN: Medical chart review compared the number and diagnoses of health center visits during the year before patients entered the MBSR program with the year following completion of the program. SETTING: The Community Health Center in Meriden, Conn. PATIENTS: The chart review process examined healthcare utilization patterns for 73 patients: 54 who completed the MBSR program in Spanish and 19 who completed the program in English. The focus of this study is a subgroup of 47 patients for whom a complete year of data were available before and after the intervention. INTERVENTION: An 8-week course in MBSR. MAIN OUTCOME MEASURES: The number and diagnoses of patients' health center visits before and after completion of the MBSR program. RESULTS: A significant decrease in the number of chronic care visits was found among the 47 patients for whom complete data were available. The 36 patients who completed the Spanish courses demonstrated a significant decrease in total medical visits and chronic care visits.

CONCLUSIONS: The results of this study suggest that MBSR may help contain

healthcare costs by decreasing the number of visits made by inner-city patients to their primary care providers after completing the MBSR program.

Work 2002;19(1):3-7

Yoga for stress reduction and injury prevention at work.

Gura ST.

In-Alignment, Inc., 1450 Catherine Drive, Berkeley, CA 94702, USA. Tel.: +1 510 558 0400; E-mail: shirataylor@hotmail.com

At work employees face numerous psychological stressors that can undermine their work performance. These stressors, stemming from a variety of possible causes, have enormous health and financial impacts on employees as well as employers. Stress has been shown to be one of the factors leading to musculo-skeletal disorders (MSDs) such as: include back pain, carpal tunnel syndrome, shoulder or neck tension, eye strain, or headaches. Yoga is an ancient form of exercise that can reduce stress and relieve muscular tension or pain. Practicing yoga at the workplace teaches employees to use relaxation techniques to reduce stress and risks of injury on the job. Yoga at the workplace is a convenient and practical outlet that improves work performance by relieving tension and job stress.

Indian J Physiol Pharmacol 1999 Apr;43(2):218-24

Stress due to exams in medical students--role of yoga.

Malathi A, Damodaran A.

Department of Physiology, Lokmanya Tilak Municipal Medical College & General Hospital, Sion, Mumbai.

A student under optimal stress does bring out his or her best, However extremes of stress can result in stress induced disorders and deteriorating performance. Can yoga be of benefit in stress induced effects in medical students? The present study was conducted in first MBBS students (n = 50) to determine the benefit if any of yogic practices on anxiety status during routine activities and prior to examination. Feedback scores were assessed to determine how the students had benefited from the practices. Anxiety status as assessed by Spillberger's anxiety scale showed a statistically significant reduction following practice. In addition the anxiety score which rose prior to exams showed a statistically significant reduction on the day of exam after practice. These results point to the beneficial role of yoga in not only causing reduction in basal anxiety level but also attenuating the increase in anxiety score in

stressful state such as exams. The results of the exam indicated a statistically significant reduction in number of failures in yoga group as compared to the control group. The improvement in various parameters such as better sense of well being, feeling of relaxation, improved concentration, self confidence, improved efficiency, good interpersonal relationship, increased attentiveness, lowered irritability levels, and an optimistic outlook in life were some of the beneficial effects enjoyed by the yoga group indicated by feedback score.

Percept Mot Skills 1999 Apr;88(2):409-16

Stress, relaxation states, and creativity.

Khasky AD, Smith JC.

Roosevelt University Stress Institute, Chicago, Illinois 60605, USA.

114 participants in four groups practiced 25 minutes of progressive muscle relaxation, yoga stretching, imagery, or a control task. Before and after training, participants took state versions of the Smith Quick Stress Test (which measures Somatic Stress, Negative Affect, and Worry) and the Smith R-State Inventory (which measures relaxation-related states Disengagement, Physical Relaxation, Mental Relaxation, Strength and Awareness, Joy, Love and Thankfulness, and Prayerfulness). After training, all took both the Verbal and Figural forms of the Torrance Tests of Creative Thinking. At posttest, groups' scores did not differ on Creativity; however, when compared with yoga stretching, imagery trainees had lower posttest scores on Negative Affect. Both yoga stretching and imagery trainees displayed higher scores on self-reported Physical Relaxation than did controls. Progressive muscle relaxation trainees had lower scores on Somatic Stress than controls. Paradoxically, for all relaxation trainees, Disengagement (feeling "distant, far away, indifferent") correlated positively with both Negative Affect and Physical Relaxation, suggesting that disengagement in relaxation may not lead to relaxation-induced anxiety but may help one cope with such anxiety.

Indian J Physiol Pharmacol 1998 Oct;42(4):473-8

Recovery from stress in two different postures and in Shavasana - a yogic relaxation posture.

Bera TK, Gore MM, Oak JP.

Scientific Research Department, Kaivalyadhama S.M.Y.M. Samiti, Lonavla.

The recovery from induced physiological stress in Shavasana (a yogic relaxation

posture) and two other postures (resting in chair and resting supine posture) was compared. Twenty one males and 6 females (age 21-30 yrs) were allowed to take rest in one of the above postures immediately after completing the scheduled treadmill running. The recovery was assessed in terms of Heart Rate (HR) and Blood pressure (BP). HR and BP were measured before and every two minutes after the treadmill running till they returned to the initial level. The results revealed that the effects of stress was reversed in significantly ($P < 0.01$) shorter time in Shavasana, compared to the resting posture in chair and a supine posture.

Nurse Pract 1997 Mar;22(3):150-2, 154, 157 passim

Mindfulness meditation-based stress reduction: experience with a bilingual inner-city program.

Roth B, Creaser T.

Stress Reduction Program, Community Health Center, CT, USA.

This article describes a bilingual mindfulness meditation-based stress reduction program in an inner-city setting. Mindfulness meditation is defined, and the practices of breathing meditation, eating meditation, walking meditation, and mindful yoga are described. Data analysis examined compliance, medical and psychologic symptom reduction, and changes in self-esteem, of English- and Spanish-speaking patients who completed the 8-week Stress Reduction and Relaxation Program at the Community Health Center in Meriden, Conn. Statistically significant decreases in medical and psychologic symptoms and improvement in self-esteem were found. Many program completers reported dramatic changes in attitudes, beliefs, habits, and behaviors. Despite the limitations of the research design, these findings suggest that a mindfulness meditation course can be an effective health care intervention when utilized by English- and Spanish-speaking patients in an inner-city community health center. The article includes a discussion of factors to be considered when establishing a mindfulness meditation-based stress reduction program in a health care setting.

Rev Esc Enferm USP 1996 Aug;30(2):217-28

Health and education: alternative courses for the development of nursing personnel

Article in Portuguese

Guimaraes Madeira C, Jorge SA, Kakehashi S, de Oliveira I.

To promote therapeutic educational activities for nursing personnel in order to decrease stress, to improve interpersonal relations and the search for self-knowledge

are the objectives of the courses promoted by the Departament of Nursing of FCM and by The Continued Education Nursing Service of the University Hospital of UNICAMP. Respiration, relaxation, body sensibilization and awareness, and theater interpretation techniques were taught in the following courses: The Hospital and Human Relations, Dance and Creativity, Yoga and Mental Relaxation. The estrategy employed was "group experience", with the participation of nurse's aides, nurses technicians, practical nurses, and registered nurses during working hours in 15 to 20 meetings per course. "Individual statements" written by the participants were used as a research tool, and the method employed was content analysis. The evaluation demonstrated that the "experience" facilitated relations among the members of the work team, opened the space for effective communication, favored self-knowledge, and helped with the problem solving. The analysis demonstrated the importance of the continuity of alternative courses to help employes improve their relations with themselves, with others and with their work, and to properly value their health/learning.

Gen Hosp Psychiatry 1995 May;17(3):192-200

Three-year follow-up and clinical implications of a mindfulness meditation-based stress reduction intervention in the treatment of anxiety disorders.

Miller JJ, Fletcher K, Kabat-Zinn J.

Department of Psychiatry, University of Massachusetts Medical Center, Worcester 01655, USA.

A previous study of 22 medical patients with DSM-III-R-defined anxiety disorders showed clinically and statistically significant improvements in subjective and objective symptoms of anxiety and panic following an 8-week outpatient physician-referred group stress reduction intervention based on mindfulness meditation. Twenty subjects demonstrated significant reductions in Hamilton and Beck Anxiety and Depression scores postintervention and at 3-month follow-up. In this study, 3-year follow-up data were obtained and analyzed on 18 of the original 22 subjects to probe long-term effects. Repeated measures analysis showed maintenance of the gains obtained in the original study on the Hamilton [$F(2,32) = 13.22$; $p < 0.001$] and Beck [$F(2,32) = 9.83$; $p < 0.001$] anxiety scales as well as on their respective depression scales, on the Hamilton panic score, the number and severity of panic attacks, and on the Mobility Index-Accompanied and the Fear Survey. A 3-year follow-up comparison of this cohort with a larger group of subjects from the intervention who had met criteria for screening for the original study suggests generalizability of the results obtained with the smaller, more intensively studied cohort. Ongoing compliance with the meditation practice was also demonstrated in the majority of subjects at 3 years. We conclude that an intensive but time-limited group stress reduction intervention based on mindfulness meditation can have long-term beneficial effects in the treatment of people diagnosed with anxiety disorders.

Indian J Physiol Pharmacol 1995 Apr;39(2):111-6

Effect of Sahaja yoga practice on stress management in patients of epilepsy.

Panjwani U, Gupta HL, Singh SH, Selvamurthy W, Rai UC.

Defence Institute of Physiology and Allied Sciences, Delhi.

An attempt was made to evaluate the effect of Sahaja yoga meditation in stress management in patients of epilepsy. The study was carried out on 32 patients of epilepsy who were rendomly divided into 3 groups: group I subjects practised Sahaja yoga meditation for 6 months, group II subjects practised postural exercises mimicking Sahaja yoga and group III served as the epileptic control group. Galvanic skin resistance (GSR), blood lactate and urinary vinyl mandelic acid (U-VMA) were recorded at 0, 3 and 6 months. There were significant changes at 3 & 6 months as compared to 0 month values in GSR, blood lactate and U-VMA levels in group I subjects, but not in group II and group III subjects. The results indicate that reduction in stress following Sahaja yoga practice may be responsible for clinical improvement which had been earlier reported in patients who practised Sahaja yoga.

Cas Lek Cesk 1994 May 16;133(10):295-7

Use of yoga in psychiatry

Article in Czech

Nespor K.

Psychiatricka lecebna v Praze 8, Narodni centrum podpory zdravi, Praha.

The author gives an account of his experience with the application of yoga in prevention and treatment of alcohol and drug related problems, in psychosomatic medicine, sexuology, treatment of neuroses, in gerontopsychiatry etc. The problem when using yoga in psychiatry is active cooperation; systemic interactions must be foreseen, it is important to warn against competitiveness and specific indications and contraindications of different yoga exercises must be respected. Yoga is also a suitable element of prevention of professional stress in the health services.

Int J Psychosom 1993;40(1-4):105-7

Twelve years of experience with yoga in psychiatry.

Nespor K.

National Center for Health Promotion, Psychiatric Hospital, Prague.

The author describes his experience with the use of yoga in the prevention and treatment of alcohol and drug related problems, in psychosomatics, neuroses, geriatric psychiatry, and in some other areas. He deals with problems of the use of yoga in psychiatry like compliance, systems aspect, competitiveness and respecting specific indications in regard to health status and contraindications with personal differences. The usefulness of yoga in the prevention of stress and burn-out in health care professionals is emphasized.

J Behav Ther Exp Psychiatry 1991 Mar;22(1):37-8

A note on eye movements and relaxation.

Hedstrom J.

Pepperdine University.

Eye movements and certain visual mechanisms appear to be related to states of relaxation and levels of wakefulness. The hatha yoga tradition in its historical and contemporary forms uses certain eye 'exercises' or postures to induce relaxation and reduce arousal. Visual correlates of the alpha state are well known. These phenomena may be involved in the success of the new eye desensitization procedure.

Indian J Physiol Pharmacol 1990 Oct;34(4):279-81

Quantitative evaluation of muscle relaxation induced by Kundalini yoga with the help of EMG integrator.

Narayan R, Kamat A, Khanolkar M, Kamat S, Desai SR, Dhume RA.

Department of Physiology, Goa Medical College, Bambolim, Santa Cruz.

The present work is aimed to quantify the degree of relaxation of muscle under the effects of Kundalini Yoga with the help of EMG integrator. The data collected from 8 individuals (4 males 4 females) on the degree of muscle relaxation at the end of meditation revealed a significantly decreased muscle activity amounting to 58% of the basal level in both the sexes.

Cas Lek Cesk 1990 Aug 3;129(31):961-4

Occupational stress in health personnel and its prevention. Possible use of yoga

Article in Czech

Nespor K.

Psychiatricka lecebna Praha.

The paper summarizes some non-specific stress factors of work in the health services (e.g. shift work) and some relatively specific stressing factors (e.g. contact with grief, intense negative emotion and death). It deals also with the consequences of excessive stress, incl. the "burnout syndrome". It gives a brief account of possible preventive measures at the individual level and at the level of the organization. In the conclusion the author mentions the possibility to use yoga in the prevention of occupational stress in the health services. Work in the health services although, associated with considerable stress, is at the same time an opportunity for personality development and self-realization.

Clin Sci Mol Med Suppl 1975 Jun;2:171s-174s

Yoga and biofeedback in the management of 'stress' in hypertensive patients.

Patel C.

1. Psychophysical relaxation exercises based on yogic principles and reinforced by biofeedback instruments were used for behaviour modification in sixteen hypertensive subjects.

2. Preliminary studies indicated that their pressor response to emotional and physical stimuli became less exaggerated and less protracted compared with controls.
