

ACTIVITIES AT CYTER

Modern medical advancements provide the rationale for the integration of various traditional healing techniques including Yoga to promote healing, health, and longevity. It is imperative that advances in medicine include the wholistic approach of Yoga to face the current challenges in health care.

The Centre for Yoga Therapy, Education and Research (CYTER) in MGMC & RI is conducting a scientifically sound Yoga therapy programme through its Yoga Therapy OPD. This is functioning from 9.30 am to 12 noon daily (Monday-Friday). Consultations are offered by Dr. Ananda Balayogi Bhavanani, Deputy Director (Yoga) and Mrs Meena Ramanathan, Coordinator and Yoga Therapist and qualified Yoga instructors are imparting the schedules. Individualised and group Yoga therapy sessions are being conducted for various medical conditions such as diabetes, hypertension, musculoskeletal and psychiatric disorders with excellent feedback from participants. Numerous pilot studies have been completed and major research studies are being planned under guidance of Dr. Madanmohan, Professor and Head, Department of Physiology, MGMC & RI.

YOGA THERAPY

More than 3000 patients have benefited from Yoga Therapy consultations and sessions since 2010. Of these around 20% were hypertensive, 10% with musculo -skeletal disorders, 20% with psychiatric disorders, 15% with skin disorders, 10% with breathing disorders and the other had other disorders. The patients who attend the Yoga Therapy unit belong to many walks of life; from poor farmers to highly placed executive, uneducated laborers earning daily wages to the most qualified people, alcohol-dependent addicts, and trans-gender people etc. Those who have attended sessions regularly attained benefits physically and psychologically, enabling them to attain, maintain or regain their health and wellbeing. These satisfied participants also motivate their friends and relatives to start yoga to enjoy all the benefits, which they are enjoying now.

Year	Male	Female	Transgender	Total	Grand total
2010	31	28	-	59	3068
2011	440	750	27	1217	
2012	210	542	10	763	
2013	331	696	2	1029	

YOGA EDUCATION

Yoga training has been imparted to nursing students of Kasturba Gandhi Nursing College over the past few years and efforts are being made to include a Yoga component in the MBBS curriculum. We have also proposed a PG Diploma in Yoga Therapy for Medical professionals. Regular Yoga awareness programmes are being held in the MRD of MGMCRI and till now 100 participants have benefited from these Yoga consultations and counseling sessions. Regular talks are being conducted as part of Arthritis, Obesity, back pain, diabetes awareness programmes organized by various departments. Capsule talks and lecture demonstrations have been given during SAF meetings to create awareness of Yoga and its potential, amongst the faculty and PG students of SBVU. The CYTER team has also participated in outreach programmes in educational institutions and other social organizations to create awareness of Yoga and the functioning of CYTER at MGMCRI.

YOGA RESEARCH

As we are getting a regular in-flow of patients and normal volunteers, we have been doing some studies on the effects of Yoga. The following are some of the studies done at CYTER in the past few years.

1. IMMEDIATE EFFECTS OF SURYANAMASKAR ON REACTION TIME AND HEART RATE IN FEMALE VOLUNTEERS.

Abstract : Suryanamaskar (SN), a yogic technique is composed of dynamic muscular movements synchronised with deep rhythmic breathing. As it may have influence on CNS, this study planned to investigate immediate effects of SN on reaction time (RT) and heart rate (HR). 21 female volunteers attending yoga classes were recruited for study group and 19 female volunteers not participating in yoga were recruited as external-controls. HR, auditory reaction time (ART) and visual reaction time (VRT) were recorded before and after three rounds of SN in study group as well as 5 minutes of quiet sitting in both groups. Performance of SN produced immediate decrease in both VRT and ART ($P < 0.001$). This was significant when compared to self-control period ($P < 0.001$) and compared to external control group, it decreased significantly in ART ($p = 0.02$). This was pronounced when $\Delta\%$ was compared between groups ($P < 0.001$). HR increased significantly following SN compared with both self-control ($p = 0.025$) and external-control group ($p = 0.032$). Faster reactivity may be due to intermediate level of arousal by conscious synchronisation of dynamic movements with breathing. Rise in HR is attributed to sympathetic arousal and muscular exertion. We suggest that SN may be used as an effective training means to improve neuro-muscular abilities. Status: This research was published in Indian J Physiol Pharmacol 2013; 57(2) : 199–204.

2. COMPARATIVE IMMEDIATE EFFECT OF DIFFERENT YOGA ASANAS ON HEART RATE AND BLOOD PRESSURE IN HEALTHY YOUNG VOLUNTEERS.

Abstract : This study planned to compare immediate cardiovascular effects of different Yoga Asanas in healthy young volunteers. Heart rate (HR), systolic pressure (SP), and diastolic pressure (DP), blood pressure (BP), were recorded using the non invasive blood pressure (NIBP) apparatus in 22 healthy young subjects, before and after the performance of Dhanurasana (DA), Vakrasana (VA) (both sides), Janusirasasana (JSA) (both sides), Matsyasana and Shavasana for 30 s. HR and BP were further recorded during supine recovery at 2, 4, 6, 8, and 10 min. A repeated measure of ANOVA was used for statistical analysis. There were significant changes in HR and BP both immediately after the Asanas as well as during the recovery period. Overall comparisons of $\Delta\%$ changes immediately after the performance of the Asanas revealed significant differences with regard to HR that increased significantly after DA. In the recovery phase, there were significant intergroup differences from 2 min onward in both SP and DP. The decrease of SP after VA (right side) (VA-R) was significantly greater than Shavasana (4th, 6th, and 8th min) and JSA (left side) (JSA-L) at 6th and 8th min. DP decreased significantly after performing JSA-L compared to VA-R at the 6th and 8th min. The cardiovascular changes immediately after the Asanas and during the recovery phase reveal inherent differences between the selected postures. The rise of HR in DA may be attributed to increased sympathetic response due to the relative difficulty of the posture as well as abdominal compression occurring in it. The effect of supine relaxation is more pronounced after the performance of the Asanas as compared to mere relaxation in Shavasana. This may be attributed to a normalization and resultant homeostatic effect occurring due to a greater, healthier de-activation of the autonomic nervous system occurring owing to the presence of prior activation. There were also subtle differences between the right sided and left sided performance of VA and JSA that may be occurring due to the different internal structures being either compressed or relaxed on either side. Our study provides initial evidence of differential cardiovascular effects of Asanas and subtle differences between right and left sided performance. Further, cardiovascular recovery is greater after the performance of the Asanas as compared to shavasana; thus, implying a better response when effort precedes relaxation. Status: This research has been accepted for publication in International Journal of Yoga.

3. DIFFERENTIAL EFFECTS OF UNINOSTRIL AND ALTERNATE NOSTRIL PRANAYAMAS ON CARDIOVASCULAR PARAMETERS AND REACTION TIME.

Abstract : Recent studies have reported the differential physiological and psychological effects of yogic uninostril breathing (UNB) and alternate nostril breathing (ANB) techniques. This study aims to determine differential effects of these techniques on reaction time (RT), heart rate (HR), and blood pressure (BP). Twenty yoga-trained subjects came to the lab on six different days and RT, HR, and BP were recorded randomly before and after nine rounds of right UNB (surya nadi [SN]), left UNB (chandra nadi [CN]), right initiated ANB (surya bhedana [SB]), left initiated ANB (chandra bhedana [CB]), nadi shuddhi (NS), and normal breathing (NB). Overall comparison of $\Delta\%$ changes showed statistically significant differences between groups for all parameters. There was an overall reduction in HR- and BP-based parameters following CB, CN, and NS with concurrent increases following SB and SN. The differential effects of right nostril initiated (SB and SN) and left nostril initiated (CB, CN, and NS) UNB and ANB techniques were clearly evidenced. Changes following NB were insignificant in all respects. The overall comparison of $\Delta\%$ changes for RT showed statistically significant differences between groups that were significantly lowered following both SB and

SN. Our study provides evidence of sympathomimetic effects of right nostril initiated pranayamas with sympatholytic/parasympathomimetic effect following left nostril initiated pranayamas. We suggest that the main effect of UNB and ANB techniques is determined by the nostril used for inspiration rather than that used for expiration. We conclude that right and left yogic UNB and ANB techniques have differential physiological effects that are in tune with the traditional swara yoga concept that air flow through right nostril (SN and pingala swara) is activatory in nature, whereas the flow through left nostril (CN and ida swara) is relaxatory. Status: This research was presented at the International Yoga conference, Kaivalyadhama, Lonavla in Dec 2012 and full paper has been accepted for publication in International Journal of Yoga.

4. HEMATOLOGICAL, BIOCHEMICAL AND PSYCHOLOGICAL EFFECTS OF A YOGA TRAINING PROGRAMME IN NURSING STUDENTS.

Abstract: We were granted the opportunity to impart a 6 month comprehensive course of yoga training for nursing students. The two goals of this study are to analyse the effects of the training on the participants' health and quality of life (QoL) and to help the participants better understand the scientific basis of these yoga practices. 60 healthy nursing students (12 M, 48 F) aged 18.60 ± 0.67 (SD) y were recruited, and 60 min of yoga training was given twice weekly, for 6 months. Selected biochemical and hematological parameters were recorded along with Ferrans and Powers QoL index before and after the training period. QoL was also tested at mid term. Post-intervention statistical analysis (repeated measures of ANOVA) revealed highly significant and beneficial changes in most hematological and biochemical parameters. These changes correlated positively with the subjects' frequency of attendance, as evidenced by Pearson's linear correlation testing. There were also significant improvements in QoL index and its subscales, both at mid training and post training. These improvements also correlated positively with attendance. The present study provides evidence of the beneficial psycho-physical effects of yoga training. All parameters tested showed positive changes, and most were statistically significant. Major findings are enhanced bone marrow function, reduced allergic tendency, alkalization of urine, metabolic reconditioning (with special emphasis on liver function) and improvement in all QoL indices. This may be attributed to an improved functioning of the body-mind complex, which is facilitated by the breath-body practices of yoga. Because we were not able to establish a separate control group, we correlated changes with the subjects' frequency of attendance. The majority correlated positively. In conclusion, our study confirms both psychological and physical benefits of yoga training in a graduate course student population. We recommend that yoga be made an integral part of medical and paramedical collegiate education. Status: This has been submitted for publication in Journal of Biomedical Human Kinetics.

5. IMMEDIATE CARDIOVASCULAR EFFECTS OF A SINGLE YOGA SESSION IN DIFFERENT CONDITIONS.

Abstract: This retrospective review of clinical data was done to determine cardiovascular effects of a single yoga session in normal subjects as well as patients of different medical conditions. Data of 1896 patients (1229 female, 633 male and 34 transgender) with mean age of 36.28 ± 12.64 y who attended yoga therapy sessions at CYTER between November 2010 and September 2012 was used for analysis. Heart rate (HR), systolic (SP) and diastolic pressure (DP) had been recorded using non-invasive blood pressure (NIBP) apparatus before and after 60 minute yoga sessions at CYTER and indices like pulse pressure (PP), mean pressure (MP), rate-pressure product (RPP) and double product (DoP) were derived from recorded parameters. Participants were undergoing appropriate yoga therapy protocols as per their individual condition while normal subjects had a general schedule of practice. Typical yoga sessions included simple warm ups (jathis and surya namaskar), breath body movement coordination practices (kriyas), static stretching postures (asana), breathing techniques (pranayama), relaxation and chanting. There were statistically significant ($p < 0.001$) reductions in all the studied cardiovascular parameters following the yoga session (Tables 1 & 2). The magnitude of reductions differed in the groups, it being more significant in those having hypertension ($n = 505$) and less significant in those having endocrine/skin ($n = 230$) and musculoskeletal ($n = 120$) conditions. It was moderately significant in the normal subjects ($n = 582$) as well as patients having psychiatric ($n = 302$) and respiratory ($n = 157$) conditions. There is a healthy reduction in HR, BP and derived cardiovascular indices following a single yoga session. The magnitude of this reduction depends on the pre-existing medical condition as well as the yoga therapy protocol adopted. These changes may be attributed to enhanced harmony of cardiac autonomic function as a result of coordinated breath-body work and mind-body relaxation due to yoga. Status: Submitted for publication in Journal of Alternative & Integrative Medicine.

6. IMMEDIATE EFFECT OF CHANDRA AND SURYANADI PRANAYAMAS ON CARDIOVASCULAR PARAMETERS AND REACTION TIME IN A GERIATRIC POPULATION.

Abstract: Previous studies have reported differential physiological and psychological effects of exclusive right and left nostril breathing. Though potential health benefits have been postulated, further clinical research is required to prove

immediate and sustained efficacy of these techniques. This study evaluated immediate effects of exclusive right (SNP) and left (CNP) nostril breathing on cardiovascular (CV) parameters and reaction time (RT) in a geriatric population. 26 subjects attending regular yoga sessions at a senior citizen hospice, were recruited for this self-controlled study. They were instructed to sit in any comfortable posture and relax for 5 min before taking the pre-intervention recordings of Heart rate (HR), blood pressure (BP), auditory and visual RT (ART and VRT respectively). They then performed the selected technique and parameters were recorded immediately after performance of 9 rounds of either SNP or CNP. The entire sequence of recordings was randomised to avoid any bias. Intra and inter group statistical analysis was carried out using Student's paired t test for data that passed normality testing and Wilcoxon matched-pairs signed-ranks test applied for the others. Overall intra-group comparison of pre-post data and inter-group Δ % comparisons showed statistically significant ($p < 0.05$) differences for all parameters. There was an overall reduction in HR and BP-based parameters following both SNP and CNP. However, inter-group Δ % comparisons revealed a significantly greater reduction after CNP for all parameters. Inter-group comparisons revealed highly significant decreases ($p < 0.001$) in VRT and ART after SNP. In conclusion, our study sheds new light on the physiological changes occurring after SNP and CNP in a geriatric population. While both techniques reduce HR and BP, CNP does it more significantly. There is shortening of RT following SNP and this may be attributed to enhance sensory motor function that is of great significance in the elderly. We suggest that Yoga should be part of the health care facilities for the elderly as it can enhance their quality of life and improve their overall health status. Status: This research has been accepted for publication in International Journal of Physiology.

7.EFFECT OF YOGA TRAINING ON CARDIORESPIRATORY HEALTH IN OBESE SUBJECTS.

Abstract : Obesity is a major health challenge worldwide. It is a contributing factor to morbidity and mortality in lifestyle disorders such as diabetes, hypertension, coronary artery disease and premature aging. Yoga is the best lifestyle ever designed for preventive health as it also promotes positive wellbeing. Studies have suggested the beneficial effects of yoga in prevention and management of obesity and its complications. However, the cardiorespiratory health benefits of yoga in obesity have not been studied in detail. The present single blind RCT aims to determine cardiorespiratory health status of obese subjects (BMI 25 - 40) and evaluate the effect of Yoga training in them. 120 obese volunteers (BMI 25 - 40) will be recruited and randomized into yoga group (60) and wait list control group (60). Cardiorespiratory health status will be evaluated by anthropometric indices (Ht, Wt, BMI, WC/HC), physiological parameters (resting HR, BP and HRV, PFT and exercise tolerance), Ferrans and Powers QoL Index and biochemical parameters (HOMA, micronutrients, LFT, lipid and thyroid profiles) before and after the study period and appropriate statistical analysis will be done. 12 weeks of Yoga training consisting of an integrated schedule of asan, pranayam and relaxation techniques along with lifestyle modifications and Yogic counseling will be given to Yoga group. Participants in control group will be treated as wait list control and will be given an opportunity to attend yoga training programme after completion of study period. A significant improvement is expected in cardiorespiratory health status that will be an indicator of the preventive and health promotive effects of Yoga. Status: This proposal has been submitted to CCRYN, Deptt of AYUSH, Ministry of Health & FW, Govt of India after obtaining clearance from IHEC.