



**UNDERSTANDING HOW YOGA WORKS: A SHORT REVIEW OF FINDINGS FROM
CYTER, PONDICHERRY, INDIA.**

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ABSTRACT

The Centre for Yoga Therapy Education and Research (CYTER) has been functioning at Mahatma Gandhi Medical College and Research Institute (MGMCR & RI) under the auspices of the Faculty of Allied Health Sciences of Sri Balaji Vidyapeeth, Puducherry, for the past six years (2010-2016). More than 30,000 patients have benefited from Yoga therapy consultations and have attended individual and group therapy sessions at CYTER. Numerous research projects are being conducted as collaborative efforts between CYTER and various departments of MGMCRI, as well as KGNC and CIDRF. This review summarizes some of the important findings from 14 research works done at CYTER and published between 2010 and 2016. These studies provide preliminary evidence of the therapeutic potential of Yoga and induce further studies exploring physiological, psychological and biochemical mechanisms as well as beneficial clinical effects.

KEYWORDS: CYTER, MGMCRI, KGNC and CIDRF.

INTRODUCTION

Integrative medicine is gaining in popularity and yoga has the potential to make a significant contribution. The art and science of yoga has been practised for thousands of years. Yoga is a popular means of relieving stress and improving fitness as it decreases stress and anxiety and improves health status. The application of Yoga as a therapy is simple and inexpensive and can be easily adopted in most patients without any complications.^[1] Yoga is qualitatively different from other modes of physical activity as it has a unique combination of isometric muscular contractions, stretching exercises, relaxation techniques, and breathing exercises. It must be emphasized that Yoga therapy or more correctly Yoga Chikitsa, encompasses the use of asana, pranayama and relaxation techniques along with dietary advice and Yogic counseling that address the root cause of the problem rather than merely providing symptomatic relief^[2] Yoga may be considered the original mind-body medicine; its philosophy and practice are highly effective in producing psycho-somatic and somato-psyche integration. Yoga improves mood and reduces stress by emphasizing every-moment body awareness involving attentional focus on one's breathing, emotions, thoughts or specific parts of the body.^[3] The practice of yoga has been shown to have preventive, curative as well as rehabilitative potential that can be explained on the basis of modulation of autonomic functions, stress reduction, improvement in physiological functions and enhanced quality of life. It has become quite apparent that yoga is a

relatively low-risk, high-yield approach to improving overall health and wellbeing.^[4, 5, 6]

The Centre for Yoga Therapy Education and Research (CYTER) has been functioning at Mahatma Gandhi Medical College and Research Institute (MGMCR & RI) under the auspices of the Faculty of Allied Health Sciences of Sri Balaji Vidyapeeth, Puducherry, for the past six years (2010-2016). More than 30,000 patients have benefited from Yoga therapy consultations and have attended individual and group therapy sessions at CYTER. Numerous research projects are being conducted as collaborative efforts between CYTER and the Departments of Physiology, Medicine, Neurology, Nephrology, Ophthalmology, Psychiatry, Anaesthesia and Biochemistry as well as KGNC and CIDRF. This paper summarizes some of the important findings from 14 research works done at CYTER and published between 2010 and 2016. These studies provide preliminary evidence of the therapeutic potential of Yoga and induce further studies exploring physiological, psychological and biochemical mechanisms as well as beneficial clinical effects.

REVIEW OF SELECTED STUDIES

Study 1: Immediate effects of suryanamaskar on reaction time and heart rate in female volunteers^[7]

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.

Study 2: Immediate cardiovascular effects of a single yoga session in different conditions.^[8]

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 suryanamaskar), 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. 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.

Study 3: Hematological, biochemical and psychological effects of a yoga training programme in nursing students.^[9]

We were granted the opportunity to impart a 6 month comprehensive course of yoga training for nursing students. The aim of this study was to analyse the effects of the training on the participants' health and quality of life (QoL). 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. Because we were not able to establish a separate control group, we correlated changes with the subjects' frequency of attendance. Post-intervention statistical analysis (repeated measures of ANOVA) revealed highly significant and beneficial changes in most hematological and biochemical parameters. 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. 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 psychological and physical effects of yoga training amongst graduate nursing course students. We suggest that yoga be made an integral part of medical and paramedical collegiate education.

Study 4: Differential effects of uninostril and alternate nostril pranayamas on cardiovascular parameters and reaction time.^[10]

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 Δ % 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.

Study 5: Immediate effect of alternate nostril breathing on cardiovascular parameters and reaction time.^[11]

This study evaluated immediate effects of 27 rounds of left nostril initiated alternate nostril breathing (ANB) technique of nadi shuddi (NS) and right nostril initiated ANB of aloma viloma (AV) pranayama on cardiovascular (CV) parameters and reaction time (RT) in a trained population. 16 subjects attending regular yoga sessions were recruited and each subject performed 27 rounds of either technique, selected randomly on different days. Heart rate (HR), systolic pressure (SP), diastolic pressure (DP), auditory and visual reaction time (ART and VRT) were recorded before and after pranayamas. NS was done by breathing in through left nostril and out through right followed by breathing in through right and out through left. AV was done by breathing in through right nostril and out through left followed by breathing in through left and out through right. All data passed normality testing and statistical analysis was carried out using Student's paired t test. HR, SP and DP reduced significantly ($p < 0.05$ to 0.001) after NS while they increased after AV. Post intervention differences as well as $\Delta\%$ between groups was significant ($p < 0.05$ to 0.001) for HR, SP and DP. ART and VRT were significantly ($p < 0.05$ to 0.001) shortened after AV and significantly prolonged after NS. Post intervention differences as well as $\Delta\%$ between groups was very significant ($p < 0.001$) for both ART and VRT. Significant reductions of HR, SP and DP after NS and their increase after AV may be attributed to modulation of autonomic tone. Right nostril initiated ANB technique produces autonomic arousal, whereas left nostril initiated ANB technique induces relaxation/balance. These can be selectively applied in various therapeutic settings. Further studies in various clinical conditions and settings can enable us to understand their therapeutic applications better.

Study 6: Immediate effect of chandra and suryanadi pranayamas on cardiovascular parameters and reaction time in a geriatric population.^[12]

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.

Study 7: Comparative immediate effect of different yoga asanas on heart rate and blood pressure in healthy young volunteers.^[13]

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.

Study 8: Single session of integrated ‘silver yoga’ program improves cardiovascular parameters in senior citizens.^[14]

This pilot study was carried out to determine cardiovascular effects of a single session of an integrated “silver yoga” program in senior citizens of Serene Pelican Township, Pondicherry. Heart rate (HR) and blood pressure (BP) measurements were recorded in 124 senior citizens (75 female, 49 male) with mean age of 67.19 ± 10.61 year who attended an integrated “Silver Yoga” program at Centre for Yoga Therapy, Education and Research from August to October 2014. Participants practiced the protocol that was specially designed for senior citizens, keeping in mind their health status and physical limitations. This included simple warm-ups (jathis), breath body movement coordination practices (kriyas), static stretching postures (asanas), breathing techniques (pranayamas), relaxation and simple chanting. Non-invasive BP apparatus was used to record the HR, systolic (SP) and diastolic pressure (DP) before and after the 60 min sessions. Pulse pressure (PP), mean pressure (MP), rate-pressure product (RPP) and double product (DoP) indices were derived from the recorded parameters. Student’s paired t-test was used to compare data that passed normality testing by Kolmogorov–Smirnov Test and Wilcoxon matched-pairs signed-ranks test for those that did not. $P < 0.05$ were accepted as

indicating significant differences for pre-post comparisons. All parameters witnessed a reduction following the single session. This was statistically more significant ($P < 0.0001$) in HR, RPP and DoP while it was also significant ($P < 0.01$ and $P < 0.05$) in SP and PP, respectively. The decrease in MP just missed significance ($P = 0.054$) while it was not significant in DP. There is a healthy reduction in HR, BP and derived cardiovascular indices following a single yoga session in geriatric subjects. 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 an integrated “Silver Yoga” program.

Study 9: Effects of a single session of yogic relaxation on cardiovascular parameters in a transgender population^[15]

This pilot study was done to determine effects of a single session of yogic relaxation on cardiovascular parameters in a transgender population. Heart rate (HR) and blood pressure (BP) measurements were recorded in 106 transgender participants (mean age of 23.86 ± 7.87 y) after ending a yogic relaxation program at CYTER, MGMCRI. Participants practised a series of techniques consisting of quiet sitting, om chanting, mukha bhastrika, nadi shuddhi, brahma mudra, pranava pranayama in sitting posture and savitri pranayama in shavasana. HR, systolic (SP) and diastolic pressure (DP) were recorded before and after the 60 minute session using non-invasive blood pressure (NIBP) apparatus. Pulse pressure (PP), mean pressure (MP), rate-pressure product (RPP) and double product (DoP) indices were derived from recorded parameters. Student’s paired t test was used to compare data that passed normality testing and Wilcoxon matched pairs signed-ranks test for others. P values less than 0.05 were accepted as indicating significant differences for pre-post comparisons. All recorded cardiovascular parameters witnessed a reduction following the session. This was statistically more significant ($p < 0.0001$) in HR, MP, RPP and DoP and significant ($p = 0.002$) in SP. There is a healthy reduction in HR, BP and derived cardiovascular indices following a single yogic relaxation session in a transgender population. These changes may be attributed to enhanced harmony of cardiac autonomic function as a result of mind-body relaxation program. It is suggested that an open and non-hostile environment is conducive for obtaining such a state of psychosomatic relaxation and that such opportunities for transgender participants should be created in all healthcare facilities.

Study 10: Health status of elderly women residing in a hospice in Pondicherry.^[16]

With advancing age, the body tends to slow down and becomes less efficient and elderly people are prone to a few age-related health issues. The present study was undertaken to assess psycho-physical health status of elderly women residing in a hospice in Pondicherry. After an introductory orientation program, thirty women with mean age 68.67 ± 7.83 yrs, agreed to be subjects

and after obtaining informed consent, various parameters was recorded. Selected cardiovascular variables such as heart rate (HR), systolic pressure (SP) and diastolic pressure (DP) and respiratory rate (RR) were measured. Pulmonary function tests (PFT) were done using spirometer and reaction time (RT) measured using RT apparatus. Select psychological variables including depression, anxiety and self-esteem were assessed using Hamilton Depression Rating Scale, Hamilton Anxiety Rating Scale and Rosenberg Self-Esteem scale respectively. We found HR, SP, DP values were as expected for age and gender and our subjects performed better on PFT and RT as compared to earlier studies in similar groups. However our subjects had lower psychological health status with increased depression, anxiety and lower self-esteem. This may be due to being in hospice away from family who either do not want them or are not there at all. Though physical health status seems satisfactory for age, this finding of inadequate psychological health function may be first evidence of worsening physical health in future. We suggest that older people must be acknowledged as integral members of society and provided opportunities to enjoy good quality of life and easy access to health services. There is great scope for incorporation of traditional health practices such as Yoga and other CAM modalities.

Study 11: Effect of different pranayamas on respiratory sinus arrhythmia.^[17]

Respiratory Sinus Arrhythmia (RSA) is the differential change of Heart Rate (HR) in response to inspiration and expiration. This is a non-invasive sensitive index of parasympathetic cardiac control. To evaluate changes in RSA by utilizing a simple and cost-effective analysis of electrocardiographic (ECG) tracings obtained during performance of four pranayama techniques. Fifty two trained volunteers performed the following pranayamas with different ratios for inspiration and expiration: sukha (1:1), traditional (1:2), pranava (1:3) and savitri (2:1:2:1) and ECG was recorded while performing the techniques with rest period of 5 minutes in-between. HR was calculated and maximum HR during inspiration (I_{max}), minimum HR during expiration (E_{min}), differences between I_{max} and E_{min} (Δ), percentage differences between I_{max} and E_{min} ($\Delta\%$) and expiration: inspiration ratio (E:I) calculated by respective formulae. Statistical analysis was carried out using repeated measures of ANOVA with Tukey-Kramer multiple comparisons test. There were significant differences between groups in all five aspects namely: $p = 0.0093$ for mean I_{max} , $p = 0.0009$ for mean E_{min} , and $p < 0.0001$ for Δ HR (I-E), $\Delta\%$ HR (I-E) and E:I ratio. Pranava pranayama produced the greatest changes in all five comparisons. We suggest that further short and long term studies be undertaken with pranava pranayama in patients to further qualitatively and quantitatively evaluate inherent mechanisms of this simple technique. Addition of these cost-effective techniques to the medical armoury will help patients of rhythm disorders and other cardiovascular conditions.

Study 12: A brief qualitative survey on the utilization of Yoga research resources by Yoga teachers.^[18]

Yoga has become popular worldwide with increasing research done on its therapeutic potential. However, it remains to be determined whether such findings actually percolate down into teaching and practice of Yoga teachers/therapists. The aim of this survey was to document awareness of Yoga research findings in the Yoga community and find out how these were utilized. It was undertaken with a select group of 34 international Yoga teachers and therapists utilizing email and social media between August and December 2015. Majority of responders had well-established reputation in Yoga and were from diverse lineages with 30 of them having more than 5 years of experience in the field. A set of eight questions were sent to them related to essentiality of Yoga research, how they updated themselves on research findings and whether such studies influenced their teaching and practice. Responses were compiled and appropriate statistics determined for quantitative aspects while feedback, comments and suggestions were noted in detail. About 89% agreed that it was essential to be up-to-date on Yoga research but only 70% updated themselves regularly with average papers read fully per year being <10. Most accessed information through general news reports, emails from contacts, and articles on internet sites whereas only 7% were through PubMed. About 60% felt these studies helped them in general teaching whereas 20% said that such studies had not really influenced it in any way. This survey provides a basic picture of a general lack of awareness of Yoga research amongst practicing Yoga teachers and therapists. Though a majority agree research is important, few seriously update themselves on this through scientific channels. With regard to future studies, most wanted "proof" that could be used to convince potential clients and felt that more qualitative methods should be applied.

Study 13: Comparative study on the effect of yogic relaxing asanas and pranayamas on cardiovascular response in healthy young volunteers.^[19]

Cardiovascular morbidity is increasing recently in India. Stress and autonomic dysfunction are associated with cardiovascular morbidity. Yoga is the best lifestyle ever designed. Based on limited scientific research, yoga (meditation, asanas, and pranayamas including relaxation) therapy is known to improve cardiovascular autonomic functions. To study and compare the effect of 6 months of training in relaxing asanas and pranayamas on blood pressure (BP), pulse pressure (PP), heart rate (HR), and rate-pressure product (RPP) in young healthy volunteers. A total of 109 healthy volunteers aged 20-25 years were divided into 3 groups consisting of asan ($n = 38$), pranayam ($n = 38$), and control group ($n = 33$). The Yoga training was given 25 min/day for 6 days/week for 6 months. Pranayam group received relaxing pranayam (pranav, savitri, nadi shuddhi and chandra nadi), asan group received relaxing asan (pawanmuktasana, balasan, dharmicasan, and shavasana) and waiting list were kept as

a control group. The results were statistically compared between groups by analysis of variance and intra-group pre-post comparisons by paired t-test. Post training analysis showed significant decreases in systolic BP and diastolic BP as well as PP, mean arterial pressure and RPP in both asan and pranayam group as compared with control. There was, however, no significant difference between asan and pranayam group. Practising either relaxing asan or pranayam enhances parasympathetic activity and decreases sympathetic activity.

Study 14: Effect of a 12 Week Yoga Therapy Program on Mental Health Status in Elderly Women Inmates of a Hospice^[20]

This study was undertaken to evaluate the effectiveness of yoga on the mental health status of elderly women inmates residing in a hospice in Puducherry. Forty elderly women were randomly divided into yoga and wait-listed control group. A yoga therapy program of 60 min was given twice a week for 12 weeks. This protocol was specially designed for senior citizens, keeping in mind their health status and physical limitations that included simple warm-up and breath-body movement coordination practices (jathis and kriyas), static stretching postures (asanas), breathing techniques (pranayamas), and relaxation. Hamilton anxiety scale for measuring anxiety, Hamilton rating scale for depression, and Rosenberg self-esteem scale to measure self-esteem were administered to both groups before and after the 12-week study period. Data were assessed for normality, and appropriate parametric and nonparametric statistical methods were applied for intra- and inter-group comparisons. Overall, intra- and inter-group comparison of prepost data showed statistically significant ($P < 0.001$) differences for all three parameters. There was an overall improvement in the scores indicating decreased levels of depression and anxiety coupled with an increase in the level of self-esteem after the yoga therapy program. The influence of yoga in the reduction of depression and anxiety scores and improvement in self-esteem scores in elderly women subjects is evident from this study. As reported in earlier studies, this may be attributed to changes in central neurotransmitters such as gamma-aminobutyric-acid coupled with increased parasympathetic tone and decreased sympatho-adrenal activity. It is recommended that yoga should be a part of health-care facilities for elderly as it can enhance the quality of life by improving their overall mental health status. It could provide a healthy and positive alternative from depressing negative thoughts, and give them a sense of purpose and hope.

CONCLUSION

The selected research studies discussed above provide preliminary evidence of the therapeutic potential of Yoga in students, geriatric people, transgender population, healthy young volunteers as well as patients with various disorders like hypertension, musculoskeletal, endocrine, skin, psychiatric, respiratory conditions. These may provide the basis for further studies that can explore the

physiological, psychological and biochemical mechanisms behind such beneficial effects. The strength of our work is the excellent compliance of our patients in addition to the fact that these studies were been done in actual patient populations as well as in normal subjects and other sectors of people such as the transgender and the geriatric populations too. We also suggest that yoga be made an integral part of medical and paramedical collegiate education as there is great scope for incorporation of yoga and other CAM modalities.

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