Chapter II

REVIEW OF RELATED LITERATURE

A review of research report related to the present study is that the research scholar gather the related literature in order to provide the background material, to evaluate the significance of the study as well as to interpret its finding.

Amita S, et. al.\(^\text{24}\) Conducted a study on “Effect of yoga-nidra on blood glucose level in diabetic patients”. An objective of this study is to evaluate the effect of Yoga-Nidra on blood glucose level in diabetic patients. This study was conducted on 41, middle aged, type-2 diabetic patients, who were on oral hypoglycemic. These patients were divided into two groups: (a) 20 patients on oral hypoglycemic with yoga-nidra and (b) 21 were on oral hypoglycemic alone. Yoga-nidra practiced for 30 minutes daily up to 90 days, parameters were recorded every 30th day. Results of this study showed that most of the symptoms were subsided (P < 0.004, significant), and fall of mean blood glucose level was significant after 3-month of Yoga-nidra. This fall was 21.3 mg/dl, P < 0.0007, (from 159 +/- 12.27 to 137.7 +/- 23.15,) in fasting and 17.95 mg/dl, P = 0.02, (from 255.45 +/- 16.85 to 237.5 +/- 30.54) in post prandial glucose level. Results of this study suggest that subjects on Yoga-nidra with drug regimen had better control in their fluctuating blood glucose and symptoms associated with diabetes, compared to those were on oral hypoglycemic alone.

Pramanik, T., et. al.\(^\text{25}\), conducted a study on “Immediate effect of slow pace Bhashrika pranayama on blood pressure and heart rate”. The objective of this study was to evaluate the immediate effect of slow pace Bhashrika pranayama (respiratory rate 6/min) for 5 minutes on heart rate and blood pressure and the effect of the same breathing exercise for the same duration of time (5 minutes) following oral intake of hyoscine-N-butyl bromide (Buscopan), a parasympathetic blocker drug. Heart rate and blood pressure of volunteers (n = 39, age = 25-40 years) was recorded following


standard procedure. First, subjects had to sit comfortably in an easy and steady posture (sukhasana) on a fairly soft seat placed on the floor keeping head, neck, and trunk erect, eyes closed, and the other muscles reasonably loose. The subject is directed to inhale through both nostrils slowly up to the maximum for about 4 seconds and then exhale slowly up to the maximum through both nostrils for about 6 seconds. The breathing must not be abdominal. These steps complete one cycle of slow pace bhashrika pranayama (respiratory rate 6/min). During the practice the subject is asked not to think much about the inhalation and exhalation time, but rather was requested to imagine the open blue sky. The pranayama was conducted in a cool, well-ventilated room (18-20 degrees C). After 5 minutes of this breathing practice, the blood pressure and heart rate again were recorded in the aforesaid manner using the same instrument. The other group (n = 10) took part in another study where their blood pressure and heart rate were recorded following half an hour of oral intake of hyoscine-N-butylbromide 20 mg. Then they practiced the breathing exercise as stated above, and the above mentioned parameters were recorded again to study the effect of parasympathetic blockage on the same pranayama. Vagal cardiac and pulmonary mechanisms are linked, and improvement in one vagal limb might spill over into the other. Baroreceptor sensitivity can be enhanced significantly by slow breathing (supported by a small reduction in the heart rate observed during slow breathing and by reduction in both systolic and diastolic pressure). Slow pace bhashrika pranayama (respiratory rate 6/min) exercise thus shows a strong tendency to improving the autonomic nervous system through enhanced activation of the parasympathetic system.

Karambelkar et.al.26 Conducted a study on “Some Respiratory studies in Ujjayi and Bhashrika Pranayama with bahya Kumbhaka”, where oxygen consumption and O2 content in the expired air were found to decrease during Ujjayi with all their Parameters increased during bhashrika; Bahya Kumbhaka being Bhashrika; Bahya Kumbhaka being

common in both varieties of Pranayama. CO2 content of expired air increased during Ujjayi and is decreased during Bhastrika.

**Karambelkar and et.al.** Conducted study on “Some Respiratory Studies on Bhastrika Pranayama with internal and external retention of Breath” were eleven rounds of Bhastrika Comparison of 20 strokes of Kapalbhati with bhaya kumbaka showed increase in Oxygen consumption and CO2 output. Significant increase in minute ventilation was observed with Antar kumbhaka while slight decrease was seen with Bahya kumbhaka.

**Gore and Gharote** conducted a study on “Immediate effect of one minute Kapalbhati on respiratory function” where Respiratory rate, minute Ventilation and oxygen consumption where significantly increased, while tidal volume was significantly decreased during the practice of Kapalbhati for one minute in twelve police cadets. Immediately after Kapalbhati the oxygen consumption was reduce and it was less than the resting value before kapalbhati practice.

**Karambelkar and Bhole** Conducted a study on “Respiratory study during Kapalbhati for 1,2,3 and 5 minutes”, where comparison of kapalbhati technique perform for 1st and 2nd minute by seven well trained subjects revealed the following in the former conditions, the rate of breathing was 123/minutes. While it reduce to 118/minutes in the later condition. On the other hand minute ventilation, oxygen consumption and

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29 P.V.Karambelkar and M.V.Bhole, “Respiratory studies during Kapalbhati for 1,2,3 & 5 minutes” Yoga Mimamsa, vol.XXVII: 1 & 2 , pp. 69 – 74,1988.
carbon-di-oxide production showed an increase in the later conditions indicating more exertion from yogic point of view Kapalbhati of longer duration may not be recommendable. However, one may thing of performing Kapalbhati for longer period for improving physical capacity.

Gore\textsuperscript{30} conducted a study on “Effect of Kapalbhati on some of the body function”, Kapalbhati involves forced but rapid, voluntary abdominal breathing. Effect of Kapalbhati on some of the body functions was studied with the help of channel polygraph system. 30 observation where made on 10 healthy and trained subjects. During Kapalbhati the heart rate increased by 15 beats/min., the eye movement were found increased by Kapalbhati even if the eyes were closed. The alpha activity from the parieto-occipital one a showed a marginal decrease in 57\% observations indication a mind quieting effect on the brain. Peripheral blood circulation as measured by way of finger plethysmography, was also found decreased. This reduction persisted up to 35 to 45 seconds after Kapalbhati rate of respiratory also decreased by 3-5 breath/min. immediately after Kapalbhati.

Bhole and Karambelkar\textsuperscript{31} studied the “Effect of Yoga training on vital capacity and breath holding time”, measuring vital capacity in ml. and breath holding time in seconds respectively in 147 and 139 male respectively, between the age group of 18-50 years, before and after three weeks training programme in 20 Asanas, two breathing practices and 3 Kriyas at nine yoga camp held during the year 1959-69, at average


increase of 15 seconds in the breath holding time and 157 ml. in vital capacity were observed after training periods.

**Wanger and Bagchi**\(^{32}\) measured finger temperature and finger pulse volume before and after Kapalbhati, Ujjayi and Bhashrika Pranayama and reported that:

i) Average finger temperature decreases in Ujjayi and Bhashrika only.

ii) It showed increases in kapalbhati.

iii) The heart rate showed elevation of two beats per minute during Bhashrika and 4 beats during Kapalbhati.

iv) In non-yogic hyperventilation, the elevation was much greater, amounting to increase of 28-32 beats per minute.

v) In the same subjects systolic blood pressure increased by 6 mm. of hg. During Bhashrika and 12 mm of hg. During Kapalbhati and decreased slightly during Ujjayi.

**Gore and Gharote**\(^{33}\) Conducted a study on “Effect of Yogic Training on Peak Flow Rate”, Peak Expiratory flow rate was found to increase significantly in 105 males and 30 females at the end of 3 weeks of training in yogic physical culture indicating an improvement in the ventilatory efficiency.


Kulkarni et.al.\textsuperscript{34} Conducted a study on “Effect of Short term Yoga Training Programme on Peak Expiratory Flow Rate”, the present study was conducted on healthy adult males (n1=48) and females (n2=15) between the age group of 16-24 years. The Peak Expiratory Flow Rates were recorded by Mini Wright’s peak flow meter before and after yoga training. The training was for the period of 21 days (3 weeks). The results showed an increase in the Peak Expiratory Flow rate after yoga training.

Singh\textsuperscript{35} conducted a study on 30 male students of Kiddy’s Corner School, Gwalior with a purpose to determine the effects of Suryabhedana Pranayama, on selected physiological variables. In order to study the effect of Suryabhedana Pranayama on selected physiological variables, the analysis of covariance statistical technique was employed to analyse the raw data and 0.05 level of significance was chosen to test the hypothesis. It was concluded that among selected physiological variables only maximum breath holding capacity exhibited significance. Physiological variables such as resting pulse rate, vital capacity, resting respiratory rate and cardio-vascular efficiency did not show the significant changes.

Khodaskar\textsuperscript{36} Conducted a comparative study of effects of yogic and non yogic exercises on selected physiological variables of Kabaddi players. This study was conducted on 75 males Kabaddi players of age


group 18-25 years of local physical education training college. The subjects were divided into three groups; (a) Experimental yogic exercises group (b) Non yogic Exercises group and (c) control group. Yogic and non-yogic training programme was given respectively to group A and group B for six weeks for 30 minutes daily except Sundays. All these three groups were being involved in the common physical education programme of the college in addition to the experimental exercises regularly.

The results showed that the training based on some yogic exercises had more positive effects compared to non-yogic exercises on the selected physiological variables.

Dharmender\(^37\) conducted a study on 30 students from Yoga match practice and yoga specialisation group from Lakshmibai National Institute of Physical Education, Gwalior with a purpose to investigate the comparative effect of Kapalbhati and Anulom-Vilom on selected respiratory variables. In order to study the comparative effect of Kapalbhati and Anulom-Vilom on selected respiratory variables, analysis of covariance was applied at significance level of 0.05. Further, to see the significance difference between group means and least significant difference post hoc test of significance was applied. It was concluded that both treatment i.e. Kapalbhati Kriya and Anulom-Vilom Pranayama have significant effect on all the selected Physiological variable. Kapalbhati Kriya practice has significant contributing changes over the resting respiratory rate and air flow rate and Anulom-Vilom Pranayama practice have significant changes over the vital capacity, negative breath holding time and positive breath holding time.

Bhowmik et al. Conducted a study on “Comparative effect of Chandra bedana and Surya Bedana on Selected Physiological Variables”. The purpose of the study was to investigate the comparative effect of Chandra Bhedana and Surya Bhedna on selected physiological variables. For this study 30 male students from BPE IIInd year group were randomly selected as subjects from LNUPE, Gwalior. The subjects were divided into three groups i.e. two experimental groups and one control group. Among the experimental groups one group was administered with Chandra Bhedana. Second group was given Surya Bhedana Pranayama and control group did not participate in training programme. The quantities measurement period was eight weeks. The selected physiological variables were Resting Heart Rate, Vital Capacity, Resting Rate, Maximum Breath Holding Time and Cardio-Vascular efficiency were administrated in the Human Performance Laboratory of LNIPE, Gwalior. The random group design applied for the effect of Chandra Bhedana and Surya Bhedana Pranayama on Physiological Variables. The analysis of covariance revealed that practice of Chandra Bhedana and Surya Bhedana pranayama had different effect on Vital capacity (F=12.964); Positive Breath Holding Time (F=28. 915); Negative Breath Holding Time (F=78.285); against required value of 3.37. However, Resting Heart Rate (F=2 2.650). Resting Respiratory Rate (F=0.084) and Cardio-Vascular efficiency (F= 0.155) against require value of 3.37, showed no differential changes on the practice of Chandra Bhedana and Surya Bhedana Pranayama Subjects.

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Bhole et.al.\textsuperscript{39} Conducted a study on “Effects of Yoga Practices on Vital Capacity – A preliminary Communication”, Vital Capacity was significantly increased from 3399 ml. to 3443 ml. in a group of 24 adult males undergoing training in yogic physical culture for three weeks in comparison to the increase from 3095 ml. to 3132 ml. in the control group.

Abraham\textsuperscript{40} conducted a study on 48 girls of B.P.E. 2\textsuperscript{nd} and 3\textsuperscript{rd} year students of LNIPE, Gwalior with a purpose to investigate the comparative effects of Suryabhedna, Kapalbhati and their combination on cardio-respiratory endurance and selected physiological variables. In order to study the comparative effects of Suryabhedna, Kapalbhati and their combination, analysis of co-variance was applied at 0.05 level of significance. It was concluded that eight weeks of training in Kapalbhati, Suryabhedna and their combination is not bringing any significant changes in the various cardio-respiratory variables of experimental and control groups. However, there was increase in mean value in all experimental groups but they were not statistically significant.

Patro\textsuperscript{41} Conducted a study on twenty students of Yoga group from LNIPE, Gwalior with a purpose to investigate the effect of Jal Kapalbhati on selected respiratory variables. The data was obtained from each group comprising of one experimental and one control group. The initial and final test scores of each group were statistically treated adopting standard statistical procedures. The subject was selected at randomly. The difference between the initial means of the group at the pre test had to be taken into account during the analysis of the post test, difference between the means by the process of application of paired t-test. The statistical


\textsuperscript{40} Sanju M. Abraham, “The Comparative Effect of Kapalbhati Suryabhedna, their Combination on Cardio-Respiratory Endurance and Selected Physiological Variables” (Unpublished Master’s Thesis, LNIPE, 2000).

\textsuperscript{41} Sujata Patro, “Effect of Jal Kapalbhati on Selected Respiratory Variables” (Unpublished master’s Theses, LNIPE, 2001).
analysis was tested for significance at 0.05 level. It was concluded that the Jal Kapalbhati Kriya caused significant changes over the respiratory variables namely positive breath holding time and negative breath holding time. The Jal Kapalbhati Kriya did not cause significant changes in vital capacity and resting respiratory rate.

Varun⁴² Conducted a study on 30 girls of B.P.E. 1st year form LNIPE, Gwalior with a purpose to compare the effect of two variables of pranayama i.e. Anuloma Viloma and Bhasrika, on cardio-respiratory endurance. In order to study the comparison of two variables of pranayama i.e. Anuloma-Viloma and Bhasrika and their effect on cardio-respiratory endurance; analysis of covariance was applied and 0.05 level of significance was chosen to test the hypothesis. It was concluded that there was no significance in any of the factors between the Anuloma – Vilom and Bhasrika Pranayama. The table value required for significance was 3.35 at 0.05 level of confidence with 9 DF and all the factors were below the table value.

Karambelkar et.al.⁴³ Conducted a study on “Oxygen Consumption during Ujjayi Pranayama”, fairly long practice of Ujjayi having 8:32:16 seconds for Puraka-Kumbhaka-Rechaka was found to decrease oxygen consumption by 40 to 50 ml. /min. while beginners showed increase in O₂ consumption by 70 to 80 ml. /min.

Bhole⁴⁴ Conducted a study on “A Comparative Study of Minute Ventilation and Tidal Volume in Deep and Pranayamic Breathing”, Minute ventilation was less during pranayamic breathing with the Puraka-kumbhaka and Rechaka phases for 5, 10 and 10 secs.

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respectively. Increased air-way resistance in Pranayamic breathing was supposed to be responsible for this.

**Karambelkar et.al.**\(^{45}\) Conducted a study on “Some Respiratory Studies in Respect of Kapalbhati and Voluntary Hyperventilation”, Even though breathing rate is very high during Kapalbhati (120/min.) in comparison to voluntary hyperventilation (26/min.); the minute ventilation in the later was found to be twice (31 lit./min.) and the tidal volume was almost ten times than in Kapalbhati. However, oxygen consumption was around 1.5 times more while \(\text{CO}_2\) output was more by 3.5 times and breath-holding time was about twice more in hyperventilation.

**Gore and Bhole**\(^{46}\) Conducted a study on “Respiratory Response to Vastra Dhuti in Asthmatics”, 1) Timed Vital Capacity and Air Velocity index was found to improve slightly immediately after Vastra Dhauti in 13 male and 14 female asthmatics when studied in attack-free condition. 2) This effect had no relation with the length of Dhauti swallowed by the patients. 3) Four weeks practice of Vastra Dhauti along with other Yoga techniques showed further improvement in this response.

**Gore**\(^{47}\) Conducted a study on “Effect of Yogic Treatment on Some Pulmonary Functions in Asthmatics”, out of 52 Asthma patients, young male patients showed significant improvement in respect of ERV, MBC and capacity ratio, while young female patients improved in respect of


minute ventilation, tidal Volume, ERV and Vital Capacity after 6 weeks yogic treatment. Old patient showed insignificant improvement.

Karambelkar et.al.⁴⁸ Conducted a study on “Effect of Yogic Practices on cholesterol Level in Females”, the yogic training did help the females, to reduce their cholesterol level. Although, apparently there is a slight lowering in the mean weight and triceps skin fold measurement these reductions are statistically non significant and also no significant relationship was found between weight reduction, triceps changes and cholesterol level changes. This may be due to the short training period of three weeks, which may be having impact on weight and body fat deposition than cholesterol. The present study has confirmed that just as in males even three weeks of yogic training programme reduces cholesterol, significantly in females also. It is also observed in this study that the females have generally higher cholesterol level. On the whole, the yogic training reduced the mean cholesterol level significantly.

Ganguly and Gharote⁴⁹ Conducted a study on “Effect of Yogic Training on Cardiovascular Efficiency on average man” this study involving 11 clinically normal males of average age 26 years. The subjects were measured before and after 8 months of yoga training, which consisted for one hour yoga practice daily including Asanas, Kriyas (cleaning practices), Pranayamas, Bandhas (locks), Mudras (Seals) and Meditation. There was found to be an average increase of 7.6 in the test score, form 78.6 to 86.2, this was a statistically significant change (0.05). One of the 5 subjects initially scoring in the high average category (65-


79) remained in that category, while 3 moved to the good category (80-89) and 1 to the excellent (90 and above) category remained in that category after testing, while 2 moved to the excellent category.

The subjects were then randomly divided into two groups; group I skipped rope 10 minutes daily for 6 weeks and group II jogged 30 minutes daily for 6 weeks. Upon completion of the conditioning programmes the subjects again were administered the Harvard step test and comparisons were made from the pre exercise and post exercise data. The conclusions of this study were that a daily 10 minute programme of rope will significantly improve (p=0.05) cardiovascular efficiency as measured by the Harvard step test and that a 10 minutes daily programme of rope skipping is as efficient as a particular 30 minutes daily programme of jogging for improving cardiovascular efficiency as measured by the Harvard step test.

As a part of this study, a sub maximal test consisting of stepping on to an 18 inch bench at the rate of 24 steps/minute for three minutes was administered to 2696 males and 2568 females, aged 10-69. The ECG, from which heart rate (HR) was measured, was recorded before, during and after the exercise, resting exercise and post exercise HR’s are significantly higher for females at all ages, pre exercise HR decreases from age 10 to 25 age in males and females and shows little age change thereafter. In both males and females the terminal (3 minutes) HR decreases from age 10 to 35 remains fairly constant to age 55, and decreases thereafter. The post exercise HR decreases again at age 65 in males and females. Reclining pre exercise HR is moderately correlated with the exercise and post exercise HR at all ages in males and females. However, there is only a low correlation between either sitting or standing anticipatory HR and exercise and post exercise HR’s.
at 2.30 and during exercise are highly correlated as are the various post exercise HR’s with each other at all ages and in both males and females. The correlation of the exercise HR and post exercise HR is moderately high.

**Ramos-Jimenez et. al.** conducted a study on “Cardiovascular and metabolic effects of intensive Hatha Yoga training in middle-aged and older women from northern Mexico.” BACKGROUND: Hatha Yoga (HY) can be an alternative to improve physical activity in middle-aged and older women. However, conventional HY (CHY) exercising may not result in enough training stimulus to improve cardiovascular fitness. The purpose of this study was to evaluate the effect of an intensive HY intervention (IHY) on cardiovascular risk factors in middle-aged and older women from Northern Mexico. MATERIALS AND METHODS: In this prospective quasi experimental design, four middle-aged and nine older CHY practicing females (yoginis) were enrolled into an 11-week IHY program consisting of 5 sessions/week for 90 min (55 sessions). The program adherence, asana performance, and work intensity were assessed along the intervention. Anthropometric [body mass index (BMI), % body fat and Σ skin folds], cardiovascular fitness [maximal expired air volume \(\text{VE}_{\text{max}}\) maximal \(\text{O}_2\) consumption \(\text{VO}_{2\text{max}}\)], maximal heart rate (HR(max)), systolic (BPs) and diastolic blood pressure (BPd), biochemical [glucose, triacylglycerols (TAG), total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C)], and dietary parameters were evaluated before and after IHY. RESULTS: Daily caloric intake (~1,916 kcal/day), program adherence (~85%), and exercising skills (asana performance) were similar in both middle-aged and older women. The IHY program did not modify any anthropometric measurements. However, it increased \(\text{VO}_2\) (max) and \(\text{VE}(\text{max})\) and HDL-C while TAG and LDL-C remained stable in both middle-aged and older women.

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groups (P < 0.01). CONCLUSIONS: The proposed IHY program improves different cardiovascular risk factors (namely VO2 (max) and HDL-C) in middle-aged and older women.

**Birkel et. al.**\(^{51}\) conducted a study on “Hatha yoga: improved vital capacity of college students”. 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 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.

**Damle et. al.**\(^{52}\) conducted a study on “Effect of Meditation on Heart Rate Response to Acoustic Shocks”. The study was carried out on total 40 volunteers from the Osho commune, Pune. In pre test, The Heart Rate (HR) variation was measured with the help of Cardiovit electrocardiograph from Switzerland. The output of ECG machine was connected to an IBM PC. Software has been developed to plot beat to

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beat interval verses time. The horn box was kept at a distance of 1 meter from the subject. It produced a 100 db sound for 0.1 sec, when operated manually. Each subject was asked to sit in a relaxed position for 10 to 15 minutes. The initial Heart Rate was recorded for 30 seconds to see the maximum increase (deviation) in resting condition. After 5 seconds the acoustic shock was given and the Heart Rate was recorded immediately. In post test although all the volunteers attended the 'Mystic rose meditation' (2) at the Osho Commune for 20 days, only 12 participants appeared for the post test. Recording of HR was done immediately after giving the acoustic shock, as in pre-test. In pretest out of 40 volunteers, 10 volunteers were found to have initial sympathetic excitation after the acoustic shock i.e. their Heart Rate (HR) increased due to the acoustic shock. 9 participants were found to have parasympathetic arousal i.e. their HR decreased after the acoustic shock. Remaining 21 participants could not be classified due to variation in their initial HR. In post test Out of 9 volunteers from the sympathetic group, 7 volunteers showed a trend of reduction in sympathetic excitation after the 'Mystic rose meditation', i.e. the increase in HR due to the acoustic shock was less. In five cases the changes were significant when compared to the initial HR deviations at rest. One volunteer showed no change and in one, the changes were of undefined category. The feedback after meditation from the parasympathetic arousal group was not available except for 3 volunteers. Out of these, one showed a little decrease in parasympathetic excitation i.e. HR did not decrease like in the pretest after the shock (from -14 to -10); one volunteer showed a mild shift to a sympathetic category (from -7 to +8), while the third one showed an increase in the parasympathetic response (from -7 to -11) to the acoustic shock. Although it is difficult to draw any conclusion from this scanty data, the results indicate a trend that the 'Mystic rose meditation' probably helps people belonging to sympathetic arousal group, to reduce their excitability, the parasympathetic group however does not show its consistency in maintaining the reduced excitability. An extensive study on this subject is needed to arrive at a definite conclusion.
Mourya et al.\textsuperscript{53} conducted a study on “Effect of slow- and fast-breathing exercises on autonomic functions in patients with essential hypertension”. OBJECTIVES: Breathing exercises practiced in various forms of meditations such as yoga may influence autonomic functions. This may be the basis of therapeutic benefit to hypertensive patients. DESIGN: The study design was a randomized, prospective, controlled clinical study using three groups. SUBJECTS: The subjects comprised 60 male and female patients aged 20-60 years with stage 1 essential hypertension. INTERVENTION: Patients were randomly and equally divided into the control and other two intervention groups, who were advised to do 3 months of slow-breathing and fast-breathing exercises, respectively. Baseline and post intervention recording of blood pressure (BP), autonomic function tests such as standing-to-lying ratio (S/L ratio), immediate heart rate response to standing (30:15 ratio), Valsalva ratio, heart rate variation with respiration (E/I ratio), hand-grip test, and cold pressor response were done in all subjects. RESULTS: Slow breathing had a stronger effect than fast breathing. BP decreased longitudinally over a 3-month period with both interventions. S/L ratio, 30:15 ratio, E/I ratio, and BP response in the hand grip and cold pressor test showed significant change only in patients practicing the slow-breathing exercise. CONCLUSIONS: Both types of breathing exercises benefit patients with hypertension. However, improvement in both the sympathetic and parasympathetic reactivity may be the mechanism that is associated in those practicing the slow-breathing exercise.

Kauts A. and Sharma N.\textsuperscript{54} Conducted a study on “Effect of yoga on academic performance in relation to stress”. The main objective of the study was to assess the effect of yoga on academic performance in relation to stress. The study started with 800 adolescent students; 159 high-stress students and 142 low-stress students were selected on the basis of scores obtained through Stress Battery. Experimental group and control group were given pre test in three subjects, i.e.,


Mathematics, Science, and Social Studies. A yoga module consisting of yoga asanas, pranayama, meditation, and a value orientation program was administered on experimental group for 7 weeks. The experimental and control groups were post-tested for their performance on the three subjects mentioned above. The results show that the students, who practiced yoga performed better in academics. The study further shows that low-stress students performed better than high-stress students, meaning thereby that stress affects the students' performance.

**Oczenski and Schwarz** 55 Conducted a study on “Vital Capacity Man Oeuvre in General Anaesthesia”, as a telecasts occurs in most patients during general anaesthesia and may be one of the major causes for the development of hypoxemia and nosocomial pneumonia, its prevention may be considered as an important objectives in preoperative management. The major causative mechanisms are the loss of respiratory muscle tone, compression and gas absorption. Vital Capacity man oeuvres have been proposed as a means to eliminate atelectasis in the vast majority of patients and restore normal pulmonary gas exchange during general anaesthesia. In this review, we describe the pathogenesis of atelectasis in the preoperative period and discuss in the light of recent published investigations the suitability oh the Vital Capacity man oeuvre as tool during general anesthesia. Reviewing the current literature, a Vital Capacity man oeuvre general anesthesia may only be useful under specific circumstances when mechanical ventilation with a high inspiratory fraction of oxygen is required or during cardiac surgery at the end of cardiopulmonary bypass to reduce the amount of atelectasis and to maintain adequate gas exchange.

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Baraka and Bizri\textsuperscript{56} Conduct a study on “Single Vital Capacity Breath for Preoxygenation”, in awake patients before induction of anesthesia, the effect of Preoxygenation by the single vital capacity breath technique following forced exhalation on the mean arterial PO$_2$ (PaO$_2$). In 10 adult patients undergoing elective surgery, the mean PaO$_2$ values achieved by Preoxygenation by the traditional tidal volume breathing for three minutes. Each patient served as her/his own control. The mean PaO$_2$ following the single vital capacity breath technique was higher (295 +/- 67 mmHg) than that achieved by the traditional tidal volume breathing technique at 30 sec and 60 sec. and was not significantly different from that achieved by the traditional technique after three minutes (307 +/- 70 mmHg). The single vital capacity breath technique following forced exhalation can rapidly provide adequate Preoxygenation within 30 sec.

Gharote and Ganguly\textsuperscript{57} conducted a study on “Effect of Yogic Training on Physical Fitness”, Cardio Vascular fitness plays a vital role in the maintenance of proper health and physical fitness. The purpose was to determine the effects of long term yogic training programme on Cardio Vascular efficiency, Harvard Step test was administered on eleven male students and the result of the study indicated that one hour of daily yogic exercises including pranayama schedule, significantly improved Cardiovascular efficiency of the student.


Ganguly et.al.\(^{58}\) With a view to see the immediate effect of Kapalbhathi on Cardio-Respiratory endurance and observed a significant improvement in the cardiovascular endurance after performing one minute of Kapalbhathi as compared to hyperventilation of similar duration.

Nandi and Adhikari\(^{59}\) Conducted a study on the effect of selected yogic practices on cardio - respiratory endurance of school boys. The present study was undertaken on 20 male students of Rajagram S.B. Raha Institution, Bankura. Cardio-respiratory endurance was measured using cooper’s 12 minute run/walk test. During the experimental period the subjects were given yogic exercises for a period of eight weeks. The final test was conducted after eight weeks. The data showed a significant improvement in the fitness test as a result of yogic practices.

Thakur\(^{60}\) studied to see the effect of Kapalbhathi on Cardio-respiratory variables. He found that there was significance increases in vital capacity (f=26.82 against required value of 4.08), resting pulse rate (f=45.23 against required value of 4.08), where as blood pressure and airflow rate showed significant change by practice of Kapalbhathi kriya.

Yoga Nidra\(^{61}\) is a very powerful process of meditation and relaxation. It is adopted by Paramhansa swami Satyanand Saraswati of Bihar Yoga School, Mungher.


The practice of Yoga Nidra opens up a deeper state of mind. Each time one practices Yoga Nidra, one’s level of consciousness deepens and becomes more aware of subconscious mind and ultimately gives more relaxation. And also gets relieved of stress from the mind. The aim of the study was to study the effect of Yoga Nidra on the activity of brain with the help of Electro-Encephalograph (EEG), 20 subjects were chosen from Yoga Nidra class. They were given practice of Yoga Nidra daily for one month. EEGs were recorded prior to study, during Yoga Nidra & after one month. Initial EEG showed Beta activity prominently with intermittent Alpha activity. With the advancement of Yoga Nidra Beta activity was slowly replaced by Alpha activity and still further by smooth well formed Alpha activity. After 30 sessions of Yoga Nidra gain of alpha activity was better and with further advancement of Yoga Nidra intermittent theta activity was intermixed with alpha activity suggestive of deep state of relaxation. EEG measures minute electrical activity in the brain in the form of brain activity waves. The frequency of brain activity waves has been shown to alter according to the state of consciousness and state of mind the subject is in. Beta activity is normally noted in the awake working state. With physical relaxation beta activity is taken up by alpha activity, and as the person goes into different stages of sleep the activity changes to theta and also may exhibit delta activity in deep sleep.

Sharma R, Gupta N, Bijlani RL. Conducted a prospective controlled study to explore the short-term impact of a comprehensive but brief lifestyle intervention, based on yoga, on subjective well being levels in normal and diseased subjects. Normal healthy individuals and subjects having hypertension, coronary artery disease, diabetes mellitus or a variety of other illnesses were included in the study. The outcome measures were ‘subjective well being inventory’ (SUBI) scores, taken on the first and last day of the course. The inventory consists of questions related to one’s feelings and attitude about various areas of life, such as happiness, achievement and interpersonal relationship. There was significant improvement in the subjective well being scores of the 77 subjects within a period of 10 days as compared to controls. These observations suggest that a short lifestyle modification and stress management educational program leads to remarkable improvement in the subjective well being.

scores of the subjects and can therefore make an appreciable contribution to primary prevention as well as management of lifestyle diseases.
Ospina MB, and et.al\textsuperscript{63} studied to provide a descriptive overview of the clinical trials assessing meditation practices for health care. Systematic review of the literature. Comprehensive searches were conducted in 17 electronic bibliographic databases through September 2005. Other sources of potentially relevant studies included hand searches, reference tracking, contacting experts, and gray literature searches. Included studies were clinical trials with 10 or more adult participants using any meditation practice, providing quantitative data on health-related outcomes, and published in English. Two independent reviewers assessed study relevance, extracted the data, and assessed the methodological quality of the studies. Four hundred clinical trials on meditation (72% described as randomized) were included in the review (publication years 1956-2005). Five broad categories of meditation practices were identified: mantra meditation, mindfulness meditation, yoga, taj chi, and qigong. The three most studied clinical conditions were hypertension, miscellaneous cardiovascular diseases, and substance abuse. Psychosocial measures were the most frequently reported outcomes. Outcome measures of psychiatric and psychological symptoms dominate the outcomes of interest. Overall, the methodological quality of clinical trials is poor, but has significantly improved over time by 0.014 points every year (95% CI, 0.005, and 0.023). Most clinical trials on meditation practices are generally characterized by poor methodological quality with significant threats to validity in every major quality domain assessed. Despite a statistically significant improvement in the methodological quality over time, it is imperative that future trials on meditation be rigorous in design, execution, analysis, and the reporting of results.

Sivasankaran S, and et.al\textsuperscript{64} hypothesized that Yoga and meditation will improve parameters of endothelial function. They examined the effects of yoga and meditation on hemodynamic and laboratory parameters as well as on endothelial function in a 6-week pilot study. Systolic and diastolic blood pressures, heart rate, body mass index (BMI), fasting glucose, lipids, has C-reactive protein (CRP), and


endothelial function (as assessed by brachial artery reactivity) were all studied at baseline and after 6 weeks of yoga practice. A course in yoga and meditation was given to the subjects for 1.5 h three times weekly for 6 weeks and subjects were instructed to continue their efforts at home. This prospective cohort study included 33 subjects (mean age 55 ± 11 years) both with (30%) and without (70%) established coronary artery disease (CAD). There were significant reductions in blood pressure, heart rate, and BMI in the total cohort with yoga. None of the laboratory parameters changed significantly with yoga. For the total cohort there was no significant improvement in endothelial-dependent vasodilatation with yoga training and meditation compared with baseline (16.7% relative improvement from 7.2 – 8.4% ; p = 0.3). In the group with CAD, endothelial-dependent vasodilatation improved 69% with yoga training (6.38-10.78%; p = 0.09). Yoga and meditation appear to improve endothelial function in subjects with CAD.

Ospina MB, and et. al65 mentioned that To review and synthesize the state of research on a variety of meditation practices, including: the specific meditation practices examined, the research designs employed and the conditions and outcomes examined, the efficacy and effectiveness of different meditation practices for the three most studied conditions, the role of effect modifiers on outcomes; and the effects of meditation on physiological and neuropsychological outcomes. Comprehensive searches were conducted in 17 electronic databases of medical and psychological literature up to September 2005. Other sources of potentially relevant studies included hand searches, reference tracking, and contact with experts, and gray literature searches. A Delphi method was used to develop a set of parameters to describe meditation practices. Included studies were comparative, on any meditation practice, had more than 10 adults’ participants, provided quantitative data on health-related outcomes, and published in English. Two independent reviewers assessed study relevance, extracted the data and assessed the methodological quality of the studies. Five broad categories of meditation practices were identified. (Mantra meditation, Mindfulness meditation, Yoga, Taj Chi, and Qi Gong). Characterization of the universal or supplemental components of meditation practices was precluded

by the theoretical and terminological heterogeneity among practices. Evidence on the state of research in meditation practices was provided in 813 predominantly poor-quality studies. The three most studied conditions were hypertension, other cardiovascular diseases, and substance abuse. Sixty-five intervention studies examined the therapeutic effect of meditation practices for these conditions. Meta-analyses based on low-quality studies and small numbers of hypertensive participants showed that TM(R), Qi Gong and Zen Buddhist meditation significantly reduced blood pressure. Yoga helped reduce stress. Yoga was no better than Mindfulness-based Stress Reduction at reducing anxiety in patients with cardiovascular diseases. No results from substance abuse studies could be combined. The role of effect modifiers in meditation practices has been neglected in the scientific literature. The physiological and neuropsychological effects of meditation practices have been evaluated in 312 poor-quality studies. Meta-analysis of results from 55 studies indicated that some meditation practices produced significant changes in healthy participants. Many uncertainties surround the practice of meditation. Scientific research on meditation practice does not appear to have a common theoretical perspective and is characterized by poor methodological quality. Firm conclusions on the effects of meditation practices in healthcare cannot be drawn based on the available evidence. Future research on meditation practices must be more rigorous in the design and execution of studies and in the analysis and reporting of results.

Telles S, Naveen KV, Dash M conducted a test after the December 2004 tsunami to study the effect of a 1 week yoga program was evaluated on self rated fear, anxiety, sadness and disturbed sleep in 47 survivors in the Andaman Islands. Polygraph recordings of the heart rate, breath rate and skin resistance were also made. Among the 47 people 31 were settlers from the mainland (i.e. India, ML group) and 16 were endogenous people (EP group). There was a significant decrease in self rated fear, anxiety, sadness and disturbed sleep in both groups, and in the heart and breath rate in the ML group, and in the breath rate alone in the EP group, following yoga (P < 0.05, t-test). This suggests that yoga practice may be useful in the management of

stress following a natural disaster in people with widely different social, cultural and spiritual beliefs.

Coppola F.67 Natural Stress Relief meditation, a mental technique which is practiced for 15 minutes twice a day, aims to reduce stress and anxiety by eliciting a specific state of physiological rest along with mental alertness. The meditation is taught in a self-administered program, requiring one hour of training during the first three days, followed by the regular twice daily practice. Each 15-min. session consists in sitting quietly with closed eyes while applying a specific mental procedure. To test the effectiveness of meditation in reducing trait anxiety, Spielberger’s State-Trait Anxiety Inventory was administered to 25 participants four times over a 3-wk. period: one week before starting to practice the meditation, a few hours before starting, 1 wk. after, and 2 wk. after. The difference in Trait Anxiety score between pre-treatment and before starting the practice was not significant, while it was significant both after the first week of practice (Cohen d = 46) and after the first 2 wk. of practice (d = 67).

Chen Km, and et.al.68 Conducted a study in 2005 and it had two phases. Phase I considered of sending a survey to 10 experts to develop the Silver Yoga Programme. A hard copy and a video containing detailed descriptions and demonstrations of the programme were then sent to the experts for review and critical regarding the clarity and feasibility of the yoga postures. Phase-II was an enquiry into older adults’ views on the programme using a quantitative evaluation and semi-structured qualitative inquiry. Fourteen women participants from a senior activity centre were interviewed individually after 1 month of Silver Yoga group practice, three times per week, 70 minutes per session. They were asked to evaluate the appropriateness of postures based on the criteria of difficulty, acceptability, feasibility and helpfulness. Five open-ended questions asked participants to reflect on their yoga experiences. Participants’ mean ratings of the acceptability, feasibility and helpfulness and guided-imaginary meditation) ranged from 8.8 ± 1.9 to 9.3 ± 1.5; mean ratings of the difficulty of the programme revealed the relaxation and guided-imagery


meditation were fairly easy to follow (0.1 ± 0.3 and 0.1 ± 0.3 respectively), but the postures in the Hatha yoga were relatively challenging (2.1 ± 2.6). The Silver Yoga Programme should undergo further pilot-testing with larger samples of older adults before it is taken up internationally as a health-promotion activity for older adults.

Granath J, Ingvarsson S, von Thiele U, Lundberg U⁶⁹ studied a stress management programme based on cognitive behavioral therapy; principles were compared with a Kundaliniyoga program. A study sample of 26 women and 7 men from a large Swedish company were divided randomly into 2 groups for each of the different forms of intervention; a total of 4 groups. The groups were instructed by trained group leaders and 10 sessions were held with each of group, over a period of 4 months. Psychological (self-rated stress and stress behavior, anger, exhaustion, quality of life) and physiological (blood pressure, heart rate, urinary catecholamine, salivary cortisol) measurements obtained before and after treatment showed significant improvements on most of the variables in both groups as well as medium-to-high effect sizes. However, no significant difference was found between the 2 programs. The results indicate that both cognitive behavior therapy and yoga are promising stress management techniques.

Krisanaprakornkit T, Krisanaprakornkit W, Piyavhatkul N, Laopaiboon M⁷⁰ investigated the effectiveness of meditation therapy in treating anxiety disorders. Electronic databases searched include CCDANCTR-Studies and CCDANCTR-References, complementary and alternative medicine specific databases, Science Citation Index, Health Services/Technology Assessment Text database, and grey literature database. Conference proceedings, book chapters and references were checked. Study authors and experts from religious / spiritual organizations were contacted. Types of studies: Randomized controlled trials. Types of participants: patients with a diagnosis of anxiety disorders, with or without another comorbid psychiatric condition. Types of interventions: concentrative meditation or mindfulness meditation. Comparison conditions: One or combination of (1) pharmacological


⁷⁰ Krisanaprakornkit T, and et.al. ”Meditation therapy for anxiety disorders” Chchrane Database of Systematic review – online 2006 Jan 25;(1)
therapy, (2) other psychological treatment, (3) other methods of meditation, (4) no intervention or waiting list. Types of outcome: (1) improvement in clinical anxiety scale, (2) improvement in anxiety level specified by trial lists, or global improvement, (3) acceptability of treatment, adverse effects, (4) dropout. Data were independently extracted by two reviewers using a pre-designed data collection form. Any disagreements were discussed with a third reviewer, and the authors of the studies were contacted for further information. MAIN two randomized controlled studies were eligible for inclusion in the review. Both studies were of moderate quality and used active control comparisons (another type of meditation, relaxation, and biofeedback). Anti-anxiety drugs were used as standard treatment. The duration of trials ranged from 3 months (12 weeks) to 18 weeks. In one study transcendental meditation showed a reduction in anxiety symptoms and electromyography score comparable with electromyography-biofeedback and relaxation therapy. Another study compared Kundalini Yoga (KY), with Relaxation / Mindfulness Meditation. The Yale-Brown Obsessive Compulsive Scale showed no statistically significant difference between groups. The overall dropout rate in both studies was high (33-44%). Neither study reported on adverse effects of meditation. The small numbers of studies included in this review do not permit any conclusions to be drawn on the effectiveness of meditation therapy for anxiety disorders. Transcendental meditation is comparable with other kinds of relaxation therapies in reducing anxiety, and Kundalini Yoga did not show significant effectiveness in treating obsessive-compulsive disorders compared with Relaxation / Meditation. Dropout rates appear to be high, and adverse effects of meditation have not been reported. More trails are needed.

Schwickert M, and et. al71 Between 60 and 90% of patients consult their family doctor for stress-associated complaints. Not infrequently, a considerable number of these patients already have elevated blood pressure. The positive effect on high blood pressure of relaxation techniques has been confirmed in various studies. Accordingly, stress management should now have a permanent place in effective antihypertensive treatment. Appropriate relaxation techniques include, for example,

71 Schwickert M, and et.al "Stress Management in the treatment of essential arterial hypertension” MMW Fortschr Med. 2006 Nov. 23; 148(47):40-2; quiz 43.
autogenic training, progressive muscle relaxation, visualization and breathing exercises, chi gong and yoga. These practices are incorporated in various lifestyle programs. They act in different ways, and can be offered to the patient in accordance with his/her individual wishes.

**Bijlani RL, and et.al**\(^{72}\) studied the short-term impact of a brief lifestyle intervention based on yoga on some of the biochemical indicators of risk for cardiovascular disease and diabetes mellitus. The variable of interest were measured at the beginning (day 1) and end (day 10) of the intervention using a pre-post design. The study is the result of operational research carried out in our Integral Health Clinic (IHC). The IHC is an outpatient facility which conducts 8-day lifestyle modification programs based on yoga for prevention and management of chronic disease. A new course begins every alternate week of the year. The study is based on data collected on 98 subjects (67 male, 31 female), ages 20-74 years, who attended one of our programs. The subjects were a heterogeneous group of patients with hypertension, coronary artery disease, diabetes mellitus, and a variety of other illness. The intervention consisted of asanas (postures), pranayama (breathing exercises), relaxation techniques, group support, individualized advice, lectures and films on the philosophy of yoga and the place of yoga in daily life, meditation, stress management, nutrition, and knowledge about the illness. The outcome measures were fasting plasma glucose and serum lipoprotein profile. These variables were determined in fasting blood samples, taken on the first and last day of the course. Fasting plasma glucose, serum total cholesterol, low-density lipoprotein (LDL) cholesterol, very-LDL cholesterol, the ratio of total cholesterol to high density lipoprotein (HDL) cholesterol, and total triglycerides were significantly lower, and HDL cholesterol significantly higher, on the last day of the course compared to the first day of the course. The changes were more marked in subjects with hyperglycemia or hypercholesterolemia. The observations suggest that a short lifestyle modification and stress management education program leads to favorable metabolic effects within a period of 9 days.

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Kochupillai V, and et. al\textsuperscript{73} Stress, a psycho physiological process, acts through the immune-neuroendocrine axis and affects cellular processes of body and immune functions, leading to disease states including cancer. Stress is also linked to the habit of tobacco consumption and substance abuse, which in turn also leads to diseases. Sudarshan Kriya (SK) and Pranayama (P), rhythmic breathing processes, are known to reduce stress and improve immune functions. Cancer patients who had completed their standard therapy were studied. SK and P increased natural killer (NK) cells significantly ($P < 0.001$) at 12 and 24 weeks of the practice compared to baseline. Increase in NK cells at 24 weeks was significant ($P < 0.05$) compared to controls. There was no effect on T-cell subsets after SK and P either in the study group or among controls. SK and P helped to control the tobacco habit in 21\% of individuals who were followed up to 6 months of practice. We conclude that the inexpensive and easy to learn and practice breathing processes (SK and P) in this study demonstrated an increase in NK cells and a reduction in tobacco consumption. When confirmed in large and randomized studies, this result could mean that the regular practice of SK and P might reduce the incidence and progression of cancer.

Pilkington K, Kirkwood G, Rampes H, Richardson J.\textsuperscript{74} : Yoga-based interventions may prove to be an attractive option for the treatment of depression. The aim of this study is to systematically review the research evidence on the effectiveness of yoga for this indication. Searches of the major biomedical database including MEDLINE, EMBASE, CINAHL, psyCINFO and the Cochrane Library were conducted. Specialist complementary and alternative medicine (CAM) and the IndMED databases were also searched and efforts made to identify unpublished and ongoing research. Searches were conducted between January and June 2004. Relevant research was categorized by study type and approved some improvements relative to control subjects on most measures, with the relative improvement in performance anxiety being the greatest. The results from this preliminary study suggest that yoga and meditation may be beneficial as a routine practice to reduce performance anxiety in musicians.

\textsuperscript{73} Kochupillai V. and et. al “Effect of rhythmic breathing (Sudarshan Kriya and Pranayam) on immune functions and tobacco addiction”, Annals of the New York Academy of Science 2005 Nov; 1056:242-52.

\textsuperscript{74} Pilkington K, Kirkwood G, Rampes H, Richardson J. “Yoga
Brown RP, Gerbarg PL. Yogic breathing is a unique method for balancing the automatic nervous system and influencing psychologic and stress-related disorders. Part I of this series presented a neurophysiologic theory of the effects of Sudarshan Kriya Yoga (SKY). Part II will review clinical studies, our own clinical observations, and guidelines for the safe and effective use of yoga breath techniques in a wide range of clinical conditions. Although more clinical studies are needed to document the benefits of programs that combine pranayama (yogic breathing asanas (yoga postures), and meditation, there is sufficient evidence to consider Sudarshan Kriya Yoga to be beneficial, low-risk, low-cost adjunct to the treatment of stress, anxiety, post-traumatic stress disorder (PTSD), depression, stress-related medical illnesses, substance abuse, and rehabilitation of criminal offenders. SKY has been used as a public health intervention to alleviate PTSD in survivors of mass disasters. Yoga techniques enhance well-being, mood, attention, mental focus, and stress tolerance. Proper training by a skilled teacher and a 30-minute practice every day will maximize the benefits. Health care providers play a crucial role in encouraging patients to maintain their yoga practices.

Kirkwood G, and et.al between March and June 2004, a systematic review was carried out of the research evidence on the effectiveness of yoga for the treatment of anxiety and anxiety disorders. Eight studies were reviewed. They reported positive results, although there were many methodological inadequacies. Owing to the diversity of conditions treated and poor quality of most of the studies, it is not possible to say that yoga is effective in treating anxiety or anxiety disorders in general. However, there are encouraging results, particularly with obsessive compulsive disorders. Further well conducted research is necessary which may be most productive if focused on specific anxiety disorders.


West J, Otte C, and et.11\(^77\) conducted a study to examine some of the psychological and neuroendocrine response to these activities. Sixty-nine healthy college students participated in one of three 90-min classes: African dance (n = 21), Hatha yoga (n = 18), or a biology lecture as a control session (n = 30). Before and after each condition participants completed the Perceived Stress Scale (PSS), completed the Positive Affect and negative Affect Schedule, and provided a saliva sample for cortisol. There were significant reductions in PSS and negative affect (ps < .0001) and Time x Treatment interactions (ps < .0001) such that African dance and Hatha yoga showed significant declines, whereas there was no significant change in biology lecture. There was no significant main effect for positive affect (p = .53), however there was a significant interaction effect (p < .001) such that positive affect increased in African dance, decreased in biology lecture, and did not change significantly in Hatha yoga. There was a significant main effect for salivary cortisol (p < .05) and a significant interaction effect (p < .0001) such that cortisol increased in African dance, decreased in Hatha yoga, and did not change in biology. Changes in cortisol were not significantly related to changes in psychological variables across treatments. There was 1 significant interaction effect (p - .04) such that change in positive affects and change in cortisol were negatively correlated in Hatha yoga but positively correlated in Africa dance and biology. Both African dance and Hatha yoga reduced perceived stress and negative effect. Cortisol increased in African dance and decreased in Hatha yoga. Therefore, even when these interventions produced similar positive psychological effects, the effects may be very different on physiological stress processes. One factor that may have particular salience is that amount of physiological arousal produced by the intervention.

Bhattacharya S, Pandey US, Verma NS\(^78\) studied to assess the effect of yogic breathing exercises (pranayama) on the oxidative stress. This study group consisted of 30 young male volunteers, trained for the purpose of this study and an


equal number of controls were used. The free radicals and Super oxide dismutase levels were measured before the study and at the end of the study. The free radicals were decreased significantly in the study group but the SOD was increased insignificantly as compared to the control group. Yogic breathing exercises not only help in relieving the stresses of life but also improve the antioxidant status of the individual. An improvement in the antioxidant status is helpful in preventing many pathological processes that are known with impaired antioxidant system of body.

Majumdar M, Grossman P, Dietz-Waschkowski B, Kersing S, Walach H. conducted the first systematic outcome evaluation to examine the effects of an 8-week meditation-based program in mindfulness in a German sample. Twenty-one (21) participants with chronic physical, psychologic, or psychosomatic illnesses were examined in a longitudinal pretest and post-treatment design with a 3-month follow-up. Both quantitative and qualitative data were gathered. Emotional and general physical well-being, sense of coherence, overall psychologic distress, and satisfaction with life were measured with standardized instruments. Overall, the interventions led to high levels of adherence to the meditation practice and satisfaction with the benefits of the course, as well as effective and lasting reductions of symptoms (especially in psychologic distress, well-being, and quality of life). Changes were of moderate-to-large effect sizes. Positive complementary effects with psychotherapy were also found. These findings warrant controlled studies to evaluate the efficacy and cost effectiveness of mindfulness-based stress reduction as an intervention for chronic physical and psychosomatic disorders in Germany.

King MS, Carr T, D’Cruz C. studied to describe transcendental meditation and review research on its use in the treatment and prevention of coronary heart disease. Transcendental meditation shows promise as a preventive and treatment method for coronary heart disease. Transcendental meditation is associated with decreased hypertension and atherosclerosis, improvements in patients with heart disease, decreased hospitalization rates and improvements in other risk factors


including deceased smoking and cholesterol. These findings cannot be generalized to all meditation and stress reduction techniques as each technique differs in its effects. Further research is needed to delineate the mechanisms involved and to verify preliminary findings concerning atherosclerosis and heart disease and the findings of short term hypertension studies.

Monocha R.\textsuperscript{81} studied to define meditation, outline the broad types of meditation and give an overview of the extent and validity of available evidence for its efficacy. The basic question of what constitutes meditation and what separates it from relaxation therapy has been an impediment to formulating quality studies in order to research meditation techniques. Examining the literature using evidence based criteria reveals that, while meditation does appear to have therapeutic potential, there is a great need for further research before definitive conclusions can be made. Researchers have yet to systematically compare different techniques of meditation to compare their profiles.

Arambula P, and et.al.\textsuperscript{82} Studied to explore the physiological correlates of a highly practiced Kundalini Yoga mediator. Thoracic and abdominal breathing patterns, heart rate (HR), occipital parietal electroencephalograph (EEG), skin conductance level (SCL), and blood volume pulse (BVP) were monitored during pre baseline meditation, and post baseline periods. Visual analyses of the data showed a decrease in respiration rate during the meditation from a mean of 11 breath / 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.

**Pettinati PM.**

Presented an introduction to insight or mindfulness meditation, yoga and guided imagery from theoretical and practical perspectives. She provides clear, easy-to-follow steps to begin using sitting meditation, walking meditation, and yoga for the health care provider and for the patient. She presents the material first for self-knowledge and self-care and secondarily for connecting to others in healing relationships.

**Astin JA.**

Examined the effects of an 8-week stress reduction program based on training in mindfulness meditation. Previous research efforts suggesting this program may be beneficial in terms of reducing stress-related symptomatology and helping patients cope with chronic pain have been limited by a lack of adequate comparison control group. Twenty-eight individuals who volunteered to participate in the present study were randomized into either an experimental group or a non-intervention control group. Following participation, experimental subjects, when compared with controls, evidence significantly greater changes in terms of: (1) reductions in overall psychological symptomatology; (2) increase in overall domain-specific sense of control and utilization of an accepting or yielding mode of control in their lives, and (3) higher scores on a measure of spiritual experiences. The techniques of mindfulness meditation, with their emphasis on developing detached observation and awareness of the contents of consciousness, may represent a powerful cognitive behavioral coping strategy for transforming the ways in which we respond to life events. They may also have potential for relapse prevention in affective disorders.

**Telles S, Naveen KV.** Stated that the use of yoga for rehabilitation has diverse applications. Yoga practice benefited mentally handicapped subjects by

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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 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.

**Cumming**\(^86\) made an attempt to explore the correlation of stress and job satisfaction among urban special education teachers. Maslach Burnout Inventory, Minnesota Job Satisfaction Questionnaire and Demographic profile were used in survey over 292 special needs teachers. Results indicate that no significant differences were found among different classification of teachers. Depersonalization was found to be a significant factor in the extrinsic satisfaction, a teacher experienced in his/her job.

**Nelson**\(^87\) studied personnel professional and found that females reported significantly more stress from politics and higher levels of psychological and physiological distress, when compared with males. However, the females did not report more stress than males on variables concerning work / home conflicts or career progress.

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Smeltzer\textsuperscript{88} used the stress diagnostic survey to determine the work stress among government and private industry. Results indicated that variables associated with communication at the group and individual, not organization level had the greatest effect on work stress. In addition a ‘type A’ behavioral style was significantly related to role overload and responsibility for people.

Brar\textsuperscript{89} investigated the psycho physiological performance variation of high and low fitness groups resulting from induced mental and physical fatigues, he concluded that:

1. Physical fatigue improved the reaction time whereas mental fatigue prolonged the reaction time, but fitness level and reaction time were independent.
2. Mental fatigue decreased the speed of movement whereas; physical fatigue did not affect it. Fitness and speed of movement were not related.
3. Mental fatigue and physical fatigue impaired the hand steadiness of the subjects.
4. Fitness was found to be an underlying factor of depth perception. Mental and physical fatigue impaired the depth perception.

Moffett’s\textsuperscript{90} study of summer faculty at the University of Lowa revealed that female, non tenure and probationary faculty experienced significantly higher levels of job stressors than male and tenured faculty. Academicians earning less than professor perceived greater stress. Faculty who classified themselves as ‘type ‘A’ personalities had more job stress than those who classified themselves as ‘type B’. Full time professors and academicians who had greater departmental seniority had minimum levels of perceived of strains.


\textsuperscript{90} Moffett, M.A., “Implications of Job Stressors are Perceived by Summer Faculty at the University of Lowa (Doctoral Dissertation, University of Lowa, 1983), Dissertation Abstracts International 44 (1983) : 3611-A.
Holman DS and et.al\textsuperscript{91} on four successive days, 10 highly trained and experienced meditators were asked to relax for 5 minutes, meditate for 20 minutes, and then relax for 5 minutes. In contrast, 10 other subjects who had no training or experience with meditation were asked to relax for 5 minutes. Physiological arousal (heart rate, skin resistance, respiration rate, systolic blood pressure, diastolic blood pressure) and subjective arousal (cognitive, somatic, relaxation) were measured throughout the experiment. Results indicate that (a) prior to meditating or resting, meditators tended to have higher heart rates and diastolic blood pressure and did not meditators, (b) meditation was associated with generally reduced arousal, but (c) while meditating, meditators did not evidence lower levels of arousal than non meditators did while resting. This investigation employed controls, which were not used in previous investigations, and the results place qualifications on previously reported results. The results have implications for the study of personality functioning, stress management, and psychotherapy.

Yesavage JA, Karasu TB.\textsuperscript{92} The purpose of this article is to present a review of the psychotherapy of the elderly, emphasizing traditional methods as well as some newer techniques. It will first review the literature on the process of psychotherapy in the elderly, then the rationale for such therapy will be discussed, and finally important technical points about such therapy will be listed, including information about the cognitive psychotherapies in the treatment of demented elderly.

Kamen\textsuperscript{93} investigated fractionated time in power trained and endurance-trained athlete under condition of fatiguing isometric exercise. For this purpose he assessed fractionated knee extensors and planter flexor RT components in a group of eight weight litters and eight long distances runners, following a four day period of baseline stabilization of each muscle group, 1 505 maximum voluntary contraction


\textsuperscript{92}Yesavage JA, karasu TB. “Psychotherapy with elderly patients” Am J Psychother. 1982 Jan; 36(1) 43-55.

(MVC) holding time exercise was administered. The result showed that the runner had longer pre motor time (PMT). Share the weight lifters in the knee extensions, but had much PMT’s than the lifters in the planters flexor condition. Compare to previously reported investigation using non-athlete, the date for the present sample of athlete indicated faster total RTs in both knee extensors and the planter flexors a resistance of 15% MVC applied during the RT task, resulted in lengthening of the motor time (MT) component in both groups prior to exercise. However while knee extensor resisted motor time was lengthened by the exercise task, no such lengthening occurred in planter flexor resisted RT. It was concluded that power trained.

**Gunner & Hans**<sup>94</sup> studied the variation of hand steadiness with physical stress for this purpose the performance of 12 subjects in a hand steadiness expressed in a form of value of hand shakiness was found not to increase linearly with work intensity, on the contrary the relation between hand shakiness and activation level induce by physical work, was found to be positively accelerated by an exponent of 1:6, subjective effort measured by a radio estimation method grew, likewise according to a positively acceleration function with an exponent of about 1:6, while subjective effort according to “RPF” category scale, like heart rate grew linearly with work load.

**Blackwell B, and et.al**<sup>95</sup> Seven selected hypertensive patients were stabilized on drugs at a research clinic. Subjects learned transcendental meditation (T.M.), were seen weekly, and took their own blood pressure several times daily. After 12 weeks of T.M. six subjects showed psychological change and reduced anxiety scores. Six subjects also showed significant reductions in home and four in clinic blood pressures. Six subjects also showed significant reductions in home and four in clinic blood-pressures. Six months later four subjects continued to derive psychological benefit and two showed significant blood-pressure reductions attributable to T.M. at home and clinic.


Woolfolk RL. The scientific research that has investigated the physiological changes associated with meditation as it is practiced by adherents of Indian Yoga, ‘transcendental Meditation, and Zen Buddhism has not yielded a thoroughly consistent, easily replicable pattern of responses. The majority of studies show meditation to be a wakeful state accompanied by a lowering of cortical and autonomic arousal. The investigations of Zen and Transcendental Meditation have thus far produced the most consistent findings. Additional research into the mechanism underlying the phenomena of meditation will require a shifting from old to new methodological perspectives that allow for adequate experimental control and the testing of theoretically relevant hypotheses.

Burk conducted a study to examine effect of different level of physical exertion, as measured by heart rate, on dynamic balance (DB). A Latin square arrangement was used to assign the levels of exertion: rest light (120 bpm), medium (140 bpm), heavy (160 bpm) and severe (180 bpm) to each of 12 subjects (SS). A modification of Raynolds Balance Device (RBD) was used as the instrument to measure ergo-meter for 7 minutes and then took six trials at one minute interval on RBD. A trial consisted of the elapsed time form the onset of the first stimulus light. The faster DB scores were achieved on trials two, three, four after heavy and severe level of exertion. Consequently it seemed that prior physical exertion at 120 bpm and 140 bpm tends to enhance the DB performance on the RDB. In contrast prior exertion at 160 bpm and 180 bpm tends to induce slower DB scores up to 5 minutes after performance on the bicycle ergo-meter.

Cotten and other determined the effect of interpolated specific and total body physical fatigue upon the performance & banning of a gross motor skill. 75 male subjects were randomly assigned to one of three groups: group A (specific body

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fatigue), group B (total body fatigue and group C (Control). The gross motor learning task was a modification of mirror target toss test (Mc grsos, rq 22: 197-200). Each subject was given one initial trial (five throws). This was followed by the appropriate experimental condition: Group A – seven minutes of severe overall physical activity (stool stepping-60 complete step-ups per minute), Group B-5 minutes. Of severe specific exercise (reverse curling 23 lb. Easy curl bar-30 re, per minutes) and Group C-5 minutes of rest. Each subject was then given ten consecutive trials (50 throws) with the assigned physical fatigue interposed for 30 sec. following each two trials. On the subsequent day, the subjects were given three consecutive trials (no exercise condition on second day). The learning score was calculated by the present of possible improvement method:

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\text{Learning} = \frac{\text{final score} - \text{initial score}}{\text{Maximum possible score} - \text{initial score}}
\]

The score of the first trial served as the initial score while the x of the three trials for the second day served as the final score. The reliabilities for the learning task for each group were \( r_A = .89 \), \( r_B = .83 \) and \( r_C = .90 \). The learning scores for each group were analysed by simple ANOVA with the results indicating that fatigue had no significant effects (\( f = 0.97 \)) upon the amount learned. The effect of either total body or specific fatigue upon performance curves (ten trials after the imposed condition interposed between every two trials) were analyzed by discriminate analysis. Result indicated that the curve of group resting before and between trials was significantly different (mah alan obis \( D^2 = 68.79, df = 20, p < .01 \)) fro the curves of other two groups. The result of this study indicated that while performance was impaired by both specific and total body fatigue, the amount learned was unaffected by fatigue.

**Wallace RK.**

States that Oxygen consumption, heart rate, skin resistance, and electroencephalograph measurements we recorded before during, and after subjects practiced a technique called transcendental meditation. There were significant changes between the control period and the meditation period in all

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measurements. During meditation, oxygen consumption and heart rate decreased, skin resistance increased, and the electroencephalogram showed specific changes in certain frequencies. These results seem to distinguish the state produced by transcendental meditation from commonly encountered states of consciousness and suggest that it may have practical applications.

Bryant\textsuperscript{100} undertook a descriptive case study analysis of basketball jump shots and the effect of fatigue on the jump shot. Five university of Missouri varsity basketball players were filmed (16mm, 64 t.p.s., 3 synchronous views, lower, upper and full body) for mechanical and cinematographic analysis through a descriptive case study approach of the motor skill of BB jump shots and the effect of fatigue on jump shot.

So performed three sets of 10m shots from 20 feet in front of the basketball, the first following minimal exertion and the second & the third after 30 min. controlled BB scrimmages, with a 109 ft. sprint preceding each jump shot was developed representing ranges of selected body measurements and application of mechanical principle and laws. Jump shot performances the effects of fatigue were found to be individualized. Six body measurements were found to be affected by fatigue between sets and four without sets. The variation of the jump shot did not reveal the mechanical reason for long range shooting skill on the basis of playing background. Superior shooter used a continuous style and long-levered play may have an advantage from 20 feet in front of the basketball.

Schwartz\textsuperscript{101} placed thirty male college subjects in two groups to discover if varying degree of muscular fatigue had any effect on depth perception. The experimental group pedaled a bicycle ergo-meter under condition of increasing workloads until a heart rate of 170 bpm was reached or until unable to pedal was required. The depth perception scores and heart rate were recorded simultaneously at


pre-selected times during the experimental period. All subjects in the experimental groups were actively exercised during the time these data were collected. The data from the control group were collected following the same procedure except that they did not perform physical work. ANOVA indicated no significant difference between the depth perception and scores during the experimental period and no significant inter-action effect. These findings were confirmed by the paired 't’ test that indicated no significant differences between initial and final depth perception, scores of eight groups.

Schemidte\textsuperscript{102} examined the status of physical fatigue as a variable affecting performance and learning of gross motor skills. In this investigation three groups practiced ten 30 sec. Trials on the Buckman ladder with a 90 sec. Intertrial interval (day 1). Two fatigue groups rod a bicycle ergo meter for two minutes. Prior to trial I and thereafter, for 75 sec. between each sub sequential ladder trial work load of 750 (N=3) and 1200 (N=14) kgm/mins respectively a control group (N=20) cancelled vowels between trials. All group returned two days later (day=2) for four rails with interval rest, the man of which was the criterion of amount learned. Fatiguing activity caused decrements in day-1 performance (F=3.32), but failed to affect day-2 performance (F=0.47), indicating that fatigue was a performance variable rather than a learning variable.

Lockey\textsuperscript{103} investigated the effect of fatigue on movement time of track & field athletes. The tested 22 subjects for speed of movement of lower extremists. Subjects in an experimental group rode bicycle ergo meter until the HR of 180 was reached. It was found that the speed of movement increased as a result of the amount of fatigue.

Carron\textsuperscript{104} in an attempt to study the effect of physical fatigue upon the learning of a motor skill assigned 75 college women students in a systematic rotation to either systematic rotation to either a control group or one of the two experimental


group (N = 25 in each group). All subjects were given a total 50 trials on the pursuit rotor. 25 trials on day 1 the practice session and 25 trials on day 2. The test session one of the experimental groups was fatigued early in practice session while the other was fatigued later in the practice session. Fatigue interpolated early and late was detrimental to subsequent performance; improvements but had no effect on the amount learned.

Marshall\textsuperscript{105} divided 80 senior high school boys into two groups to study the immediate effect of fatigue upon selected measures of kinesthesia. The experimental group undertook 10 minutes sit up exercise. Just prior to performing on a stabliometer, without a fatigue about. These were significant decrement in initial, final and overall performance of the experimental subjects, which supported the hypothesis that preliminary unrelated fatiguing exercises would, causes a detrimental effect on performance.

Ware\textsuperscript{106} conducted a study on the effect of fatigue on tolerance, kinesthetic positioning and steadiness and used a work about 15 squat thrust in one minute to induce mild fatigue. The difference between pre-test, post-test indicated a tendency to improve static balance but did not affect on kinesthetic positioning of the shoulder joint and increase in hand tumor. Mild fatigue appeared detrimental to performance in which steadiness was important.

Phillips\textsuperscript{107} Examined the influenced of fatiguing warm-up exercises on speed-up of movement and recitation latency. He concluded that related warm-up exercise of moderate intensity failed to improve arm speed in a large muscle criterion movement, while heavy but non-related warm-ups exercise did improve speed by 16\%. Three groups each consisting 25 male college students, were measured under both test and control conditions.

\textsuperscript{105} Thedore R. Marshall, “The Immediate Effect of Fatigue on Selected Measures of Kinesthesia in Junior High School Boys” Completed Research in Health, Physical Education and Recreation (1960) : 139.

\textsuperscript{106} Lanctla T. Ware, “A Study of the Effect of Fatigue on Balance Kinesthetic Positioning and Steadiness.” Completed Research in Health, Physical Education and Recreation (1963) : 73.

Neither of warm-up exercises influenced reduction latency. The correlation between RT and MT scores was no significant ($r = .17$), for the heavy exercise (stool stepping), highly reliable individual difference were observed in stepping rate drop off before fatigue ($r = .93$) and after $37\%$ fatigue ($r = .98$), but two types of drop off scores were not significantly co-related ($r = .24$). In the arm action warm-up exercise, the correlation between initial rate of movement and rate at $24\%$ fatigue was non-significant ($r = .08$).

Morris conducted a study to examine fractionated reflex components (responses) after local fatiguing isotonic and isometric muscular exercise of the quadriceps musculature. He subdivided total reflex time into peripheral and central component by fractionated procedure. The central components (reflex latency) constituted the time for the monosynaptic reflex are whereas the peripheral component (reflex motor time) represented the time for muscular contraction. 12 male university students were tested prior to and after severe isometric and isotonic exercise. Isometric exercises produce a strength decrement of $57$ and isotonic exercise task produced strength decrement of $35$ percent. Although differential strength decrement were shown, both exercise types significantly ($p < .01$) lengthened total reflex time. Additionally, both reflex latency and reflex motor time was increased. These results suggest that severe muscular fatigue of either isometric or isotonic origin adversely affect total reflex time specially the peripheral (muscular) components.