

## Chapter II

### REVIEW OF RELATED LITERATURE

A study of relevant literature is essential to get a full picture of what has been done and said with regard to the problem under study. Aggarwal quotes that in the words of Walter R. Brog “The literature in any field form the foundation upon which all future work will be built”.

The project worker traced different types of research works like abstracts from dissertations, thesis, journals, magazines and relevant books on yoga, music, prenatal and infant.

A series of relevant studies related to the problem under study and views expressed by various personalities have been presented in this chapter:

1. Studies on prenatal yogic practices on selected variables.
2. Summary of the literature.

#### **2.1. STUDIES ON PRENATAL YOGIC PRACTICES ON SELECTED VARIABLES**

Alan Slater, et al, (2007) analysed the intermodal perception at birth: newborn infants' memory for arbitrary auditory–visual pairings. Most of the stimuli that we experience are intermodal in that they provide information to more than one sensory modality. Some of these intermodal relationships are amodal in that they provide equivalent information to the senses, while others are quite arbitrary. For instance, there is no information specifying that a particular voice has to be associated with a particular face, or that a particular animal makes a particular sound. The ability of newborn infants to learn arbitrary visual–auditory associations was investigated by familiarizing 2-day-old infants to two alternating visual stimuli (differing in colour

and orientation), each accompanied by its ‘own’ sound. On post-familiarization test trials attention recovered to a novel visual–auditory combination. These findings are a clear demonstration that newborn infants can learn arbitrary visual–auditory associations, and they are discussed in terms of Bahrick’s theory of early intermodal perception.

Lisa M. Oakes, et al, (2013) examined six-month-old infants’ (N = 168) memory for individual items in a categorized list (e.g., images of dogs or cats) to investigate the interactions between visual recognition memory, working memory, and categorization. In Experiments 1 and 2, infants were familiarized with six different cats or dogs, presented one at a time on a series of 15-second familiarization trials. When the test occurred immediately after the sixth familiarization trial (Experiment 1), infants showed strong novelty preference for items presented on the fourth or fifth familiarization trial, but not for the items presented on the first three trials or on the sixth trial. When a brief (15-second) retention delay occurred between the end of the sixth trial and the test trials (Experiment 2), memory for the sixth item was enhanced, memory for the fourth item was impaired, and memory for the fifth was unchanged relative to when no retention delay was included. Experiment 3 confirmed that infants can form a memory for the first item presented. These results reveal how factors such as interference and time to consolidate influence infants’ visual recognition memory as they categorize a series of items.

Charlene Krueger, et,al,(2004) University of North Carolina at Chapel Hill, Chapel Hill, NC, USA . Recurring auditory experience in the 28- to 34-week-old fetus. This study describes the influence of recurring auditory experience on the fetus during a transitional time period in neurobehavioral development (28-34 weeks gestation). Findings demonstrate that fetal responding can be influenced by earlier

experiences and that this effect is potentially influenced by maturity of the autonomic nervous system.

Susan A Rose, et al, (2004) conducted study in Children's Hospital at Montefiore, Departments of Pediatrics and Psychiatry, Kennedy Center, Albert Einstein College of Medicine. Visual recognition memory is a robust form of memory that is evident from early infancy, shows pronounced developmental change, and is influenced by many of the same factors that affect adult memory; it is surprisingly resistant to decay and interference. Infant visual recognition memory shows (a) modest reliability, (b) good discriminant validity, with performance depressed by numerous peri-natal risk factors, including teratogens and premature birth, (c) good predictive validity, relating to broad cognitive abilities in later childhood, including IQ and language, and (d) significant cross-age continuity, relating to memory in later childhood (through at least 11 years). Infant visual recognition memory is related to, and may be to some extent accounted for by, processing speed, forgetting, and certain aspects of attention (particularly look duration and shift rate). There is growing evidence that infant recognition memory may be an early form of declarative memory that depends on structures in the medial temporal lobe.

Rose SA ,et al, (2003) have undertaken a study on Infant visual recognition memory: independent contributions of speed and attention. Relations between infant visual recognition memory and later cognition have fueled interest in identifying the underlying cognitive components of this important infant ability. The present large-scale study examined three promising factors in this regard—processing speed, short-term memory capacity, and attention. Two of these factors, attention and processing speed (but, surprisingly, not short-term memory capacity), were related to visual recognition memory: Infants who showed better attention (shorter looks and more

shifts) and faster processing had better recognition memory. The contributions of attention and processing speed were independent of one another and were similar at all ages studied—5, 7, and 12 months. Taken together, attention and speed accounted for 6%-9% of the variance in visual recognition memory, leaving a considerable, but not unexpected, portion of the variance unexplained.

Wiley, et al, (2003) analysed the Influence of Prenatal Tactile and Vestibular Stimulation on Auditory and Visual Responsiveness in Bobwhite. The fact that the sensory systems do not become functional at the same time during prenatal development raises the question of how experience in a given modality can influence functioning in other sensory modalities. The present study exposed groups of bobwhite quail embryos to augmented tactile and vestibular stimulation at times that either coincided with or followed the period of onset of function in the later-developing auditory and visual modalities. Differences in the timing of augmented prenatal stimulation led to different patterns of subsequent auditory and visual responsiveness following hatching. No effect on normal visual responsiveness to species-typical maternal cues was found when exposure to tactile and vestibular stimulation coincided with the emergence of visual function (Days 14–19), but when exposure took place after the onset of visual functioning (Days 17–22), chicks displayed enhanced responsiveness to the same maternal visual cues. When augmented tactile and vestibular stimulation coincided with the onset of auditory function (Days 9–14), embryos subsequently failed to learn a species-typical maternal call prior to hatching. However, when given exposure to the same type and amount of augmented stimulation following the onset of auditory function (Days 14–19), embryos did learn the maternal call. These findings demonstrate that augmented stimulation to earlier-emerging sensory modalities can either facilitate or interfere

with perceptual responsiveness in later-developing modalities, depending on when that stimulation takes place.

Chamberlain, et al, (1999) refers to a large program implemented in Caracas, Venezuela, and directed by Beatriz Manrique. This study shows how prenatals who received a stimulation program during gestation had an advantage over other children in almost every category measured including auditory capacities, speech, memory and motor skills. These studies on prenatal stimulation demonstrate the fact that prenatals are able to learn and communicate from at least the 20th week of gestation.

Lisa Skedung, et al, (2013) in their work *Feeling Small: Exploring the Tactile Perception Limits*, shows that the human finger is exquisitely sensitive in perceiving different materials, but the question remains as to what length scales are capable of being distinguished in active touch. They combine material science with psychophysics to manufacture and haptically explore a series of topographically patterned surfaces of controlled wavelength, but identical chemistry. Strain-induced surface wrinkling and subsequent templating produced 16 surfaces with wrinkle wavelengths ranging from 300 nm to 90  $\mu$ m and amplitudes between 7 nm and 4.5  $\mu$ m. Perceived similarities of these surfaces (and two blanks) were pairwise scaled by participants, and interdistances among all stimuli were determined by individual differences scaling (INDSCAL). The tactile space thus generated and its two perceptual dimensions were directly linked to surface physical properties – the finger friction coefficient and the wrinkle wavelength. Finally, the lowest amplitude of the wrinkles so distinguished was approximately 10 nm, demonstrating that human tactile discrimination extends to the nanoscale.

Mona Khalajzadeh, et al, (2012) studied the effect of yoga on anxiety among pregnant women in second and third trimester of pregnancy. The purpose of this study

was the effect of selected yoga exercises on anxiety in pregnant women in the second and third trimester. Therefore, 24 healthy, non-athlete, and volunteer pregnant women in the second and third trimester of pregnancy were divided into experimental and control groups. They participated in a pretest-posttest randomized-groups design. The anxiety level was assessed by Pregnancy Outcome Questionnaire (POQ) in pregnancy. The experimental group performed the selected yoga exercises for 8 weeks. Data analysis using 2(group) \* 2(trimester) \* 2(test) ANOVA with repeated measures of test factor indicated the significant main effect of test and interaction of test and group ( $p < .001$ ). Other effects were not significant. In general, it can be concluded that yoga exercises regardless of trimesters of pregnancy has a positive impact on women's anxiety.

Mahin Kamalifard, et al, (2012). Under took a study on the Efficacy of Massage Therapy and Breathing Techniques on Pain Intensity and Physiological Responses to Labor pain. There are many non-pharmacological methods for relieving labor pain. The preferable method is certainly the one that is effective and harmless. Therefore, we decided to compare the efficacy of massage therapy and breathing techniques on pain intensity, physiological responses to labor pain, labor type and the outcomes. Methods: A quasi-experimental study was conducted in Alzahra Hospital in Tabriz. At first, 40 primigravidas, satisfying the inclusion criteria, were selected and randomly divided into two groups of massage 1 (M1) and breathing 1 (B1). Then, another 42 mothers were selected based on the same criteria and randomly divided into two groups of massage 2 (M2) and breathing 2 (B2). An educated research assistant (ERA) provided practical training to (B1 and B2 groups) by holding one educational session. As the labor process started, the ERA, who was present at the labor room, repeated the breathing technique for B1 and B2 groups. The breathing

groups employed the techniques during the first or second stage of labor at 4, 6, 8 and 10 centimeter of dilatation for 30 minutes. The intensity of pain was measured by a numerical rating scale (NRS) 30 minutes after determining dilatation. The physiological responses were evaluated at the same time intervals. The ERA performed massaging at the same dilatations for M1 and M2 groups. The data was collected similarly. Labor progression was evaluated by the partograph. Results: Massage at 4 and 6 cm dilatations and breathing at most dilatations decreased pain scores significantly. The mean difference of pain intensity and physiological responses to pain was not significant between the massaging and breathing groups at most dilatations. Conclusion: Based on the findings of this research, providing the possibility of choosing one or both methods for labor pain relief and decreasing cesarean section rate is suggested.

Selvakumar, Chandrasekar and Pushparaj, et al, (2011) studied the effect of selected yogic practices on cardio vascular endurance of college students. Sixty male subjects were selected from Thiagarajar College, Madurai and their age ranged from 18 to 20 years. The subjects were divided into two groups namely the control and the experimental group. The experimental group underwent selected asanas and pranayama practice weekly five classes for twelve weeks. Control group did not undergo any training programme rather than their routine work. Cardio vascular endurance was measured through field test using by one mile run and walk. Prior to and after end of practice period all subjects were tested. The results of pre-test and post-test were compared with using Analysis of Co-variance. Finding of cardio vascular endurance shows significant improvement due to the practices of yoga when compared to the control group.

Pamela J. Reis, et al, (March 2011) examined the effect of prenatal yoga practice in late pregnancy and patterning of change in optimism, power, and well-being. The purpose of this study was to explore changes in human-environmental field patterning of optimism, power, and well-being over time, in women during the second and third trimesters of pregnancy upon completion of a 6-week prenatal yoga program. A descriptive design was used to answer research questions developed according to the Science of Unitary Human Beings theoretical framework: (1) What are the changes in patterning, as observed through the manifestation of optimism, power, and well-being over time, in women before beginning and upon completing a 6-week prenatal yoga program during the second and third trimesters of pregnancy, and (2) does change in patterning, as observed through the manifestations of optimism, power, and well-being over time, differ for women beginning yoga classes in the third trimester from women who begin classes in the second trimester of pregnancy? A convenience sample of 21 pregnant women was recruited from a public health prenatal clinic and a private nurse-midwifery practice in Wake County, North Carolina. The sample was delimited to women who volunteered to participate in the study and were (a) in the second and third trimesters of pregnancy between 20 to 32 weeks gestation; (b) 18 years old and above; (c) able to speak, read, and write in English; and (d) experiencing an uncomplicated, low-risk pregnancy.

Tekur P, et al. et al, (2010) conducted a study on the effect of yoga on quality of life of CLBP patients at Division of Yoga and Life Sciences, Swami Vivekananda Yoga Research Foundation (SVYASA), Bangalore, India. About 80 patients with CLBP (females 37) registered for a week long treatment at SVYASA Holistic Health Centre in Bengaluru, India. They were randomized into two groups (40 each). The yoga group practiced a specific module for CLBP comprising asanas (physical



postures), pranayama (breathing practices), meditation and lectures on yoga philosophy. The control group practiced physical therapy exercises for back pain. Perceived stress scale (PSS) was used to measure baseline stress levels. Outcome measures were WHOQOL Bref for quality of life and straight leg raising test (SLR) using a Goniometer. There were % left) significant negative correlations (Pearson's,  $P < 0.005$ ,  $r > 0.30$ ) between baseline PSS with all four domains and the total score of WHOQOLBref. All the four domains' WHOQOLBref improved in the yoga group (repeated measures ANOVA  $P = 0.001$ ) with significant group\*time interaction ( $P < 0.05$ ) and differences between groups ( $P < 0.01$ ). SLR increased in both groups ( $P = 0.001$ ) with higher increase in yoga (31.1 % right, 28.4 than control (18.7% right, 21.5 % left) group with significant group\*time interaction (SLR right leg  $P = 0.044$ ). It was concluded that CLBP, a negative correlation exists between stress and quality of life. Yoga increases quality of life and spinal flexibility better than physical therapy exercises.

Jan G. Nijhuis ,et al, (2009), undertook a study entitled Aspects of Fetal Learning and Memory, Maastricht University Medical Centre. Ninety-three pregnant women were recruited to assess fetal learning and memory, based on habituation to repeated vibroacoustic stimulation of fetuses of 30–38 weeks gestational age (GA). Each habituation test was repeated 10 min later to estimate the fetal short-term memory. For Groups 30–36, both measurements were replicated in a second session at 38 weeks GA for the assessment of fetal long-term memory. Within the time frame considered, fetal learning appeared GA independent. Furthermore, fetuses were observed to have a short-term (10-min) memory from at least 30 weeks GA onward, which also appeared independent of fetal age. In addition, results indicated that 34-week-old fetuses are able to store information and retrieve it 4 weeks later.

Peter Tze-Ming Chou, et al, (2009) conducted a pilot study on the potential use of Tomatis method to improve L2 reading fluency, Wenzao Ursuline College of Languages, Kaohsiung, Taiwan. This was a pilot study that used the Tomatis Method to see the effects it had on L2 reading fluency in a group of Taiwanese learners. Eight volunteers participated in this study undertaking 40-hours of before-and-after-experimental treatments. The results from the analysis showed that the participants had significant improvements in the areas of fluency, tone, stress, and intelligibility. However, there was not a significant improvement in pronunciation. This study concludes that the Tomatis Method seemed to help participants improve their reading fluency as well as increase the levels of confidence and motivation when learning the target language.

Subramanya and Telles, et al, (2009), studied fifty-seven male volunteers (group average age  $\pm$  S.D., 26.6  $\pm$  4.5 years) the immediate effect of two yoga relaxation techniques was studied on memory and state anxiety. All participants were assessed before and after (i) Cyclic meditation (CM) practiced for 22:30 minutes on one day and (ii) an equal duration of Supine rest (SR) or the corpse posture (shavasana), on another day. Sections of the Wechsler memory scale (WMS) were used to assess; (i) attention and concentration (digit span forward and backward), and (ii) associate learning. State anxiety was assessed using Spielberger's State-Trait Anxiety Inventory (STAI). There was a significant improvement in the scores of all sections of the WMS studied after both CM and SR, but, the magnitude of change was more after CM compared to after SR. The state anxiety scores decreased after both CM and SR, with a greater magnitude of decrease after CM. There was no correlation between percentage change in memory scores and state anxiety for either session. A cyclical combination of yoga postures and supine rest in CM improved memory

scores immediately after the practice and decreased state anxiety more than rest in a classical yoga relaxation posture (shavasana).

Janet A. DiPietro, et al, (2008) Fetal responses to induced maternal relaxation during pregnancy, *Biological Psychology* Fetal responses to induced maternal relaxation during the 32nd week of pregnancy were recorded in 100 maternal–fetal pairs using a digitized data collection system. The 18-min guided imagery relaxation manipulation generated significant changes in maternal heart rate, skin conductance, respiration period, and respiratory sinus arrhythmia. Significant alterations in fetal neurobehavior were observed, including decreased fetal heart rate (FHR), increased FHR variability, suppression of fetal motor activity (FM), and increased FM–FHR coupling. Attribution of the two fetal cardiac responses to the guided imagery procedure itself, as opposed to simple rest or recumbency, is tempered by the observed pattern of response. Evaluation of correspondence between changes within individual maternal–fetal pairs revealed significant associations between maternal autonomic measures and fetal cardiac patterns, lower umbilical and uterine artery resistance and increased FHR variability, and declining salivary cortisol and FM activity. Potential mechanisms that may mediate the observed results are discussed.

Upadhyay, et al, (2008), studied the pranayama (breathing exercise), one of the yogic techniques which can produce different physiological responses in healthy individuals. The responses of Alternate Nostril Breathing (ANB) the Nadisudhi Pranayama on some cardio-respiratory functions were investigated in healthy young adults. The subjects performed ANB exercise (15 minutes everyday in the morning) for four weeks. Cardio-respiratory parameters were recorded before and after 4-weeks training period. A significant increment in Peak expiratory flow rate (PEFR L/min) and Pulse pressure (PP) was noted. Although Systolic blood pressure (SBP) was

decreased insignificantly, the decrease in pulse rate (PR), respiratory rate (RR), diastolic blood pressure (DBP) were significant. Results indicate that regular practice of ANB (Nadisudhi) increases parasympathetic activity.

Kiellgren, et al, (2007), designed a protocol that can investigate whether SK&P can lead to increased feeling of wellness in healthy volunteers. Participants were recruited in a small university city in Sweden and were instructed in a 6-day intensive program of SK&P which they practiced daily for six weeks. The control group was instructed to relax in an armchair each day during the same period. Subjects included a total of 103 adults, 55 in the intervention (SK&P) group and 48 in the control group. Various instruments were administered before and after the intervention. Hospital Anxiety Depression Scale measured the degree of anxiety and depression, Life Orientation Test measured dispositional optimism, Stress and Energy Test measured individual's energy and stress experiences. Experienced Deviation from Normal State measured the experience of altered state of consciousness. There were no safety issues. Compliance was high (only 1 dropout in the SK&P group, and 5 in the control group). Outcome measures appeared to be appropriate for assessing the differences between the groups. Subjective reports generally correlated with the findings from the instruments. The data suggest that participants in the SK&P group, but not the control group, lowered their degree of anxiety, depression and stress, and also increased their degree of optimism (ANOVA;  $p < 0.001$ ). The participants in the yoga group experienced the practices as a positive event that induced beneficial effects. These data indicate that the experimental protocol that is developed here is safe, compliance level is good, and a full scale trial is feasible. The data obtained suggest that adult participants may improve their wellness by learning and applying a program based on

yoga and yogic breathing exercises; this can be conclusively assessed in a large-scale trial.

Cowen and Adams, et al, (2007), investigated the differences in heart rate during the physical practice of yoga postures, breathing exercises, and relaxation. Sixteen participants were led through three different styles of yoga asana practice. Polar S610 heart rate monitors were used to measure one minute average heart rates throughout each session. Repeated measures analysis of variance indicated that there was a significant difference ( ) in heart rate between astanga yoga ( , SD=12.84) and the other two styles, but not between the hatha ( , SD=9.32) and gentle ( , SD=7.41) yoga styles. These results indicate that there may be different fitness benefits for different styles of yoga practice.

Smith, et al., (2007), compared yoga and relaxation as treatment modalities at 10 and 16 weeks from study baseline to determine if either of modality reduces subject stress, anxiety, blood pressure and improves quality of life. A randomised comparative trial was undertaken comparing yoga with relaxation.: One hundred and thirty-one subjects with mild to moderate levels of stress were recruited from the community in South Australia. Ten weekly 1- h sessions of relaxation or hatha yoga. Changes in the State Trait Personality Inventory sub-scale anxiety, General Health Questionnaire and the Short Form-36. Following the 10 week intervention stress, anxiety and quality of life scores improved over time. Yoga was found to be as effective as relaxation in reducing stress, anxiety and improving health status on seven domains of the SF-36. Yoga was more effective than relaxation in improving mental health. At the end of the 6 week follow-up period, there were no differences between groups in levels of stress, anxiety and on five domains of the SF-36. Vitality, social function and mental health scores on the SF-36 were higher in the relaxation

group during the follow-up period. Yoga appears to provide a comparable improvement in stress, anxiety and health status compared to relaxation.

Greg D. Reynolds, et al, (2006), undertook a study entitled Familiarization, Attention, and Recognition Memory in Infancy: An Event-Related Potential and Cortical Source Localization Study. This study investigated the effects of familiarization and attention on event-related potential (ERP) correlates of recognition memory in infants. Infants 4.5, 6, or 7.5 months of age were either familiarized with 2 stimuli that were used during later testing or presented 2 stimuli that were not used later. Then, infants were presented with a recording of Sesame Street to elicit attention or inattention and presented with familiar and novel stimuli. A negative ERP component over the frontal and central electrodes (Nc) was larger in the preexposure familiarization group for novel- than for familiar-stimulus presentations, whereas the Nc did not differ for the group not receiving a familiarization exposure. Spatial independent components analysis of the electroencephelogram and “equivalent current dipole” analysis were used to examine putative cortical sources of the ERP components. The cortical source of Nc was located in areas of prefrontal cortex and anterior cingulate cortex.

Kaushik, et al, (2006), compared mental relaxation and slow breathing as adjunctive treatment in patients of essential hypertension by observing their effects on blood pressure and other autonomic parameters like heart rate, respiratory rate, peripheral skin temperature, electromyographic activity of the frontalis muscle and skin conductance. One hundred patients of essential hypertension either receiving antihypertensive drugs or unmedicated were selected randomly. Various parameters were recorded during the resting state and then during mental relaxation and slow breathing for 10 min each, separated by a quiet period of 15 min. All parameters were

recorded again after mental relaxation and slow breathing. Changes in various parameters observed after mental relaxation and slow breathing were analyzed and compared. Both mental relaxation and slow breathing resulted in a fall in systolic blood pressure, diastolic blood pressure, heart rate, respiratory rate and electromyographic activity with increase in peripheral skin temperature and skin conductance. Slow breathing caused a significantly higher fall in heart rate ( $p < 0.05$ ), respiratory rate ( $p < 0.001$ ), systolic blood pressure ( $p < 0.05$ ) and diastolic blood pressure ( $p < 0.01$ ). Increase in peripheral skin temperature ( $p < 0.05$ ) and reduction in electromyographic activity ( $p < 0.05$ ) occurred more with mental relaxation. No significant differences were seen between increases in skin conductance ( $p > 0.2$ ) observed with both the modalities. Even a single session of mental relaxation or slow breathing can result in a temporary fall in blood pressure. Both the modalities increase the parasympathetic tone but have effects of different intensity on different autonomic parameters.

Jain, et al., (2005), studied the responses of right nostril breathing (RNB) and left nostril breathing (LNB) on cardio-respiratory and autonomic functions in healthy student volunteers of both sexes. The RNB and LNB groups comprised 10 males and 10 females in each in the age range of 17-22 years. Initially, in both groups control values of respiratory rate (RR), heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBF), peak expiratory flow rate (PEFR) and galvanic skin resistance (GSR) were recorded. The same parameters were recorded after 15 min (acute exposure) and 8 wks of training in RNB and LNB. In males RR ( $P < 0.0001$ ), SBP ( $P < 0.05$ ) and DBF ( $P < 0.05$ ) fell significantly after 15 min of RNB. After 8 wks training in RNB, HR ( $P < 0.01$ ) decreased, SBP ( $P < 0.001$ ) declined more profoundly and RR ( $P < 0.0001$ ) and DBP ( $P < 0.05$ ) decrement was maintained. After 15 min of

LNB, RR ( $P<0.01$ ), HR ( $P<0.01$ ), SBP ( $P<0.001$ ) and DBP ( $P<0.01$ ) declined significantly, on 8 wks training, RR ( $P<0.0001$ ) and HR ( $P<0.001$ ) decreased further, the decrement in SBP ( $P<0.001$ ) and DBP ( $P<0.01$ ) was the same. In females, RR alone fell significantly ( $P<0.05$ ) after 15 min RNB. After 8 wks RR decrement was more profound ( $P<0.0001$ ) and DBP also declined significantly ( $P<0.01$ ). Similarly, 15 min LNB resulted in significant reduction in RR ( $P<0.001$ ) and HR ( $P<0.05$ ) only. Following 8 wks, of training in LNB, in addition to RR ( $P<0.0001$ ) and HR ( $P<0.05$ ) decrement, SBP ( $P<0.01$ ) and DBP ( $P<0.05$ ) also fell significantly. Both in males and females, GSR did not change significantly ( $P>0.05$ ) either after RNB or LNB (15 min/8 wks). PEFR rose significantly ( $P<0.05$ ) only in females after 8 wks of LNB. The results suggest that there are no sharp distinctions between effects of RNB and LNB either acute exposure (15 min) or after training (8 wks). However, there is a general parasympathetic dominance evoked by both these breathing patterns.

Srivastava, et al., (2005), show that the alternate nostril breathing (ANB) may modulate cardio-respiratory and autonomic functions. However, the studies are scarce and the results are highly conflicting. The present study was conducted in healthy young volunteers comprising males ( $n=20$ ) and females ( $n=20$ ) in range the of 17-22 years. In both groups respiratory rate (RR/min), heart rate (HR/ min), systolic blood pressure (SBP; mm Hg), diastolic blood pressure (DBP; mm Hg), peak expiratory flow rate (PEFR; L/min) and galvanic skin resistance (GSR; microV) were recorded thrice; once as control and then after 15 min (acute exposure) and following 8 weeks of training in ANB (15 min daily). In males the control RR was  $16.60 \pm 2.01$ , HR  $75.75 \pm 11.07$ , SBP- $115.9 \pm 7.33$ , DBP  $70.4 \pm 6.28$  and PEFR  $550.00 \pm 51.50$ . After 15 min of ANB-RR ( $14.75 \pm 1.41$ ,  $P<0.001$ ), HR ( $68.45 \pm 12.41$ ,  $P<0.01$ ) and SBP ( $113.6 \pm 6.04$ ,  $P<0.05$ ) fell significantly. After 8 weeks of ANB training



RR (12.35 +/- 1.35, P<0.0001), HR (63.20 +/- 11.11, P<0.001), SBP (109.5 +/- 5.61, P<0.001), declined to much greater extent and PEFR (571.50 +/- 46.26, P<0.01) rose significantly. In females the control RR was 17.25 +/- 1.89, HR-74.90 +/- 12.85, SBP-106.70 +/- 6.91, DBP-68.70 +/- 5.52 and PEFR-394.50 +/- 44.89. After 15 min of ANB RR (15.05 +/- 1.54, P<0.001) and HR (64.75 +/- 9.80, P<0.001) showed significant decline with concomitant rise in PEFR (407.00 +/- 2.31, P<0.05). Following 8 wks training the decrement in RR (12.60 +/-1.50, P<0.0001) and HR (63.30 +/- 8.65, P<0.001) was maintained. SBP (103.10 +/- 4.92, P<0.001) and DBP (65.8 +/- 5.54, P<0.001) decreased further and PEFR (421.00 +/- 38.51 P<0.001) rose, GSR was unaffected by ANB in both males and females. These results suggest that in general there is a tilt towards parasympathetic dominance by alternate nostril breathing. This breathing may be a useful adjuvant to medical therapy of hypertension and COPD.

Richard P. Brown, et al,(2005)studied Sudarshan Kriya Yogic Breathing in the Treatment of Stress, Anxiety, and Depression Yogic breathing which is a unique method for balancing the autonomic 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 a 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.

Nobuyuki Kawai, et al, (2004) undertook a study entitled Memory in a Chimpanzee Fetus: Learning and Long-Lasting Memory Before Birth. They tested whether a chimpanzee fetus could form an association between an extrauterine tone and vibroacoustic stimulation (VAS) using classical conditioning treatment. Two kinds of pure tone were used as the conditioned stimuli, one where a 500-Hz tone was always followed by a VAS of 80 Hz (110 gal), the unconditioned stimulus (US), and another where a 1000-Hz tone was never followed by a VAS. This treatment was repeated 156 times in total until natural labor at 233 days of gestational age. Behavioral tests on the 33rd and 58th days after birth revealed a differential response to the tones: The infant displayed an exaggerated response to the 500-Hz tone, but not to the 1000-Hz tone. Other naïve chimpanzee infants did not show any response to either tone, which suggests that a chimpanzee fetus can distinguish between tones and form an association, and that it retains such information for at least 2 months after birth.

J. Gavin Bremner, et al, (2002) examined the nature of imitation by infants, at the Department of Psychology, Lancaster University, Lancaster. The issue of whether young infants truly imitate facial and manual gestures has been hotly contested over the past few decades. The reason many workers have been sceptical about the phenomenon is that imitation appears to imply so much about the young individual's

ability to represent others and to make matches between their behaviour and the infant's own behaviour.

David Hartman, et al, (2002), conducted a study entitled Memory Access to our Earliest Influences Abstract: An adult in hypnotherapy can age regress to a pre-episodic childhood experience, e.g., age one or two or the womb, and can nevertheless 'know' certain information about the experience. Commonly, people experience in such regressions that the environment is toxic, or that they are unwelcome, or that their parents wanted a child of the other gender. They know it to be true, without being capable of remembering it. they explored how this phenomenon happens, including the role of implicit-procedural memory and factors influencing memory retention or loss. they review the literature on traumatic memory, and the reliability of hypnotic age regression to pre- and perinatal experience. they assessed documentation that the fetus and neonate do have sentient experience, and that they record the experiences in memory which is accessible later. they review current neurobiology research to trace the way in which early deeply encoded memories persevere over time and profoundly influence behavior in later life. And they consider the implications for psychotherapy with children and adults.

I.W.R. Bushnell, et al, (2001) conducted study on Mother's Face Recognition in Newborn Infants: Learning and Memory. Department of Psychology, University of Glasgow, Scotland, UK Two studies are reported that address issues related to memory for faces in young infants. The first correlates the opportunity to view the mother's face with expressed visual preference for that face, and shows that very little exposure is required, with greater levels of exposure showing stronger preferences. The second study examines the role of delay between exposure to the mother's face

and preference testing, finding that strength of preference is not significantly impacted by a 15-min delay. Implications for a model of face processing are discussed.

Graven, (2000) studied the infants as young as 22 weeks gestation, concerns about the impact of environmental stimulation take on greater importance. The auditory system in the human fetus appears to be developed enough by 23 to 25 weeks gestation to result in fetal physiological reactivity to sound. Background noise levels in the human uterus have been measured over just 50 dB at lower frequencies, with occasional bursts over 70 dB.

Abrams & Gerhardt, (2000), show that the auditory environment of the fetus contains sounds generated by the audible maternal pulse, the borborygmi from digestions, and the attenuated low-frequency sounds (<250 Hz) of the maternal voice and that of outside noise, filtered via the maternal tissue and amniotic fluid.

Lickliter, (2000) revealed that various forms of sensory stimulation appear to have different effects on the organization, structure and functional integration of neural systems and the development of behavioral coordination in preterm infants. The process of early neurological organization might be influenced by both the timing of certain types of stimulation (when in the developmental process they take place) and the nature of the stimulation (how much or what type). For example, it appears that preterm human infants experience earlier than normal visual stimulation, altered types and amounts of auditory stimulation, and reduced levels of vestibular stimulation. While minimal visual stimulation may not result in large changes in neurological structure and function, altering the intensity, timing, and amount of visual stimulation during the perinatal period may have profound.

Philbin, (2000) have shown that unlike the low-intensity, low frequency sound that is present in utero, preterm infants are exposed to mechanical and speech sounds

which are much more variable in pitch, intensity, complexity and regularity the NICU sound environment can potentially lead to hearing loss, difficulties in processing auditory input, difficulty in sleep and state rhythmically, and can influence and disrupt physiological systems, resulting in problems such as apnea and bradycardia. It could also be the case that these atypical, altered auditory experiences might lead to deficits in overall intersensory development.

Telles, Reddy and Nagendra, et al, (2000), evaluated a statement in ancient yoga texts that suggests that a combination of both “calming” and “stimulating” measures may be especially helpful in reaching a state of mental equilibrium. Two yoga practices, one combining “calming and stimulating” measures (cyclic meditation) and the other, a “calming” technique (shavasan), were compared. The oxygen consumption, breath rate, and breath volume of 40 male volunteers (group mean +/- SD, 27.0 +/- 5.7 years) were assessed before and after sessions of cyclic meditation (CM) and before and after sessions of shavasan (SH). The 2 sessions (CM, SH) were 1 day apart. Cyclic meditation includes the practice of yoga postures interspersed with periods of supine relaxation. During SH the subject lies in a supine position throughout the practice. There was a significant decrease in the amount of oxygen consumed and in breath rate and an increase in breath volume after both types of sessions (2-factor ANOVA, paired t test). However, the magnitude of change on all 3 measures was greater after CM: (1) Oxygen consumption decreased 32.1% after CM compared with 10.1% after SH; (2) breath rate decreased 18.0% after CM and 15.2% after SH; and (3) breath volume increased 28.8% after CM and 15.9% after SH. These results support the idea that a combination of yoga postures interspersed with relaxation reduces arousal more than relaxation alone does.

Rhawn Joseph, et al, (1999) revealed that the human brainstem is fashioned around the 7th week of gestation and matures in a caudal to rostral arc thereby forming the medulla, pons, and midbrain. The medulla mediates arousal, breathing, heart rate, and gross movement of the body and head, and medullary functions appear prior to those of the pons which precede those of the midbrain. Hence, by the 9th gestational week, the fetus will display spontaneous movements, one week later takes its first breath, and by the 25th week demonstrates stimulus-induced heart rate accelerations. As the pons, which is later to mature, mediates arousal, body movements, and vestibular and vibroacoustic perception, from around the 20th to 27th weeks the fetus responds with arousal and body movements to vibroacoustic and loud sounds delivered to the maternal abdomen. The midbrain inferior-auditory followed by the superior-visual colliculi is the last to mature, and in conjunction with the lower brainstem makes fine auditory discriminations, and reacts to sound with fetal heart rate (FHR) accelerations, head turning, and eye movements—around the 36th week. When aroused the fetus also reacts with reflexive movements, head turning, FHR accelerations, and may fall asleep and display rapid eye movements. Thus fetal-cognitive motor activity, including auditory discrimination, orienting, the wake-sleep cycle, FHRs, and defensive reactions, appear to be under the reflexive control of the brainstem which also appears capable of learning-related activity.

Sleigh and Lickliter, et al, (1997) examined the effects of substantially augmented prenatal auditory stimulation on the auditory and visual functioning of bobwhite quail chicks. In contrast to the accelerative effects of slightly augmented auditory stimulation found that by greatly increasing the overall amount of prenatal visual/auditory stimulation (regardless of type of stimulus), chicks exhibit interference in the emergence of normal intersensory perceptual development. Specifically,

embryos exposed to greatly augmented prenatal auditory stimulation (40 min/hr) continued to respond to maternal auditory cues into later stages of postnatal development and failed to respond to maternal visual cues at the ages when normally reared chicks typically do. In addition, these chicks exhibited an overall higher level of arousal and higher mortality rates than chicks prenatally exposed to either no or slightly (10 min/hr) augmented auditory stimulation.

Lickliter, & Cooper, et al, (1998)The concept and impact of visual stimulation on the preterm infant has been approached in several different ways. One approach has been to examine the effects of presentation of specific patterned stimulation on preterm infants. Studies like these have typically focused on factors such as the impact of visual frequency and contrast on preterm infants' visual attention, arousal, behavioral organization, or other outcomes, and questions have focused on how infants react to the presentation of specific types of visual stimulation. Another approach has looked at the impact that overall illumination has on preterm infants. The focus of this line of research has not been on the supplemental presentation of specific visual stimulation, but rather what is the impact of the presence or absence of light (illumination level) in the environment on the preterm infant. This approach is typically more concerned with the impact of the opportunity for visual processing on factors such behavioral organization, establishment of sleep-wake states, and processing of other stimulation while in lighted conditions.

Hofer, (1988)Behaviors suggest that a network of maternal 'regulators' is already well established at birth for mammals. Prenatal exposure to maternal auditory stimulation (specifically maternal voice) may therefore contribute to the initial processes involved in developing reciprocal social interaction between the mother and

infant, and (in the case of maternal voice) may facilitate the use of auditory stimulation in emotional and social regulation in the months following birth.

Nancy KL, et al, (1996) The pain and discomfort of labour and birth. JOGNN A study conducted on the effect of breathing and skin stimulation techniques on labour pain perception. Among pregnant women (75% primiparous) the patients were in the 38th to 42nd week of pregnancy, not at high risk and expected to have normal vaginal delivery. They were selected from volunteers by non random samplings. The total samples were 40 cases, with 20 in the experimental group and 20 in the control group. Data were obtained through visual analog scale, inspection form, observation form and postnatal interview form. The study investigator provided information about labour, breathing techniques to the pregnant women assign to the experimental group at the beginning of labour (latent phase). The women received massage and were encouraged to breathe. Study results demonstrated that nursing support and patient-directed education concerning labour and non-pharmacological pain control method including breathing and cutaneous stimulation technique were effective in reducing the perception of pain.

Fifer and Moon, (1995) suggest that the perinatal response to mother's voice is indicative of a model for the effects of early auditory experience on the developing brain of the fetus. In essence, the maternal voice is a consistent, naturally occurring stimulus which is salient during a highly sensitive time period for the neurodevelopment of the fetus, and that there are immediate and enduring effects of this stimulation on the developing auditory system and the newborn's later perceptual and attentional preferences. For newborn infants, the maternal voice acts as a modulator of arousal, working to alert, soothe, calm, or maintain infant state. Newborn infants, both humans and other animals, exhibit differential responses to and



proximity-seeking behaviors to maternal stimuli (such as odor, touch, visual stimulation, and maternal voice).

Anthony J. Decasper, (1994) analysed the infant behavior and development. Pregnant women recited a short child's rhyme, "the target," aloud each day between the thirty third and thirty seventh weeks of their fetuses' gestation. Then their fetuses were stimulated with tape recordings of the target and a control rhyme. The target elicited a decrease in fetal heartrate whereas the control did not. Thus, fetuses' exposure to specific speech sounds can affect their subsequent reactions to those sounds. More generally, the result suggests that third trimester fetuses become familiar with recurrent, maternal speech sounds.

G. Hepper, et,al (1994), examined the archives of Disease in Childhood Development of fetal hearing Previous Research has revealed that the human fetus responds to sound, but to date there has been little systematic investigation of the development of fetal hearing. The development of fetal behavioural responsiveness to pure tone auditory stimuli (100 Hz, 250 Hz, 500 Hz, 1000 Hz, and 3000 Hz) was examined from 19 to 35 weeks of gestational age. Stimuli were presented by a loudspeaker placed on the maternal abdomen and the fetus's response, a movement, recorded by ultrasound. The fetus responded first to the 500 Hz tone, where the first response was observed at 19 weeks of gestational age. The range of frequencies responded to expanded first downwards to lower frequencies, 100 Hz and 250 Hz, and then upwards to higher frequencies, 1000 Hz and 3000 Hz. At 27 weeks of gestational age, 96% of fetuses responded to the 250 Hz and 500 Hz tones but none responded to the 1000 Hz and 3000 Hz tones. Responsiveness to 1000 Hz and 3000 Hz tones was observed in all fetuses at 33 and 35 weeks of gestational age, respectively. For all frequencies there was a large decrease (20-30 dB) in the intensity

level required to elicit a response as the fetus matured. The observed pattern of behavioural responsiveness reflects underlying maturation of the auditory system. The sensitivity of the fetus to sounds in the low frequency range may promote language acquisition and result in increased susceptibility to auditory system damage arising from exposure to intense low frequency sounds.

Als, et al, ( 1982) revealed that historically, the early preterm infants were viewed as inadequate, underdeveloped full-term infants, with nervous systems that were too immature to be greatly affected by the environment or their experiences. However, it is now felt that the preterm infant is an organism well-equipped and adapted for the uterine environment . Indeed, the uterine environment not only provides the fetus with a basic life support structure but is by its very nature a developmental context with limited sensory experiences. That is, the event of early birth thrusts the preterm infant into a vastly different environment than the typical prenatal environment, one in which the infant is ill-prepared to cope with even basic survival tasks. Instead of the 'normal' uterine environment, the preterm infant who ends up in the NICU depends on medical technology and support staff to provide not only life support but also to assist the infant in regulating his/her physiological/behavioral state and environment. With medical advancements that provide the ability to save infants as young as 22 weeks gestation, concerns about the impact of environmental stimulation take on greater importance.

Lotas, (1992), studied the sound levels in the NICU have been found to range from 50 -90, and sometimes as high as 120, decibels (dbs). Decibels are the measuring unit for sound energy. To put these measures in perspective, normal adult conversation is around 60 decibels, a busy street corner is around 80 decibels, and loud thunder around 120 decibels. Much of this ambient noise is associated with the

equipment used in the NICU, voices of staff, and alarms of equipment. In addition, this noise is often constant, with little variation or fluctuation (except for the unpredictability of alarms), and not contingent with any other sensory stimulation. In addition, the ambient decibel level of many incubators can be around 60 db.

Madanmohan, et al., (1992), studied the effect of yoga training on visual and auditory reaction times (RTs), maximum expiratory pressure (MEP), maximum inspiratory pressure (MIP), 40 mmHg test, breath holding time after expiration (BHTexp), breath holding time after inspiration (BHTinsp), and hand grip strength (HGS). Twenty seven student volunteers were given yoga training for 12 weeks. There was a significant ( $P < 0.001$ ) decrease in visual RT (from 270.0 +/- 6.20 (SE) to 224.81 +/- 5.76 ms) as well as auditory RT (from 194.18 +/- 6.00 to 157.33 +/- 4.85 ms). MEP increased from 92.61 +/- 9.04 to 126.46 +/- 10.75 mmHg, while MIP increased from 72.23 +/- 6.45 to 90.92 +/- 6.03 mmHg, both these changes being statistically significant ( $P < 0.05$ ). 40 mmHg test and HGS increased significantly ( $P < 0.001$ ) from 36.57 +/- 2.04 to 53.36 +/- 3.95 s and 13.78 +/- 0.58 to 16.67 +/- 0.49 kg respectively. BHTexp increased from 32.15 +/- 1.41 to 44.53 +/- 3.78s ( $P < 0.01$ ) and BHTinsp increased from 63.69 +/- 5.38 to 89.07 +/- 9.61 s ( $P < 0.05$ ). Our results show that yoga practice for 12 weeks results in significant reduction in visual and auditory RTs and significant increase in respiratory pressures, breath holding times and HGS

Raghu Raj, et al,(1996) conducted study to determine whether breathing through a particular nostril has a lateralized effect on hand grip strength. 130 right hands dominant, school children between 11 and 18 yrs of age were randomly assigned to 5 groups. Each group had a specific yoga practice in addition to the regular program for a 10 days yoga camp. The practices were: (1) right, (2) left, (3)

alternate- nostril breathing (4) breath awareness and (5) practice of mudras. Hand grip strength of both hands was assessed initially and at the end of 10 days for all 5 groups. The breath awareness and mudra groups showed no change. Hence the present results suggest that yoga breathing through a particular nostril, or through alternate nostrils increases hand grip strength of both hands without lateralization.

## **2.2. SUMMARY OF LITERATURE**

The investigator has collected all the reviews related to pranayama practices, music and relaxation practices on selected Visual Recognition memory, Auditory Perception, Tactile Perception and Intermodal Perception variables from the Libraries of Tamil Nadu Physical Education and Sports University, Bharathidasan University, Anna Centenary Library and Annamalai University libraries from the internet to provide sufficient knowledge to the readers and for the effective analysis of the present study.

The reviews are presented under three sections namely studies on Pregnancy in yoga (pranayama) (n=14), auditory variables in prenatal (n=15) and infant behaviour in prenatal stimulation (n=15)

All the research studies that are presented in this section prove that pranayama practices and auditory stimulation contribute significantly for better improvement in all the criterion variables. Research studies using pranayama practices revealed compatible results from Jan G. Nijhuis ,et,al(2009), Tekur P, et.al, (2010) and Madanmohan, et al., (1992). There was clear evidence that the use of pranayama practices were one of the effective training methods to improve the selected criterion variables on Infant Behaviour.

Research studies using therapeutic exercises revealed compatible results from Lisa M. Oakes,et,al(2013), Graven,et,al( 2000), Lisa Skedung,et,al (2013),

Wiley, et,al (2003) and Alan Slater,et,al (2007),. The current study created Auditory exercises programme to determine its effectiveness as a tool for selected pVisual Recognition memory, Auditory Perception, Tactile Perception and Intermodal Perception variables among Infant Behaviour.

The review of literature helped the researcher from the methodological point of view too. It was learnt that most of the research studies cited in this chapter show that analysis and experimental design as the appropriate methods for finding out the foundation and main ingredient for future research and investigating in training methods for changing the Visual Recognition memory, Auditory Perception, Tactile Perception and Intermodal Perception variables.