10.1 GENERAL

The appraisal of the research work in this doctoral thesis is presented under the following headings:

1. Summary of the findings
2. Implications and applications of the study
3. Limitations of the study
4. Suggestions for future studies

10.2 SUMMARY OF THE FINDINGS

In the present study twenty-nine male volunteers (age range from 20 to 45 years) were each assessed in five sessions. These were (i) right-, (ii) left-, and (iii) alternate-nostril yoga breathing (i.e. (i) sūryānuśāla viloma, RNYB, (ii) candrānuśāla viloma, LNYB and (iii) nādiśuddhi, ANYB respectively), (iv) breath awareness (BAW), and (v) non intervention (CTL).

The background for the present study were previous findings that unilateral yoga breathing influences (i) performance in cognitive tasks with a contralateral effect and (ii) middle auditory evoked potentials were influenced ipsilaterally.

In the present group of volunteers at the beginning and the end (and in some cases during) of the practice the following assessments were made:

i. P300 event related potential

ii. Long latency auditory evoked potentials
iii. Verbal and spatial memory delayed recall task

iv. Hand grip strength

For each of the variables the data was analyzed separately using repeated measures ANOVA followed by post-hoc analysis. The summary of the findings is as follows:

Following SAV P300 peak latency reduced on the left side supporting the idea of enhanced performance in this attentional task contralaterally. Long latency auditory evoked potentials on the other hand supported the idea of an ipsilateral change in evoked potentials with the decrease in the peak latency in the N2 component during CAV. The N2 component corresponds to neural activity in secondary auditory cortices and is influenced by attention, stimulus variables such as probability, modality and intensity. The results of the verbal and spatial memory scores were similar to earlier studies showing an increase in spatial memory scores after left nostril yoga breathing in this delayed recall memory task. Hand grip strength showed a decrease in left hand grip strength supporting the idea that left nostril dominance corresponds to rest phase of the BRAC.

10.3 IMPLICATIONS AND APPLICATIONS OF THE STUDY

The present findings have shown that cognitive and attentional tasks are facilitated contralaterally though this kind of change of seen only following right nostril yoga breathing, whereas the speed of processing auditory information, based on auditory evoked potentials appears facilitated ipsilaterally. Hence it appears that simple processing and relay of sensory information is facilitated ipsilaterally whereas more complex and
cognitive tasks are facilitated contralaterally by uninostril yoga breathing. These findings have possible applications in

I. Education

II. Specific occupations

III. Health care

I. Education: Most systems of education place an emphasis on left hemispheric activity. Hence any practice which facilitates right hemispheric activity may be useful.

II. Specific occupations: Certain occupations require left hemisphere attributes such as logic and analysis. For example these are required in mathematics, science and in the contemporary situation, in the development of software. In contrast other occupations require right hemispheric qualities like aesthetic appreciation. This may be seen in occupations associated with music, art and even in computer graphics and animation. Hence, possibly these specific yoga breathing practices may be selectively used in the specific occupations for benefit.

III. Health care: It is that known that some diseases affect one hemisphere more than the other. Examples of this are schizophrenia (affecting the left hemisphere), obsessive compulsive disorder (also affecting the left hemisphere) manic depressive psychosis (possibly, affecting the right hemisphere). Hence these uninostril yoga breathing practices may be usefully applied in these disease conditions.

10.4 LIMITATIONS OF THE PRESENT STUDY

1. One of the main limitations of the study was that cognitive tasks, whether the P300 which is a neuroelectric phenomenon and an event related potential or more simple paper
and pencil tasks (e.g., the memory task) were recorded before and after but not during the practice. That is because during the yoga breathing the participants would have found it impossible to do the respiratory maneuvers during the task. This is particularly the case as yoga breathing requires the dominant hand to occlude the nostril. In studies of unilateral forced nostril breathing where one nostril with a cotton plug this problem is not seen.

2. Each participant had to come to the laboratory 30 times each. This was laborious and difficult in terms of compliance of the participants.

3. Attempting to understand which parts of the brain are altered during the practice using evoked potentials is not the ideal method. This is because any sensory evoked potential gives information about changes in neural relay centers along that pathway specifically; in this case it was the auditory pathway.

10.5 SUGGESTIONS FOR FUTURE WORK

1. Given the limitations of sensory evoked potentials mentioned above further studies should include neuro-imaging techniques with proper consideration about how to reduce any artifacts associated with or during yoga breathing.

2. Also future studies could be planned to asses the applications of uninostril yoga breathing in education, specific occupations, and in the management of diseases.