# APPRAISAL OF THE STUDY

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8.0 APPRAISAL

To understand the limitations of the present study as well as to get insight into new ideas for future research a critical review of the work done has been made. This has been presented under the following headings:

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

8.1 SUMMARY OF THE FINDINGS

The present study was conducted on sixty healthy male participants with ages ranging from 18 to 31 years (group average age ± S.D., 22.8 ± 2.7 years). They were studied in four sessions, viz., cañcalatā, ekāgratā, dhāraṇā and dhyāna. Each session consisted of Pre (5 minutes), During (20 minutes) and Post (5 minutes) states. Mid-latency auditory evoked potentials (MLAEPs) were recorded in the pre, during and post states whereas performance in the attentional tasks was studied before and after ekāgratā and dhāraṇā session. Visual analog scales to measure the ability to follow guided instructions were given immediately after the practice of all four sessions.

For each of the variables the data were analyzed separately using repeated measures ANOVA followed by post-hoc analyses. During dhyāna, latencies of two
MLAEPS components, the Na and Pa waves were prolonged, suggesting that auditory information transmission at the level of the medial geniculate and primary auditory cortex was delayed.

The present study also showed significant improvement in all measures of the d2 test of attention [TN (total number of items processed), E (errors), E% (percentage of errors), TN-E (total performance), and CP (concentration performance)] after dhāraṇā and ekāgratā. However, the performance in the digit symbol substitution test was better after dhāraṇā but did not change after ekāgratā. Dhāraṇā and ekāgratā produce nearly comparable results (in the digit symbol substitution test performance) though dhāraṇā results in better incidental learning and better accuracy.

The subjective assessment to follow the guided instructions showed that, dhāraṇā is the most difficult state compared to cañcalatā, ekāgratā and dhyāna states.

8.2 CONCLUSION

The present study showed an increase in the peak latency of Na and Pa waves during dhyāna which suggests an increase in information processing time at the level of medial geniculate and primary auditory cortex. In contrast, following dhāraṇā there was an improvement in performance on all measures of the d2 test of attention (TN, E, TN-E, E%, and CP) and in the digit symbol substitution test. The results suggest that, dhāraṇā (meditative focusing) is associated with better attention, incidental learning, and better accuracy. Subjective assessment about the ability to follow guided instructions showed that, dhāraṇā is the most difficult state compared to the cañcalatā,
ekāgratā and dhyāna states. Hence this also shows that dhāraṇā and dhyāna are two distinct and different meditative states.

8.3 IMPLICATIONS AND APPLICATIONS OF THE STUDY

In the present study, the prolonged latencies of the Na and Pa waves suggest slowing of auditory information transmission at mesencephalic–diencephalic levels and at the level of the primary auditory cortex. Increase in latency is correlated with the activation of inhibitory mechanisms in cortical areas within the auditory pathway. GABA is a well-known inhibitory neurotransmitter in the central nervous system. The implications of a study on yogasana were that GABA may be mediating some, if not all, of the beneficial effects of yoga on mood and anxiety (Streeter et al., 2007; Streeter et al., 2010). The present results cannot be directly compared to these studies, as meditation differs from yoga postures. However, the mental state during yoga posture is ideally the same as in meditation. The practice of dhyāna may be useful in treating anxiety and mood disorders.

The present study also showed, better incidental learning and better accuracy (based on the digit symbol substitution test performance) after dhāraṇā. The practice of dhāraṇā is helpful in improving incidental learning and better accuracy. Hence, dhāraṇā may be helpful for slow learners, mentally challenged persons with various types of disorders, attention deficits and attention-deficit hyperactivity disorder (ADHD).
8.4 STRENGTH OF THE STUDY

The present study evaluated the psychophysiological changes following cañcalatā, ekāgratā, dhāraṇā and dhyāna using mid-latency auditory evoked potentials and performance on attentional tasks in sixty participants. In this study meditation has been studied in two separate meditative states based on the descriptions from the yoga texts. The findings revealed that dhāraṇā and dhyāna are different and distinct meditative states, hence they produce different results. This may explain the differences found in earlier meditation studies and shows the importance of taking descriptions from traditional texts.

8.5 LIMITATIONS OF THE STUDY

The main limitation of the study was that, there was no way to be certain that the participants were in cañcalatā, ekāgratā, dhāraṇā and dhyāna states, except for their self-reports and reports of the teacher. Another limitation is that it was also not possible to rule out that participants fell asleep during recordings despite CCTV monitoring and reviewing the raw electroencephalogram (EEG) trace. The performance in attentional tasks was studied only in dhāraṇā and ekāgratā which is a limitation of the study.

8.6 SUGGESTIONS FOR FUTURE STUDIES

The limitations of the present study may be corrected in future studies if a reliable physiological marker for the four mental (cañcalatā, ekāgratā, dhāraṇā and dhyāna) states is found. Also, it would be helpful if the EEG is recorded throughout, along with
the eye movements and muscle tone to rule out sleep episodes and to assess the
electrical activity of the brain. Studying performance in attentional tasks during all
four states along with autonomic variables may give more information. In order to get
the more conclusive idea about the cortical activity, function magnetic resonance
imaging (fMRI) could be used. The clinical application of dhāraṇā and dhyāna may be
studied.