SUMMARY AND CONCLUSIONS

The ASHA task force (1985) defines central auditory processing as the auditory system mechanism and process responsible for sound localization, lateralization, auditory discrimination, auditory pattern reorganization, temporal resolution, temporal masking, temporal integration, temporal ordering, and auditory performance decrement with degraded acoustic signals. Central auditory processing disorders are defined as deficiencies in any one or more of these behaviors.

Various studies have been conducted to study the effect of these perceptual training. Merzenich, Johnston, Schrenier, Miller & Tallal (1996) (Cited in Veale, 1999) & Tallal et al. (Cited in Veale, 1999) have described the positive effects of computer based games that train to modify temporal processing deficits in these children. Merzenich et al (1996) (Cited in Gillam, 1999) claimed that these studied strongly indicate that the fundamental temporal processing deficits can be over come by training. The concept of auditory training to stimulate auditory related problems dates back to pre-medieval times (Musiek & Berge, 1988). Initially auditory training was used to enable hearing impaired individuals make maximum use of their residual hearing. However since 1960 it has been used in the rehabilitation of individuals with CAPD.

There are number of computer based training material like Captain’s Log Personal Trainer, Earobics, Fast-forward, Laureate Special needs software, and Lindamood Bell. Only Earobics (Cognitive Concepts Inc., 1997-2000) and Fast Forward: (Scientific learning Corporation, 1998) are widely used. There are reports widely available only about the Earobics and Fast-forward program. And all the
programs are in English and can be used with western population only. So this successful attempt has been made to develop a computer based training material in one of the Indian Language (Kannada).

Looking into the prevalence data for APD even though it is sparse it is high. In India, the percentage of children found to have dyslexia ranges from 3% (Ramaa, 1985) to 7.5% (Nishi Mary 1988) (Cited in Ramaa, 2000). Ravanant & Rajalakshmi (2004) estimated 7 to 8% prevalence of Auditory processing disorders in school going children in the age range of 8 to 12 years in India. Hurley & Singer (1989) states that, the number of children with APD within the population of learning disability cannot be stated with any certainty or accuracy. It is likely to be very high. The difference in the findings is probably due to the method used to determine the presence of the problem. Most often these children go unidentified as they drop out of school because of poor academic performance. It can be noted it is quite high in India. It is estimated to be nearly 7 to 8% in the school going children in the age range of 8 to 12 years (Ravanant & Rajalakshmi 2005). Thus, the newly developed tool will be very helpful to manage children with APD as soon as they are identified.

The objectives of the present study were to develop computerized training modules in Kannada language for Auditory integration and Auditory separation aspects of auditory processing disorder and to check the efficacy of the developed therapy program. A total of 34 subjects with auditory processing disorder participated in the study. The diagnosis was based on the results of series of tests to identify central auditory processing disorder (CAPD). Based on the type of auditory process impaired, the subjects were classified into three groups. Group 1 consisted of 9 Subjects with difficulty in auditory separation task, Group 2 comprised of 11 subjects
with difficulty in auditory integration task and the remaining 14 subjects who exhibited difficulty in both auditory separation and auditory integration tasks formed the third group. The subjects from these three groups were randomly selected and sub-classified into experimental and control group. The experimental subjects from the respective groups received therapy using the newly developed computerized training modules in the specified tasks, whereas the control group subjects were not given any therapy. All the subjects knew to read and write Kannada and they were attending school. All the subjects who attended the therapy program were aware about their problem and they were highly motivated to undergo treatment.

Every subject was evaluated initially with The Auditory Processing Screening Checklist - Teachers/Parents (Rajalakshmi & Gopi Sankar, 2003). Those subjects who failed the checklist were administered the CD version of Dichotic Digit Test (DDT) developed in Audio lab version –II (Regishia, 2003). The CD version of Pitch Pattern Test (PPT) developed in Audio lab version –II (Shivani, 2003). The CD version of Competing Sentence Test (CST) developed in Audio lab version –II (Ravanan & Rajalakshmi, 2004). Based on the test scores the children were diagnosed as children with Auditory processing Disorders (APD). Based on the test score they were classified as children with auditory separation deficit or auditory integration deficit or both. Volunteers from the subjects who failed the test were taken as experimental group children and given deficit specific therapy.

Here in this study the target set forth was improvement of auditory processing skills and maintaining it. Results were represented in the tabular form and standard graphical representation for each process worked, separately and discussed.
In the present study two processes were focussed and worked on. These were auditory separation or auditory integration or both combined. These two processes are considered to be the most important activities a child faces to in his/her daily life, so these two activities were concentrated on and worked on. Five subjects underwent therapy for auditory separation activity, six subjects underwent therapy for auditory integration and seven subjects underwent therapy for both the activity. All the subjects who attended therapy were highly motivated and they were regular in their therapy. The subjects underwent therapy for thirty sessions. Assessment was done on the first day which formed the baseline score for the subjects. Assessment was done for all the subjects with the same tests on fifteenth day, thirtieth day, and after two months after cessation of therapy.

From the scores it is evident that, the subjects who underwent therapy for auditory separation activity improved by therapy and they were also able to maintain the scores even after cessation of therapy.

From the scores of the subjects who underwent therapy for auditory integration it is evident that there is good improvement in the subjects, who underwent training for auditory integration task and they were also able to maintain the scores even after cessation of therapy.

From the scores of the subjects who underwent therapy for both auditory integration and auditory separation task, it is evident that subjects who underwent training with the newly developed training modules for both auditory integration & auditory separation deficits, showed good improvement and they were also able to maintain it even after the cessation of therapy.
Conclusions

1. Present study indicated that there is very good improvement in the subjects who underwent therapy with the newly developed computerized training modules in Kannada language for auditory integration and auditory separation aspects of auditory processing disorder. This also shows us that if deficit specific therapy is given, based on the processes affected there will be very good improvement.

2. The present study also indicates that if systematic and a well planned therapy is given with computer based material and with interactive games the child is able to maintain the improvement over a period of time without any deterioration in the newly improved skills even after the cessation of therapy.

Suggestions for future research

1. More studies on similar lines if carried out will confirm the results.

2. This is an experimental design if carried out with larger population for a longer period emphatic results may be obtained.

3. The use of many more test in the test battery are likely to be useful in the choice of the treatment.

4. Since electrophysiological measures are also proved to be of importance in the study of children with learning disability and in children with auditory processing disorders it can also be used for evaluation and for monitoring the progress in any given subject.

5. Studies can be undertaken with subjects having APD and treatment given for more longer duration, till the child is able to overcome the problem fully and the scores improves to the normal level. It can also be studied if the child is able to maintain the improvement over time.
6. Computerized training modules can be developed to tackle other auditory processing aspects as memory, sequencing etc.

7. Since India is a multilingual country computerized training modules can be developed in other languages.

8. Further, personal computers are now-a-days widely available in schools in India, hence if such computer interactive programs are developed in other languages it would be very helpful for the children to overcome their problem.