

Abacus-A Tool for Memory

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ABSTRACT

In case of a mental abacus, representation of a number requires the tracking of the beads and representing the identity and precise location of each bead is necessary not only for identifying values, but also for performing arithmetic computations. N-Back test was for visual assessment there is an improvement in memory in abacus learners, which is significant (p value-0.000). Similarly, to assess auditory memory for numerical tasks, digit span forward test was used, which primarily taps short-term memory. Which when auditorily presented, it can be noted that there is also a significant improvement (p value-0.000) in memory in children undergoing abacus training than children who do not. This highlights that there is a significant improvement in the memory for numerical tasks that are presented both visually and auditorily.

Key words: Arithmetic computation, Abacus, Numerical task.

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INTRODUCTION

Until numbers were invented and put into use, the only option were counting devices, which was used for day today calculations and then came, abacus which was invented to help in counting large numbers. Abacus helps people keep track of numbers while they do the computing [1-2]. The SOROBAN, the Japanese abacus which was the first invented one. While being trained in the usage of abacus, the abacus learner tries to analyse and solve the verbal, numerical and spatial tasks that are presented to them in form of visual and auditory stimulus. Hence this study aims to evaluate the effect of abacus training on short-term memory and working memory in children who are undergoing abacus training.

METHODOLOGY

Study design

Out of those 120 children, 100 children were undergoing abacus training in UCMAS abacus training centre in various parts of Chennai, and the remaining 20 children were not exposed to abacus training till then.

Inclusion criteria

Children with RCPM percentile IQ score of 2:25 percentile and those who were undergoing abacus training (levels I-V) at the time of the study, between the age 7-11 years of both the sex were included in the study.

Exclusion criteria

Children with Raven's coloured progressive matrices IQ score of <25 percentile and those who were not regular to the class were excluded. Further children with H/o medical/surgical illnesses, hearing/visual problems, epilepsy, delayed developmental milestones, learning disabilities were excluded from the study.

The study population of 120 children were divided into 6 groups.

The Raven's Coloured Progressive Matrices test measures a child's capacity to apprehend meaningless figures that are presented for observation, see the relationship that exists between the set of figures, and complete the sequence of the sets by a systematic method of reasoning then in the assessment of IQ, children were at first divided into group of 6. They were administered the test book, and the instruction was given in the local language to them to do the test.

N-Back Test is a kind of assessment in which the child must raise hands if they identify any number that repeats itself in alternate fashion. Free Recall (AMVT) is the next test for auditory memory. In this test the examiner reads out a series of 15 words, and the subject is requested to immediately recall the possible number of words.

Cueing task (AMST)

In which each trial begun with a series of auditory cues which is presented through the headphones. The child must remember the sequence in which it was presented and will answer accordingly. The sequence started with 3 cues in the first trial. The scores are given as number of correct responses/maximum number of cues in the trial.

RESULTS

The visual and auditory memory for verbal, numerical and spatial tasks for levels 0, I, II, III, IV, V. There was a significant improvement in both the visual and auditory memory for numerical and spatial tasks (p value < 0.001) compared to verbal tasks, also there was improvement in the working memory as well and also there is an improvement in the visual memory for verbal tasks among the abacus learners, though not statistically significant. The visual memory for numerical tasks among all the study groups. The linear trend line implies that there is an improvement in the visual memory for numerical tasks among the abacus learners and there is a decline in the auditory memory for verbal tasks among the abacus learners.

The working memory all the study groups says that there is a linear trend line implying an improvement in the working memory among abacus learners, which is statistically significant. When comparing the visual and auditory memory for numerical tasks among all the groups in abacus learners there is an improvement in both visual and auditory memory, and the line diagram clearly depicts that auditory memory is better than visual memory for numerical tasks and no significant difference exists in the parameters between male and female abacus learners.

DISCUSSION

There is an improvement in memory among abacus learners than non-abacus learners. Abacus training results in significant improvement of the visual and auditory memory for both the numerical and spatial tasks than for verbal tasks [3-7]. Improvement in the auditory memory is much more pronounced than the improvement in visual memory. There is a significant improvement in the working memory as well. However, the improvements in the respective domains were noted right from the first level of abacus training that is right from the acquisition of the skill. With higher levels even though the improvement is observed. It is not much marked. Positive correlation was observed in the parameters among numerical tasks and spatial tasks, and as well as among spatial tasks and working memory, that highlights the interdependent processing of the tasks by the brain [8-10].

CONCLUSION

Based on observation, we would prefer to conclude, that Abacus training in children tends to improve visual and auditory memory by rapid processing of information, associating the information with cues and efficient retrieval from the long-term memory, which are all possible by the utilization of the 'mental abacus', which is processing of the information in the 2-dimensional space using visual spatial capabilities of the brain.

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ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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