UCMAS
EDUCATION WITH A DIFFERENCE

Synopsis of research done on students of Mental Abacus

SUMMARY

UCMAS is an abacus training program that utilises mental arithmetic training with the purpose of enhancement of various cognitive skills such as memory, attention, perception, motor skills etc. Multiple researches have been conducted on users of the mental abacus internationally, the most comprehensive of which were conducted on UCMAS students in Gujarat by teams of researchers from universities like Harvard, Stanford, California University and MIT.

The research showed that while the users exhibited astonishing calculating abilities, the mental representations formed were a result of redeployment of pre-existing visual resources. Further research conducted on school students in an economically backward area displayed that mental abacus expertise can be acquired in a large classroom setting, though the extent of expertise and performance is dependent on the pre-existing cognitive abilities.

Separate research conducted on students in Sudan resulted in a net gain of 7.11 IQ points in the group that received abacus training. Previous researches on intelligence have shown that the intelligence levels of backward economies like Sudan are drastically lower than developed economies like Britain. The initial scores of the Sudanese children were an approximate 12th percentile to that of British children of the same age group (difference of 17 IQ points). Thus the study shows that intelligence of children will improve by placing greater emphasis on problem solving skills in school.

In conclusion, abacus training is a legitimate brain-training program and its effects are transferred to daily life with core areas like memory, attention being the targets.

UCSD HARVARD STANFORD PAPER

Historically, devices like the Asian and Japanese Soroban abacus have been used to perform calculations.

The Asian abacus (used by UCMAS students) represents number via the arrangement of beads into columns, where each column represents a place value that increases from left to right. Moving the beads toward the dividing beam makes them count towards the total number represented.

The research sought to investigate how **MA representations could override the limitations of cognitive systems like the Approximate Number System (ANS)** and **Understanding how nonlinguistic visual resources can support the representation of large exact numerosities.**

Three hypotheses were formed and their validity examined via various MA based experiments.

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HYPOTHESES

1. Perceptual Sharpening- Improvement in astuteness of ANS
2. Perceptual Chunking- Efficient processing of information in 'chunks'
3. Perceptual Redeployment- Storage of each column of the abacus as a separate model

EXPERIMENTS

1. Rapid addition – Summation of addends
2. Flashcard reading – Identical, rotated, bead only abacus and random dot arrays
3. Untrained adult students perform same tasks

RESULT

From the data collected from the experiments from both the participant groups and its analysis on various parameters such as coefficients of variation and reaction time graphs, the Perceptual Redeployment hypothesis holds true. MA representations are formed by redeployment of preexisting visual resources and columns of the abacus are stored a separate models in working memory.

SUDAN RESEARCH

The effects of abacus training on mental computation and intelligence were assessed by the means of Standard Progressive Matrices (SPM). SPM are used to measure fluid intelligence visual abilities, non-verbal reasoning and intelligence factors.

Intelligence is a determinant of a number of desirable outcomes in everyday life, including educational attainment, earning, health and longevity.

EXPERIMENT

- 3185 pupils from rural Khartoum state were divided into 2 groups (Experimental and control) on bsis of age, sex and urbanisation.
- IQ of the groups were tested with SPM
- Experimental group given abacus training which consists of training in mental processes used for solving cognitive problems. However, abacus training does not provide direct training on solution of progressive matrice problems.
- IQ of groups tested again at the end of the experimental training.

RESULT

Initially, the difference between the IQ scores of the experimental and control groups was negligible. However, after abacus training it was found that there was a net gain of 7.11 IQ points in favour of the experimental group. Thus the effect of abacus training is to increase the scores and decrease the time taken for test completion.

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ZENITH RESEARCH

Users of the mental abacus perform astonishing feats of mental arithmetic. The research aimed to discover whether Mental Abacus expertise can be achieved by large numbers in a K 12 classroom setting and produce benefits for a broad range of students and whether MA expertise is the product of changes to basic cognitive capacities.

HYPOTHESES FORMED TO ANALYSE THE QUERY

- Cognitive Transfer: MA expertise results from changes in children's ability to create and manipulate structures in visual working memory.
- Cognitive Moderation: MA exploits pre-existing abilities and expertise arises in individuals with strong spatial working memory abilities.

EXPERIMENT

Experiment group- received 3 hours MA training Control group- received 3 hours of supplementary practice of mathematics curriculum.

Both groups were tested over a period of three years by a battery of computerized and paper-based tasks. The experimental group was administered paper and pencil tasks to test their abacus abilities.

RESULT

MA group showed a significant advantage across a range of arithmetic tasks relative to controls, but that MA training was not associated with differential gains in mental rotation, working memory, or approximate number abilities. Instead, children's spatial working memory at the beginning of the study mediated their ability to learn MA and reap its benefits. The conclusion was that MA expertise can be achieved by many children in a standard classroom setting, and that it results from efficient use of pre-existing abilities, rather than from changes to basic cognitive abilities.