

ABSTRACT

Background: Removing math phobia and stress is a challenge for teachers and educators anywhere across the globe. Many students develop stress and Math Anxiety early in life due to inefficient learning environments. Breathing patterns of growing students change under high stress and test anxiety and they become inactive during teaching and learning process. Disturbed working memory, cognitive skills and Math Anxiety affect math performance. Students develop emotional imbalances and aggression. Such imbalances may magnify during their higher education causing serious damage to their personality in general and career in particular. In such scenario any alternative strategies to reduce Math Anxiety and aggression, to improve cognitive skills and mindfulness play major roles in building a healthy personality and also in deciding a student's career by influencing their subject results.

'Vedic Mathematics' by the late Śāṅkarācārya of Purī uses patterns in school mathematics, which benefit teaching, empower students with the feeling "I can", and reducing Math Anxiety. Prāṇāyāma may assist emotion regulation, managing anxiety and working memory, directly benefitting cognitive faculties. Establishing the efficacy of Prāṇāyāma and Vedic Maths methods is the need of the present competitive education system.

Aims and Objectives: To evaluate the effectiveness of Vedic Maths and Yogā Prāṇāyāma in the management of Math Anxiety and development of cognitive skills in school children, further assessing results in terms of average exam marks, % of passes, 100% etc.

To measure the changes in Math Anxiety, cognitive flexibility, mindfulness, aggressiveness, emotion regulation, and working memory of students after the Vedic Maths and Prāṇāyāma practices.

To report the changes in student's Board Examination results conducted and evaluated by Pre University Board, after giving training in Vedic Maths and Prāṇāyāma.

Methods

Study 1: (Pilot Study)

Participants: 40 Resident students of 8th, 9th and 10th at Sri Sai Angels School Chikkamagaluru.

Design: 3 group pre-post design. Students were randomly assigned to 3 groups: Yogā Prāṇāyāma (13), Vedic Maths (14) and Jogging (13). Variables were assessed before and after the seven days workshops.

Assessments: Math Anxiety (MARS-R Math Anxiety Rating Scale Revised), Working Memory (Digit Span), Self-defeating and self-enhancing cognitions associated with performance and anxiety when faced by a test (CCAQ - Children's Cognitive Assessment Questionnaire), Cognitive flexibility, Creativity, and reaction to cognitive stress (STROOP)

Studies 2 & 3: Student participants were randomly assigned to three groups, Yogā Prāṇāyāma, Vedic Maths and Controls. Study 2 used Prāṇāyāma and Vedic Maths workshops for 15 days; Study 3 used three different classes randomly assigned to three groups. Two workshops went for 15 days. Data were collected pre and post intervention.

Math Anxiety, Working Memory, CCAQ, STROOP, Mindfulness, Aggression, Emotional Regulation and Reaction time were assessed.

Final exam results analysis: Performance on PU Board final exams Mathematics results of two batches were analyzed in detail and compared to those in physics and chemistry.

Intervention:

The Yogā Prāṇāyāma group practiced Kapālabhāti, Sectional Breathing, Bhastrikā, Sūrya Anuloma, Candra Viloma, Nāḍī Śuddhi and Bhrāmarī over a 30 minutes time period, allowing 5 minutes time for each.

After each allotted 5 minute time period, the group was instructed to start performing the next technique. Each workshop ended with Bhrāmarī Prāṇāyāma.

Participants of Vedic Maths group solved problems for 30 minutes each day after learning different Vedic Maths techniques using Sūtras ‘vertically and crosswise’, ‘transpose and apply’, ‘addition and subtraction’ etc. Vedic Maths group learned skills in Speed Multiplication, Squaring and Cubing Numbers, Multiplication of Algebraic Expressions, Solving Unique Algebraic Equations, Solving Simultaneous Equations, Solving Quadratic Equations, HCF of Equations, Partial Fractions, Problems from Differential and Integral Calculus, Conics, Straight Lines, Determinants, and Binomial Expressions.

Subjects in Study 1 Control Group went for jogging during pilot study.

Subjects in Control Groups in Studies 2 and 3 attended their regular conventional maths classes.

Results

Overall findings were that reduction in Math Anxiety was highest in the Vedic Maths groups while improvement in cognitive skills was highest in Yogā Prāṇāyāma groups. Yogā Prāṇāyāma practices stimulate thinking patterns improving cognitive skills, and mental processes increasing competitive success. Vedic Maths improves pattern finding skills; they may therefore stimulate mirror neurons and endorphin release. The joy element brought by this could be the reason for reduction in Math Anxiety. More research is needed to determine relative effectiveness of Yogā Prāṇāyāma and Vedic Maths methods.

Conclusions

Yogā Prāṇāyāma methods are effective in enhancing cognitive skills in school students. Vedic Maths methods used along with conventional mathematics teaching is effective in reducing Math Anxiety and improving cognitive flexibility.