



Clinical Research

Effects of *Medhya Rasayana* and *Yogic* practices in improvement of short-term memory among school-going children

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Abstract

Excellent memory, extraordinary intelligence, great academic achievement, and successful career are the dreams of every individual in this era of competition and professionalism. A good memory power acts as a catalyst in all walks of life, be it academic success or maintenance of personal relationships. It is observed that an average man uses only 10% of his natural memory. Remaining 90% is left unused in a haphazard manner. As per the American psychologist Carl Emil Seashore, if one is alert and makes systematic attempts to awaken and use the natural memory properly, his/her natural memory would be activated creatively and would offer benefits of higher order. A comparative study was conducted comprising 90 subjects to know the efficacy of *Medhya Rasayana* and *Yogic* practices in short-term memory of school-going children. The study was conducted over a period of 3 months. It was an open, prospective, and randomized clinical study. The subjects of group A formed the control group and they were observed silently for 3 months without any intervention. The subjects in group B were administered with *Choorna* (powder) of four *Medhya Rasayanas*, *Mandukaparni* (*Centella asiatica* Linn.), *Yashtimadhu* (*Glycyrrhiza glabra* Linn.), *Guduchi* [*Tinospora cordifolia* (Willd.) Miers ex Hook. f. and Thoms.], and *Sankhapushpi* (*Convolvulus pluricaulis* Choisy), at a dose of 2 g twice daily with milk. Subjects belonging to group C were advocated regular *Yogic* practices of *Asanas*, *Pranayama*, and *Dhyana*. Further study revealed that among the three groups, group B treated with *Medhya Rasayana* showed highly significant and most effective changes with respect to objective parameters in the tests, i.e. (1) short-term memory test pictures and (2) serial recall effects test using memory scope. Among the three groups, group C treated with *Yogic* practices showed highly significant and most effective changes with respect to subjective and objective parameters in mini mental status scale i.e. test 3. The treatment is cost effective and devoid of side effects, which can be beneficial for the community. Mean increase after first follow-up in group B was higher as compared to group C. This shows that *Medhya Rasayanas* are quick in action and bring about improvement in memory faster when compared with *Yogic* practices. So, on the whole, group B can be considered to be the most efficient among the three groups.

Key words: *Medhya Rasayana*, school children, short term memory, *Yogic* practices

Introduction

In the present era, individuals are overloaded with stress, tension, anxiety, and lack of sleep, which adversely affect the memory of most individuals. It is very common even in children. The prevalence of attention-deficit hyperactivity disorder (ADHD)

among children of age group 11-17 years was 2.1%, anxiety disorders was 6.9%, and depression was 2.1% in the US in 2007.^[1] Also, the prevalence of overall mental illnesses is 12.5% in 0-16 year age group, prevalence of anxiety disorders in developed countries is on an average 8% (2-24%) and in India, it is 4.1% among 4-16 year olds.^[2] The prevalence of attention-deficit hyperactivity syndrome is 1.7-17.8% in India. Hence, it very essential to manage these mental faculties affecting the short-term memory of children by advocating *Medhya Rasayanas* and *Yogic* practices as mentioned in our ancient classics.

Daily use of *Medhya Rasayana* is not only good for memory but also good for promotion of mental health. *Yogic* practices

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reduce stress in life and enhance lifespan along with increasing memory. Hence, the present research work has been designed to know the relation between *Prakriti* and *Sara* of children with short-term memory of school-going children, to evaluate the effect of *Medhya Rasayana* on the improvement of short-term memory and maintenance of health and to evaluate the effect of *Yogic* practices in the improvement of short-term memory among school-going children.

Materials and Methods

Approval was obtained from the departmental research committee and ethical committee of the institute. This study was conducted at a school, and subjects attending the OPD in an Ayurvedic institute were the participants. Consent was obtained from the school authorities and parents of the children participating in the study.

Research design

The study involved intragroup comparison as well as intergroup comparison of three groups A, B, and C. It was an open, prospective, and randomized clinical study.

Inclusion criteria

Age, 10-16 years; sex, both sexes.

Exclusion criteria

Age below 10 years and above 16 years, mental retardation, epilepsy, any systemic disorder.

Study design and treatment schedule

In this study, 90 subjects were selected after taking consent from school authorities and parents. The 90 subjects were divided into three groups with each having 30 subjects. General history, general physical examination, and systemic examinations were done to rule out any illness. Selected questions from Hamilton's Stress Index questionnaire were also used to rule out any major stress among the subjects. The groupings were as follows:

Group A: Control group

Group B: *Medhya Rasayana*

Group C: *Yogic* practices.

Group A: This was the control group. No treatment was given to this group.

Group B: Subjects treated with *Medhya Rasayana*. *Medhya Rasayana* consists of *Mandukaparni* (*Centella asiatica* Linn.) (*Panchanga*), *Yashtimadhu* (*Glycyrrhiza glabra* Linn.) (root), *Guduchi* [*Tinospora cordifolia* (Willd.) Miers ex Hook. f. and Thoms.] (stem), and *Sankhapushpi* (*Convolvulus pluricaulis* Choisy) (*Panchanga*).^[3] These four raw drugs were identified by the experts in the Department of *Dravyaguna*. After identification, they were taken in equal proportion and made into *Suksmacurna* (fine powder). Subjects of this group were advised to take *Medhya Rasayana* 2 g twice daily with milk for 3 months. The combination comprised of fine powder of the above-mentioned four *Medhya Rasayana* drugs, milk powder, and sugar powder in the ratio 2:1:1. Totally 4 g of medicine (*Medhya Rasayana* 2 g, milk powder 1 g, and sugar powder 1 g) was given in one dose. These drugs were mixed with milk powder and sugar powder to increase the palatability of the drug, so that children could consume it easily. This combination was used as

the subjects were school-going children. *Medhya Rasayana* was given in the morning and evening with milk.

Group C: Subjects treated with *Yogic* practices. They were asked to practice *Yogic* practices regularly in the following order.

General schedule for yoga

- Joint movements: 5 rounds each/day Toes- flexion and extension, foot- flexion and extension, ankle- rotation, knee- rotation, hip- rotation, finger- flexion and extension, wrist- rotation, elbow- flexion and extension, shoulder-rotation, neck- rotation
- Standing *Asanas*: 5 rounds each/day *Tadasana*, *Tiryaka Tadasana*, *Vrukshasana*, *Virabhadrasana*, *Trikonasana*
- Pranayama*- *Anuloma-Viloma*- 15 rounds/day, *Bhramari*- 10 rounds/day, *Omkar Dhyana*- 15 min/day
- Shatkarma*- *Kapalabhati*- up to 100 rounds/day.

Assessment criteria

The following criteria were used to evaluate the improvement:

- Short-term memory test - Pictures
- Serial effects test - Words
- Mini Mental State Scale.

Short-term memory test - pictures (test 1)

A sheet containing 20 pictures was provided to the subjects. A 2-min time schedule was provided to memorize the pictures and the sheet was collected back. The subjects were then asked to write down the names of pictures on a blank sheet within 2 min. A sheet containing a new set of 20 pictures was provided at each follow-up so as to avoid remote memory effect. Test 1 was done manually and scoring was out of 20.

Serial recall effect test - words (test 2)

This test was done with the help of Digital Memory Scope MD-100, a microprocessor-based instrument designed primarily for testing the memory of subjects. A set of 10 words was shown to each subject and he/she was asked to reproduce the words in the same order as it was shown at the same time duration. For every wrong answer, the esc key was pressed. At the end of the test, the screen displayed the score. For each follow-up, a new set of 10 words was used to avoid repetition. Test 2 was scored out of 20.

Mini mental status examination (test 3)

This test, designed by Folstein, assesses the mental status of a subject through a questionnaire, regarding orientation about date, time, place, season, and factors, along with mental stress if any, which directly affects the short-term memory and performance at the school. Some questions regarding reproducing of numbers in the same and reverse order also help to assess the recollection capacity or memory of an individual. Some questions also analyze the writing skills of an individual. Test 3 was scored out of 30.

Observation and Results

The collected data were computed in Microsoft Excel sheet showing various variables, and analysis was done using statistical software SPSS version 16.0. The demographic profile and personal characteristics were collected. Intragroup comparison was done by paired *t*-test to compare initial and various follow-ups. Independent sample *t*-test was done and

difference of means of two independent groups was calculated for intergroup comparison. Increase in mean values in test 1 in group B was 2.53 and 5.30 after the 1st and 2nd follow-ups, respectively, compared to the initial value, and was statistically highly significant, whereas the mean increase in group C at 1st follow-up was 1.63 and was statistically not significant; however, the difference in a mean score of 2nd follow-up was 4.93, which was statistically highly significant. As the mean values in groups B and C were higher compared to group A, groups B and C may be considered to be better than the control group [Table 1].

Increase in mean values in test 2 in group B was 1.67 and 2.27 after 1st and 2nd follow-ups, respectively, compared to the initial value, and was statistically highly significant. Similarly, mean increase in group C at 1st follow-up was 0.60 and was statistically insignificant. However, the difference in a mean score at 2nd follow-up was 1.73, which was statistically highly significant. As the increase in mean values in groups B and C was higher compared to group A, groups B and C may be considered to be better than the control group [Table 2].

Increase in mean values in test 3 in group B was 1.17 and 3.73 after 1st and 2nd follow-ups, respectively, compared to the initial value, and they were statistically significant and statistically highly significant, respectively. Whereas increase in mean values in group C at 1st follow-up was 1.90 and 4.10 after 1st and 2nd follow-ups, respectively, compared to the initial value, and was statistically highly significant [Table 3]. However, when the difference between initial and 2nd follow-up

values was compared between group A and group B as well as between group A and group C, statistically highly significant results were obtained [Table 4]. Group C was considered better than the control group as the increase in mean values in C was higher.

Discussion

Deterioration and weakening of memory process can be delayed by the intake of *Medhya Rasayanas*^[4] and by the regular practice of *Yoga* since childhood. Majority of children (i.e., 87.78%) belonged to 10-12 age group [Table 5]. About 51.11% subjects were males and rest were females [Table 6]. Maximum number of subjects (i.e., 83.33%) belonged to Hindu religion, followed by Muslims (i.e., 16.67%). This signifies Hindu-dominant population in and around Varanasi. About 62.22% subjects belonged to middle class, 20% to upper class, and 17.78% to lower class.

In this study, maximum number of subjects had *Kapha-Pittaja Deha Prakriti* (i.e., 36.67), followed by *Vata-Pittaja Deha Prakriti* (33.33%) [Table 7]. Basically, *Pitta Prakriti* persons are blessed with excellence of memory,^[5] but practically, finding *Eka Doshaja Prakriti* persons is very difficult. Retention of the perceived object is brought about by *Kapha* as it is the normal function or *Kapha. Pitta*, having *Ashukari* (fast spreading) and *Tikshna* qualities, stimulates the mind and helps in perception of the object and recollection of previous expression. Further, people with *Raktasarata* and *Satvasarata* are naturally gifted with good memory.^[6] Regarding *Samhanana*, maximum subjects (54.44%)

Table 1: Within-group comparison by paired t test

| Group | Initial score | Test 1 score (out of 20) Mean±SD | | Within-group comparison by paired t test | |
|---------------------|---------------|----------------------------------|------------|------------------------------------------|---------------------------------|
| | | FU1 | FU2 | Initial vs. FU1 MD±SD | Initial vs. FU2 MD±SD |
| Group A, control | 10.60±4.01 | 10.50±3.40 | 10.50±3.78 | 0.10±2.38 t=0.19 P>0.05 | 0.10±2.69 t=0.20 P>0.05 |
| Group B, MR group | 10.60±2.88 | 13.13±2.19 | 15.90±1.84 | 2.53±2.67 t=5.19 P<0.001 | 5.30±2.49 t=11.64 P<0.001 |
| Group C, Yoga group | 12.13±3.09 | 12.77±2.06 | 17.07±2.79 | 1.63±2.95 t=1.16 P>0.05 | 4.93±2.91 t=9.28 P<0.001 |

SD: Standard deviation, MD: Mean difference, MR: *Medhya rasayana*

Table 2: Within-group comparison by paired t test

| Group | Initial score | Test 2 score (out of 10) Mean±SD | | Within-group comparison by paired t test | |
|---------------------|---------------|----------------------------------|-----------|------------------------------------------|--------------------------------|
| | | FU1 | FU2 | Initial vs. FU1 MD±SD | Initial vs. FU2 MD±SD |
| Group A, control | 2.90±2.95 | 4.60±2.82 | 5.50±2.53 | 0.30±2.51 t=0.66 P>0.05 | 0.60±2.40 t=1.37 P>0.05 |
| Group B, MR group | 7.13±2.94 | 8.80±1.40 | 9.40±0.97 | 1.67±2.25 t=4.06 P<0.001 | 2.27±2.53 t=4.90 P<0.001 |
| Group C, Yoga group | 7.40±2.44 | 8.00±2.05 | 9.13±1.25 | 0.60±2.19 t=1.50 P>0.05 | 1.73±2.36 t=4.02 P<0.001 |

SD: Standard deviation, MD: Mean difference, MR: *Medhya rasayana*

Table 3: Within-group comparison by paired t test

| Group | Test 3 (out of 30) Mean±SD | | | Within-group comparison paired t test | |
|---------------------|-------------------------------|------------|------------|------------------------------------------|---------------------------------|
| | Initial score | FU1 | FU2 | Initial vs. FU1 MD±SD | Initial vs. FU2 MD±SD |
| Group A, control | 19.37±3.03 | 19.27±3.69 | 19.37±3.30 | 0.10±1.75 t=0.31 P>0.05 | 0.00±1.76 t=0.00 P>0.05 |
| Group B, MR group | 24.23±2.60 | 25.40±2.19 | 27.97±1.52 | 1.17±2.00 t=3.19 P<0.01 | 3.73±1.87 t=10.91 P<0.001 |
| Group C, Yoga group | 20.73±3.02 | 22.63±2.54 | 24.83±2.36 | 1.90±2.51 t=4.15 P<0.001 | 4.10±2.35 t=9.54 P<0.001 |

SD: Standard deviation, MD: Mean difference, MR: Medhya rasayana

Table 4: Intergroup comparison on difference of initial and follow-up

| Intergroup comparisons of difference between initial and FU | Unpaired t test | | |
|-------------------------------------------------------------------------|------------------------|------------------------|------------------------|
| | Group A vs. group B | Group A vs. group C | Group B vs. group C |
| Test 1 | | | |
| Initial-FU1 | t=3.51 P<0.01 | t=0.68 P>0.05 | t=2.60 P<0.05 |
| Initial-FU2 | t=7.88 P<0.001 | t=6.79 P<0.001 | t=0.52 P>0.05 |
| Test 2 | | | |
| Initial-FU1 | t=3.01 P<0.01 | t=1.28 P>0.05 | t=1.86 P>0.05 |
| Initial-FU2 | t=2.65 P<0.01 | t=1.89 P>0.05 | t=4.84 P>0.05 |
| Test 3 | | | |
| Initial-FU1 | t=2.74 P<0.01 | t=3.68 P<0.01 | t=1.25 P>0.05 |
| Initial-FU2 | t=7.76 P<0.001 | t=7.46 P<0.001 | t=0.67 P>0.05 |

FU: Follow-up, P: Probability

Table 5: Distribution according to age

| Age (in years) | No. of subjects | | | Total | |
|-------------------|-------------------|-------------------|-------------------|-------|-------|
| | Group A (n=30) | Group B (n=30) | Group C (n=30) | No. | % |
| 10-12 | 30 | 20 | 29 | 79 | 87.78 |
| 13-16 | 0 | 10 | 1 | 11 | 12.22 |

Table 6: Distribution according to sex

| Sex | No. of subjects | | | Total | |
|--------|-------------------|-------------------|-------------------|-------|-------|
| | Group A (n=30) | Group B (n=30) | Group C (n=30) | No. | % |
| Male | 15 | 13 | 18 | 46 | 51.11 |
| Female | 15 | 17 | 12 | 44 | 48.89 |

Table 7: Distribution according to Deha Prakriti

| Deha Prakriti | No. of subjects | | | Total | |
|------------------|-------------------|-------------------|-------------------|-------|-------|
| | Group A (n=30) | Group B (n=30) | Group C (n=30) | No. | % |
| Vata Pitta | 14 | 7 | 9 | 30 | 33.33 |
| Kapha Pitta | 6 | 15 | 12 | 33 | 36.67 |
| Kapha Vata | 10 | 8 | 9 | 27 | 30 |

had *Madhyama Samhanana* and 45.56% had *Pravara Samhanana*. This indicates the proper development of body due to proper intake of food and good *Vyayama*. Regarding *Satmya*, maximum subjects (62.22%) came under the *Madhyama Satmya* category, followed by 32.22% in *Pravara Satmya*. This indicates that the children consumed more than four *Rasas* regularly in the diet. About 61.11% subjects belonged to *Madhyama Satva*, whereas 24.44% belonged to *Pravara Satva* and only 14.44% belonged to *Avara satva*. This shows that proper *Satva* leads to good memory. Maximum subjects were not under major stress, which was assessed by means of selected questions from Hamilton's Stress Index. Majority of subjects (i.e., 65.56%) were having *Pravara Abhyavaharanashakti*, while 27.78% subjects were having *Madhyama Abhyavaharanashakti*. *Jaranashakti* was also found to be *Pravara* in majority of subjects (61.11%). This indicates that children are basically physically active, and because of it, their *Agni* is increased. Hence, they need good amount of energy through food. Majority of subjects (i.e., 55.56%) were having *Madhyama Vyayamashakti*. This also indicates that subjects were physically fit for doing Yoga. In this study, the effect of four *Medhya Rasayanas*, *Mandukaparni*, *Yashtimadhu*, *Guduchi*, and *Sankhapushpi*, was studied. These are easily available, and they are very beneficial for memory and also help in the prevention of many diseases. *Medhya Rasayana* was given to group B subjects at a dose of 4 g twice daily for 3 months.

Mode of action of Medhya Rasayana

Medhya Rasayanas strengthen the body and maintain normal body function. *Pitta Dosha* maintains the intelligence and *Kapha* sustains the body with intelligence and *Dhriti* (courage) by its *Sthira Guna*.^[7] *Pranavata* performs the intellectual function and it is the main factor involved in grasping and fast recall, especially because of its *Chala* (mobile) and *Vishada* (fast-spreading) properties. *Sadhaka Pitta* performs functions like discrimination between right and wrong by the *Nishchayatmaka Buddhi* and *Medha* (intelligence).^[8] *Medhya Rasayanas* help to maintain *vata*, *pitta*, and *Kapha Doshas* normal functions. According to *Ayurveda*, *Mandukaparni* is *Medhya* by *Prabhava* (special effect). *Mandukaparni* present in *Medhya Rasayana* improves learning and memory processes by modulating dopamine, 5-Hydroxytryptamine receptor, and noradrenaline systems, which was also reported in a study on rats.^[9] It is also effective in preventing the cognitive deficits as well as oxidative stress.^[10] It also reduces stress which is one among the factors leading to memory impairment by reduction in raised

circulating corticosterone. It also shows immune-modulatory activity and strong antioxidant activity as revealed by increased level of superoxide dismutase (SOD), glutathione peroxidase, and glutathione in mice. *Ce. asiatica* extract and powder may ameliorate H₂O₂-induced oxidative stress by decreasing lipid peroxidation via alteration of the antioxidant defense system in rats.^[11] Thus, it is a general health promoter. It has neuronal dendritic growth-stimulating property.^[12] This may help in enhancing concentration power, thus improving short-term memory. Asiaticoside, an active principle present in *Ce. asiatica*, imparts anxiolytic activity,^[13] and thus, it helps in reducing the anxiety which is one of the factors affecting the memory. Aqueous extract of *Ce. asiatica* Linn. is reported to be effective in preventing the cognitive deficits as well as oxidative stress caused by intracerebroventricular streptozotocin in rats.

Madhura and *Shita* qualities and *Vatapittashamaka* and *Rasayana* effects of *Yashtimadhu* bring about soothing effect, and probably this helps in bringing about *Stairya* and *Dhriti* to establish stability of mind and for enhancing memory [Table 8]. The root of *G. glabra* Linn. contains the active principles, glycyrrhizin, glycoside, isoliquiritin, liquiritin, steroid estrogen, hispaglabridin B, isoliquiritigenin, and paratocarpin B.^[14] Experiments showed that *G. glabra* Linn. increases the blood circulation to the central nervous system and balances the sugar levels in the blood.^[15] The isoflavones glabridin and hispalglabridins A and B of *G. glabra* Linn. have significant antioxidant activity. The antioxidants protect susceptible brain cells from the oxidative stress, resulting in reduced brain damage and improved neuronal function, thereby enhancing the memory.^[16] Ethanol extract of *G. glabra* Linn. possesses cerebroprotective effect in hypoxic rats, which may be mediated by its antioxidant effects. According to a study improvement in learning and memory of mice was observed when they were administered aqueous extract of liquorice in a dose of 150 mg/kg. This is probably due to facilitation of cholinergic transmission in mouse brain.^[17]

Guduchi, another component of *Medhya Rasayana*, has *Katu*, *Tikta Rasas* which help in keeping the mind alert, so that things can be remembered properly. By *Tridosahara* property, it helps to establish a balance and a good coordination of grasping, retention, and recall of memory. Further, *Rasayana Prabhava* helps in retaining things. *T. cordifolia* has active principles such as tinosporone, tinosporic acid, cordifolisides A-E, syringen, berberine, giloin, gilenin, crude giloininand, arabinogalactan polysaccharide, picrotene, gilosterol, tinosporol, tinosporidine, sitosterol, cordifol, and glucan polysaccharide. The root extract of *T. cordifolia* was found to possess normalizing activity against stress-induced changes in norepinephrine, dopamine, 5-hydroxytryptamine, and 5-hydroxyindoleacetic acid levels. *T. cordifolia* enhances cognition (learning and memory)

in normal rats. Cyclosporine-induced memory deficit was successfully overcome with *T. cordifolia*.^[18] *T. cordifolia*, at a dose of 500 mg daily, enhances verbal learning and memory and logical memory (of immediate and short-term type) compared to placebo in healthy volunteers.^[19] According to Burton, *T. cordifolia* has found a place in natural and herbal treatments of ADHD. *Guduchi* is shown to have antioxidant activity and amelioration.^[20] This helps in health promotion as well as preventing forthcoming diseases.

Sankhapushpi is the most effective among the four *Medhya Rasayana* drugs mentioned by *Acharya Charaka*.^[21] It has *Kashaya Rasa* and *Ushna Guna*, which may enhance the alertness and quick understanding and retention of experiences. It has *Tridosahara* property. *C. pluricaulis* contains many phytonutrients like convolidine, convolvine, convolvidine, convoline, confoline, phyllabine, subhirsine, and scopoline. These compounds help in brain stimulation and increase the ability to concentrate.^[22] *C. pluricaulis* reduces anxiety and stress by controlling the production of body's stress hormones, adrenaline and cortisol. It is reported to possess anxiolytic and memory-enhancing and mood-elevating effects, and is claimed to retard brain aging.^[23] Neuroprotective role of *C. pluricaulis* has been proved in the study by Bihagi *et al.* on aluminum-induced neurotoxicity in rat brain. The psychotropic effect of *C. pluricaulis* was studied by Singh and Mehta on 30 outpatients of anxiety neurosis in 1976. After 1 month of treatment, a significant reduction in the neurotic features was observed and immediate memory span was significantly improved.

Mode of action of Yoga

Due to short-term memory loss, the individual faces many problems and overall poor performance in work. *Yoga* can help humanity in a major way by making individuals overcome the challenges posed by loss of memory. An integrated approach to *Yoga* is necessary for the holistic development of memory. *Tadasana* develops physical and mental balance. *Tiryak Tadasana* balances the body as well as the mind.^[24] *Vrukshasana* gives sense of balance and poise. *Virabhadrasana* develops concentration power. *Trikonasana* stimulates the nervous system and alleviates nervous depression. *Kapalabhati* energizes the mind for mental work and removes sleepiness,^[25] thus brings about alertness needed for the improvement of short-term memory. While performing *Anuloma-Viloma*, breathing through the left nostril tends to activate the right hemisphere and breathing through the right nostril activates the left hemisphere. It has calming effect and relieves anxiety, improves concentration, and stimulates *Ajna cakra*. The brain centers are stimulated to work nearer to their optimum capacity. *Bhramari* relieves stress and cerebral tension, and thus helps in alleviating anger, anxiety, and insomnia. *Omkar Dhyana* produces benefits at many levels of life. It simultaneously influences body, emotions, mental functioning, and relationships. Meditation also improves brain functioning, enhances the ability to focus, improves perception and memory, promotes development of intelligence, decreases craving for cigarette, alcohol, and drug abuse, along with decreasing the withdrawal symptoms, induces relaxation, and decreases stress. Meditation is an inherent ability of the human body. Meditation is an activity whereby the nervous system, brain, and senses get tuned themselves for best functioning. During meditation, the concentration on different *Cakras* like on *Muladhara Cakra*

Table 8: Properties of plants as per Bhavaprakash Nighantu

| Plant name | Rasa | Guna | Virya | Vipaka |
|---------------------|--------------------------------|--------------|--------------|----------------|
| <i>Mandukaparni</i> | <i>Tikta, kashaya, madhura</i> | <i>Sara</i> | <i>Shita</i> | <i>Madhura</i> |
| <i>Yashtimadhu</i> | <i>Madhura</i> | <i>Shita</i> | <i>Shita</i> | <i>Madhura</i> |
| <i>Guduchi</i> | <i>Katu, tikta</i> | <i>Laghu</i> | <i>Ushna</i> | <i>Madhura</i> |
| <i>Sankhapushpi</i> | <i>Kashaya</i> | - | <i>Ushna</i> | - |

enhances health and *Vidya*, *Manipura Cakra* enhances *Vidya* and capacity, and on *Vishudha Cakra* brings about improvement in speech and knowledge. The *Satvasarata* state leads to excellence of memory; this state can be brought about by the regular practice of *Yoga*, so as to improve short-term memory.

Objective assessment

In test 1 (short-term memory test - pictures), the intergroup comparison showed that group B treated with *Medhya Rasayana* was most effective as the increase in mean values in the group was higher. A similar study conducted also showed marked improvement in visual reproduction of Wechsler memory scores after the practice of *Yoga*.^[26]

Intergroup comparison showed that group B (*Medhya Rasayana*) was most effective in test 2 (serial recall test). This shows that *Medhya Rasayana* enhances the *Granthagrahana Samarthy* of students.^[27] Intergroup comparison showed that in test 3, group C with *Yogic* practices was the most effective as the increase in mean values in the group was higher. This shows that the *Yogic* practices help in the improvement of mental status like relief from day-to-day stress and also help in the improvement of memory. When group B was compared with group C in test 1, the difference between the 1st follow-up values was found to be significant. Increase in mean values after 1st follow-up in group B was higher as compared to group C. This shows that *Medhya Rasayanas* are quick in action and bring about improvement in memory faster when compared with *Yogic* practices. So, on the whole, group B can be considered to be the most efficient among the three groups.

Conclusion

Medhya Rasayana helps in improvement of memory power. *Yogic* practices help to improve the concentration and calm the mind, resulting in memory improvement. Among the three groups, group B treated with *Medhya Rasayana* was highly significant and most effective with respect to objective parameters in tests 1 and 2. Further, the treatment is cost effective and devoid of side effects, so it can be applied in the community. Among the three groups, group C treated with *Yogic* practices was highly significant and most effective with respect to subjective and objective parameters in test 3. It is also a cost-effective, non-pharmacological intervention; so, everyone can adopt it to enhance memory as well as prevent many lifestyle disorders. Group B treated with *Medhya Rasayana* is most effective in improving short-term memory of school-going children among the three groups.

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हिन्दी सारांश

मेध्यरसायन एवं योगाभ्यास का विद्यालयीन छात्रों की स्मृतिहास पर प्रभाव

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उत्कृष्ट स्मृति, अद्वितीय बुद्धि, अत्युत्तम शैक्षणिक सफलता पाना यह आज के स्पर्धात्मक युग में हर व्यक्ति का सपना होता है। शैक्षणिक सफलता और वैयक्तिक संबंध बनाये रखने के लिए अच्छी स्मरणशक्ति अत्यावश्यक है। सामान्य व्यक्ति अपनी बुद्धि का १० प्रतिशत उपयोग करता है, बाकी ९० प्रतिशत उपयोग में ही नहीं आती है। सावधानी और अच्छे तरीके से अगर कोई अपनी प्राकृत स्मृति को जागृत करे तो उसे बहुत ही अच्छे लाभ मिलते हैं। यह अध्ययन ९० छात्रों पर किया गया है। इसमें चरक चिकित्सा अध्याय-१, पाद-३, सूत्र-३०/३१ में कहे गये चार मेध्य रसायनों मंडूकपर्णी, यष्टिमधु, गुडूची और शंखपुष्पी इनकी उपयोगिता देखी गयी और योगिक क्रिया जैसे की ताड़ासन, तिर्यकताड़ासन, वृक्षासन, वीरभद्रासन, त्रिकोनासन, कपालभाती, अनुलोम-विलोम, भ्रामरी और ॐकार ध्यान इनका विद्यालयीन छात्रों की आशुस्मृति पर प्रभाव देखा गया है। इस अध्ययन से यह निष्कर्ष निकला की तीनों वर्गों में से दूसरा वर्ग जिसको मेध्य रसायन दिया गया वह टेस्ट १ और टेस्ट २ में बहुत ही फायदेमंद साबित हुआ। यह चिकित्सा कम खर्च वाली और बिना किसी दुष्परिणाम वाली होने के कारण इसका उपयोग करना चाहिए। तीसरा वर्ग जो योगाभ्यास का था वह टेस्ट ३ में लाभप्रद सिद्ध हुआ। हर किसी को अपनी स्मृति बढ़ाने के लिए और विकृत जीवनशैली से होने वाली व्याधियों से बचने के लिए इसका उपयोग करना चाहिए। तीनों वर्गों में जो वर्ग मेध्य रसायन लेता था, वह सबसे लाभकारी सिद्ध हुआ।