

Nootropic efficacy of *Satvavajaya Chikitsa* and Ayurvedic drug therapy: A comparative clinical exposition

Hetal Amin, Rohit Sharma¹

Departments of Basic Principles Including Drug Research and ¹Rasashastra and Bhaishajya Kalpana Including Drug Research, I.P.G.T. and R.A., G.A.U., Jamnagar, Gujarat, India

Address for correspondence: Dr. Hetal Amin,
Department of Basic Principle, I.P.G.T. and R.A., G.A.U., Jamnagar - 361 008, Gujarat, India.
E-mail: dr.hetal1985@gmail.com

ABSTRACT

Introduction: Ayurveda is known for philosophical basis, and its approach to psychological ailments is quite different from conventional system of management. *Satvavajaya Chikitsa* (Ayurvedic psychotherapy) is a nonpharmacological approach aimed at control of mind and restraining it from unwholesome *Artha* (objects) or stressors. Withdrawal of the mind from unwholesome objects is known as *Sattvavajaya Chikitsa* or it is a treatment by Self Control. Charaka defines it as a mind controlling therapy in which a stress has been laid on restraining of mind from unwholesome objects. Thus, it includes all the methods of *Manonigraha* and *Astanga Yoga* (*Yogic* techniques) too. Indian philosophy portrays *Astanga Yoga* as a primary tool to control mind; hence it can be used as *Satvavajaya Chikitsa*.

Aims and Objectives: To evaluate efficacy of *Satvavajaya Chikitsa* and *Aushadhiya Medhya Chikitsa* for improving *Smriti* in young healthy volunteers.

Materials and Methods: Totally, 102 physically healthy volunteers between age group 16 and 25 years were divided into two groups. In Group A, *Satvavajaya Chikitsa* was adopted in form of *Yogic* procedures such as *Asana*, *Pranayama*, Chanting etc., with counseling and placebo. Group B was *Shankhapushpi* tablets made with whole part of Shankhpushpi plant was used as standard control. The Weschler's memory scale (WMS) was adopted to collect data before and after intervention period of 2 months. Paired and Unpaired *t*-test were used for analysis the data in Sigmastat Software.

Results: Group A (*Satvavajaya* + placebo) with counseling showed statistically highly significant result ($P < 0.001$) in verbal retention for similar pair, verbal retention for dissimilar pair and visual immediate tests; while Group B (*Shankhapushpi* tablets) showed significant result ($P < 0.01$) in auditory delayed, visual delayed, auditory recognition and visual recognition tests.

Conclusion: *Satvavajaya Chikitsa* shows better results in immediate recollection in terms of short-term memory; while *Shankhapushpi* found much better in long-term memory enhancement on various tests of WMS.

Key words: Memory; *Satvavajaya*; shankhapushpi; *Smriti*; yoga.


INTRODUCTION

Nootropics are referred to as brain tonics, memory enhancers, and cognitive enhancers. A cognitive enhancer is a substance that enhances concentration and memory.^[1] Nootropics are thought to work by altering the availability

of the brain's supply of neurochemicals (neurotransmitters, enzymes, and hormones), by improving the brain's oxygen supply, or by stimulating nerve growth. However, the efficacy of nootropic substances, in most cases, has not been conclusively determined. This is complicated by the difficulty of defining and quantifying cognition and intelligence.^[2] Memory herbs increase the level of neurotransmitters, particularly acetylcholine and improve blood flow to the brain, thereby increasing its oxygen and nutrient supply, which will aid brain function and memory.^[3]

It is always interesting to probe into the mystic nature of mind. *Satvavajaya* is a factual knowledge of psychological

Access this article online

Website: www.ijoy.org.in	Quick Response Code 
DOI: 10.4103/0973-6131.158473	

self-control that helps to discriminate between thoughts and actions and to pull out phobic nucleus. It adopts a comprehensive psychosomatic-spiritual approach to maintain the normalcy of mental health as well as bringing back its healthy state if it is impaired.^[4,5]

The term *Smriti* (memory) denote a wide array of higher intellectual faculties including memory, cognition, past sense perception, mastery in mind. Though *Smriti* is related to *Atma* (soul) and *Mana* (mind),^[6] Charaka has defined *Satvavajaya* as *Ahitebhyoarthebhyo Manonigraha* (withdrawal of the mind from unwholesome objects).^[6] Charaka also defines *Sattvavajaya Chikitsa* as a mind controlling therapy in which a stress has been laid on restraining of mind from unwholesome objects. Thus, it may include all the methods of *Manonigraha* e.g. *Astanga Yoga* (*Yogic* techniques). Indian philosophy portrays *Astanga Yoga* as a primary tool to control mind; hence it can be used as *Satvavajaya Chikitsa*.^[6] Among all available techniques prevailing for control over mind, *Yoga* offers one of the best mind controlling methods, as it stresses on *Chittavritti Nirodha* (control mind from different thoughts).^[7] The methods of self-hypnosis,^[8] positive suggestions,^[9] and counseling^[10] have been used as *Satvavajaya Chikitsa* in recent studies.

Young people are more exposed to educational and competitive stress; which eventually result in an inability to concentrate and affect memory.^[11] Earlier studies suggest that yogic practices are found effective in improving the cognitive functions, attention and memory (visual and spatial),^[12,13] thereby resulting in improved academic performance.^[14] Adoption of *Yoga* practices in daily life can also help to reduce the educational and professional stress.^[15,16] In spite of number of such studies, no data are available until date to investigate the effect of *Satvavajaya Chikitsa* (as *Yoga* therapy) on short-term and long-term memory enhancement.

Shankhapushpi (*Convolvulus pluricaulis* Choisy.) is a widely reputed *Medhya* (nootropic) herb in Ayurveda.^[6] *Shankhapushpi* has been used as a rejuvenator, anti-ageing, mental stimulant and tranquilizer, anti-stress and cognition enhancing potential; hence, it is recommended as a brain tonic to improve intellect, attention, concentration, memory and alleviate nervous disorders.^[17] Earlier preclinical studies on various extracts of *Shankhapushpi* reported significant results on learning behavior and memory enhancement activity^[18] and recommended its usage as brain tonic to promote intellect and memory, alleviate nervous disorders and hypertension.^[19] In spite of plentiful preclinical researches already carried out, minimal clinical studies exploring its nootropic activity

are available. Previous studies ascertain the beneficial effect of *Shankhapushpi* in short-term memory;^[20] however, any published data on the efficacy of *Shankhapushpi* on long-term memory are lacking.

The potency of single or compound drugs can be further augmented by conducting the *Bhavana* process, by levigating the *Churna* (powder) with their own juice or decoction.^[6] *Bhavana* can be helpful in developing pharmaco-therapeutically potent new molecules. Various herbs including *Shankhapushpi* have been mentioned to potentiate as *Rasayana* through this process.

Though it is not a virgin territory of research, persuasive research to manage memory deterioration is still unmapped. Considering all these, the present clinical study is conducted to compare the therapeutic efficacy of *Satvavajaya Chikitsa* (as *Yoga* therapy) with *Aushadhiya Chikitsa* (medicine treatment) on *Smriti*. As per scholar knowledge, the present study is the first of its kind to assess the comparative improvement in short-term and long-term memory with *Yoga* and drug therapy.

MATERIALS AND METHODS

Source of patients

One hundred and two physically healthy volunteers from Jamnagar city, Gujarat, who fulfill the inclusion criteria, were included in the study. A cross-sectional study was conducted on 102 volunteers, attending the OPD and IPD of IPGT and RA, Gujarat Ayurved University, Jamnagar, Gujarat, India. The volunteers were selected using simple random sampling by coin test and written informed consent was taken as per Helsinki declaration after offering sufficient explanations about the study and its aims. All patients were interviewed in the local language by a single person.

Inclusion criteria

Physically healthy volunteers (without any pathological condition, routine hematological viz. T.L.C., D.L.C., Hb%, E.S.R. and P.C.V. and routine urine and microscopic examinations were carried out before treatment along with *Dashavidha Prariksa* [10-fold examination]) having complaints of poor memory were selected on the basis of *Smarana Shakti* (recollection power/memory). For assessment of memory, Weschler's Memory Scale (WMS) test was performed.^[21] The individuals who have <10 score as per proforma were selected for the study. Age group ranging 16–25 years (mean 21.8 ± 0.52) was randomly selected without any bar of race, religion, and sex.

Exclusion criteria

Patients with neurological or psychological disturbances or under medication for systemic disease were excluded from the study.

Study design

In this randomized control trial, for assessment of memory, WMS tests were carried out before (pre) and after (post) 2 months intervention. To rule out any pathological condition, routine hematological viz. T.L.C., D.L.C., Hb%, E.S.R. and P.C.V. and routine urine and microscopic examinations along with *Dashavidha Prarikscha* were carried out before treatment. Signed informed consent was obtained from each volunteer after giving detailed description of the study. Institutional Ethical Clearance obtained from Ethical Committee of the IPGT and RA, Jamnagar, and the study has been registered at CTRI (Number: CTRI/2013/10/004100).

Grouping and posology

Group A (trial group) was having fifty volunteers who were getting *Satvavajaya Cikitsa*, which include *Yogic* procedures, placebo [Table 1] and counseling for motivation. In placebo, four tablets (500 mg each tablet) were given for twice a day made with rice powder after food with milk as a vehicle for 60 days.

Group B (standard control group) having 52 volunteers who received four *Shankhapushpi* tablets (500 mg each tablet) were given for twice a day after food with milk as a vehicle for 60 days.

Table 1: Baseline characteristics 102 of volunteers

Characters	Categories	Percentage
Age (years)	16-18	45.65
	19-23	54.35
Gender	Male	67.65
	Female	32.35
Religion	Hindu	68.63
	Muslim	31.37
Marital status	Married	60.78
	Unmarried	39.22
Socioeconomic status	Poor	2.94
	Middle	91.30
	Higher middle	3.92
Habitat	Urban	74.51
	Rural	25.49
	Physical activity	Routine work
Emotional makeup	Regular	39.22
	Irregular	3.92
	Normal	37.25
Mental stress	Tensile	37.25
	Depressed	1.96
	Anxious	54.90
	Social	1.10
Professional	Professional	97.83
	Domestic	2.76

Preparation of *Shankhapushpi* tablet

Shankhapushpi (*Convolvulus pluricaulis* Choisy.) powder made with whole plant of *Shankhapushpi* was given three *Bhavana* (trituration) of *Shankhapushpi* juice^[1] and the tablets of 500 mg prepared in Pharmacy, Gujarat Ayurved University, Jamnagar. The confirmatory test for completion of *Bhavana* was done as per features of good trituration narrated in Ayurvedic classics.^[22] Prior to clinical evaluation, the trial drug was subjected to preliminary pharmacognostic and phytochemical evaluation as per standard procedures.^[23]

Criteria for assessment

The eight subtests of WMS were verbal retention for similar pair (VRSP), verbal retention for dissimilar pair (VRDP), auditory immediate, auditory delayed (AD), visual immediate (VI), visual delayed (VD), auditory recognition (AR) and visual recognition (VR). Specific scoring pattern was developed to assess the effect of therapies. The scoring was given to eight tests ranging from 0 to 5. Zero score given for all false answers and 5 score for all right answers.

The obtained data on the basis of observations were subjected to statistical analysis in terms of mean, standard deviation, standard error and Paired *t*-test. All statistical analyses were conducted ($P < 0.001$ as highly significant, $P < 0.05$ or $P < 0.01$ as significant and $P < 0.10$ as nonsignificant).

RESULTS

All 102 volunteers enrolled completed the study. It was found that maximum numbers of volunteers belonged to the age group of 19–23 years (54.35%), graduates (97.83%), secondary class students (2.17%), from middle class (91.30%), and vegetarians (65.22%). *Vishamagni* (abnormal status of digestive power) was found in 36.96%, *Vishamashana* (irregular or faulty dietary habits) in 76.09%, *Madhyama Koshtha* (~normal digestion) in 67.56%, tea addiction in 73.91% and *Asamayaka Nidra* (disturbed sleep) in 82.61%. *Krodha* (anger) was found in maximum number of volunteers (59.45%). About 43.24% of volunteers had *Vata* dominant *Sharira Prakriti*. Additional baseline characteristics are depicted in Table 1. Schedule of *Yogic* practice taught and suggested are described in Table 2. The obtained results of eight subtests of WMS of both groups are detailed in Figures 1-3 and Tables 3 and 4 and paired and unpaired '*t*' test results are mentioned in Table 5 and Tables 3 and 4 and paired and unpaired '*t*' test results are mentioned in Table 5.

DISCUSSION

Male: Female ratio was 3:7; average weight of subjects was 54 ± 10 kg; average height of subjects was 157 ± 8 cm.

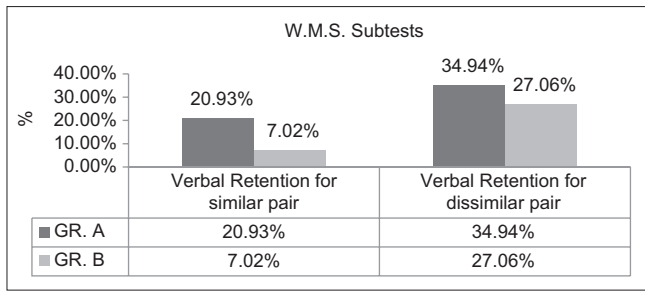


Figure 1: Verbal retention for similar and dissimilar pair test result

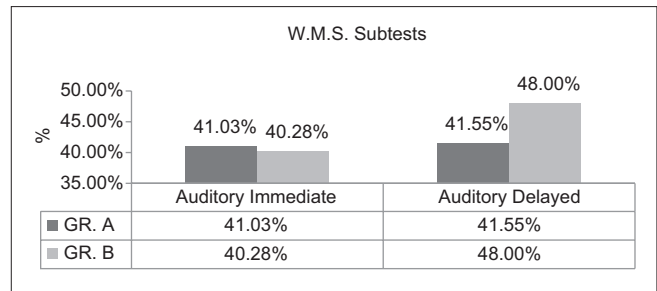


Figure 2: Auditory immediate and delayed test result

Table 2: Schedule of Yogic practice taught and suggested

First week	Minimum	Second week	Minimum	Third week	Minimum
<i>Pranadharana</i>	05	<i>Pranadharana</i>	05	<i>Pranadharana</i>	05
Relaxation	05	Relaxation	05	Relaxation	05
Prayer	05	Prayer	05	Prayer	05
Rotation/stretches	05	Rotation/stretches	05	Rotation/stretches	05
<i>Asana</i>					
<i>Natarajasana</i>	03	<i>Natarajasana</i>	03	<i>Natarajasana</i>	03
<i>Vrikshasana</i>	03	<i>Vrikshasana</i>	03	<i>Vrikshasana</i>	03
<i>Sarvangasana</i>	03	<i>Sarvangasana</i>	03	<i>Sarvangasana</i>	03
<i>Matsyasana</i>	03	<i>Matsyasana</i>	03	<i>Matsyasana</i>	03
<i>Shavasana</i>	03	<i>Shavasana</i>	03	<i>Shavasana</i>	03
<i>Pranayama</i>					
<i>Anuloma-Viloma</i> (3 rounds)	05	<i>Anuloma-Viloma</i> (3 rounds)	05	<i>Anuloma-Viloma</i> (3 rounds)	05
<i>Bhramari</i>	05	<i>Bhramari</i>	05	<i>Bhramari</i>	05
<i>Shuddhi Kriya</i>					
<i>Kapalbhati</i>	05	<i>Kapalbhati</i>	10	<i>Kapalbhati</i>	15
<i>Tratakon AUM</i>	05	<i>Tratakon AUM</i>	05	<i>Tratakon AUM</i>	05
<i>Dharna and Dhyana on AUM</i>	05	<i>Dharna and Dhyana on AUM</i>	05	<i>Dharna and Dhyana on AUM</i>	05
Prayer	05	Prayer	05	Prayer	05
Total duration	65	Total duration	70	Total duration	75

Third week procedures were continued till 2 months completion

Table 3: Effect of *Sattvavajaya Cikitsa*+placebo on 8 subtests of WMS

WMS test	n	Mean score		df (%)	±SD	±SE	t	P (n=50)
		BT	AT					
Verbal retention for similar pair	50	3.78	4.78	20.93	17.15	4.04	5.27	<0.001
Verbal retention for dissimilar pair	50	3	4.61	34.94	19.48	4.6	7.52	<0.001
Auditory immediate	50	2.39	4	40.28	14.17	3.34	12.17	<0.001
Auditory delayed	50	2.5	4.28	41.55	18.36	4.33	9.50	<0.001
Visual immediate	50	2.33	4.33	46.15	20.88	4.92	9.83	<0.001
Visual delayed	50	2.9	4.39	32.91	18.06	4.26	7.43	<0.001
Auditory recognition	50	3.88	4.5	19.75	35.19	8.29	2.66	<0.01
Visual recognition	50	3.83	4.83	20.68	44.18	10.41	3.54	<0.01

SD = Standard deviation, SE = Standard error, BT = Before treatment, AT = After treatment, WMS = Weschler's memory scale

Table 4: Effect of *Shankhapushpi* tablet on 8 subtests of WMS

WMS test	n	Mean score		df (%)	±SD	±SE	t	P (n=52)
		BT	AT					
Verbal retention for similar pair	52	4.1	4.36	7.02	17.94	3.39	2.07	<0.01
Verbal retention for dissimilar pair	52	3.04	3.86	27.06	35.54	6.72	2.16	<0.01
Auditory immediate	52	2.79	3.93	41.03	19.56	3.70	7.99	<0.001
Auditory delayed	52	2.68	3.96	48	33.66	6.36	4.34	<0.001
Visual immediate	52	2.88	3.79	32.5	37.37	7.06	2.97	<0.001
Visual delayed	52	2.79	4.04	44.87	26.75	5.06	5.89	<0.001
Auditory recognition	52	2.92	3.54	20.73	33.89	6.40	2.00	<0.05
Visual recognition	52	3.14	4.04	28.41	35.58	6.72	2.57	<0.01

SD = Standard deviation, SE = Standard error, BT = Before treatment, AT = After treatment, WMS = Weschler's memory scale

Mean age of subjects was 21.8 ± 0.52 . Majority of subjects (97.83%) were medical and engineering students. It signifies the high level of stress (educational) and (professional) among these professionals.^[24] Under such stress, he/she does not bring out his/her best, as extreme stress can result in mental health problems, which may tarnish their academic performance. Maximum volunteers were from middle socioeconomic status; maximum cases were reported to have *Vishamashana* and *Vishamagni*; which may be due to educational stress or other social issues in this age group. Majority of the volunteers (82.61%) were having disturbed and inadequate sleep. *Nidra* is responsible for *Jnana* (knowledge), as it is very essential mean for three stages of knowledge production that is, *Dhi* (intellect), *Dhriti* (retention) and *Smriti* (memory).^[6] Disturbed or reduced sleep results in impaired transfer of data from short-term into long-term memory.^[25,26] Maximum numbers of cases were found to possess the *Vata* and *Pitta* dominant *Prakriti*. *Prakriti* has direct relation with *Smriti*. *Pitta Prakriti* persons have been described as *Medhavi* (high intellect), *Nipuna Mati* (sharp memory),^[6] which shows that these people have a high intelligence quotient. In contrast, *Vata Prakriti* persons have *Alpa Smriti* (poor memory)^[27] and *Anavasthita Mati* (unstable psyche)^[6] which signifies their poor ability to recall past incidences and poor decision taking power.

Group A (*Satvavajaya* + counseling + placebo) showed statistically highly significant result ($P < 0.001$) in VRSP, VRDP and VI tests [Figures 1 and 4]. *Yogic* procedures like balancing and forward bending type *Asana* (yogic postures) and *Pranayama* (breathing exercises) increase circulation of blood to brain that helps to calm the *Manas* and enhance concentration skills.^[28] Balancing *Asana* activates *Ajna Chakra* (site between the brows) that allows an individual to find life rhythm, which further aids to health of *Manomaya Kosha* (site of intellectual conducts).^[29] *Yogic* procedures regulate the movement of *Vata* that steer *Manas* and hence memory gets improved. *Sadrishya* (similarity) is one of the cause for *Smriti*^[30] and hence the concentration and retention power for similar pair is increased. *Yogic* procedures control the *CancaLatva Guna* (mobility) of *Vayu*^[6] and dwindle the *Rajas* and *Tamas Guna* which

in turn helps to remove *Avarana* (covering) over *Buddhi* by channelizing *Vayu* to *Nadi* (i.e. *Ida*, *Pingala* and *Sushumna*). All these procedures increase the *Uha Shakti* (logic power) of a person to think with logic and proper reasoning. *Viparyaya* (dissimilarity) is also one of the reasons for *Smriti* improvement in VRDP test.^[6] The *Asana*, *Pranayama*, meditation, om chanting together with notional correction based on philosophy of yoga was found to improve both cognitive that is, visual perception and motor function.^[31] It improves *Manasika CancaLatva* (unstable mind) and perks up the concentration of *Manas*.^[6] *Shuddhi Prakriya* (cleansing process) such as *Kapalbhati* (a type of breathing exercise) and *Trataka* (to concentrate on an object) eliminates the *Mala* (wastes) of the body^[30] and also activates *Manas* for proper *Indriyabhigraha Karma* (manoeuvring the acts of senses). Therefore, the supportive role of *Yogic* procedures on zest, concentration and grasping power can be understood. *Yogic* procedures help in regeneration of neural tissues beside producing anti-stress effect;^[32] therefore, attention, concentration power, retaining power and recall memory also get improved for longer time and memory of past heard things can be recalled very quickly. *Yogic* procedures in form of *Satvavajaya Cikitsa* as *Trataka* helps to clear unwanted and negative thoughts and reduces excessive thinking to make one sharp and attentive by balancing *Vata* and thus *Udana Vayu* is controlled, which is responsible for *Smriti*.^[1]

In clinical trials as well as in practice, some therapists consistently achieve better outcomes than others, regardless of the treatment approach used. The approach that brings the positive outcomes is effective counseling or psychotherapy.^[33] During counseling in group A, various interpersonal skills were taken care of during counseling viz. verbal fluency, interpersonal perception, affective modulation, expressiveness, warmth, acceptance, and empathy. The approach was persuasive and convincing. Adequate, acceptable (i.e., compatible interaction with attitudes, values, culture, and worldview of volunteer) and adaptive (i.e., providing means by which the volunteer can overcome his/her difficulties) explanation was given for the volunteer's distress.

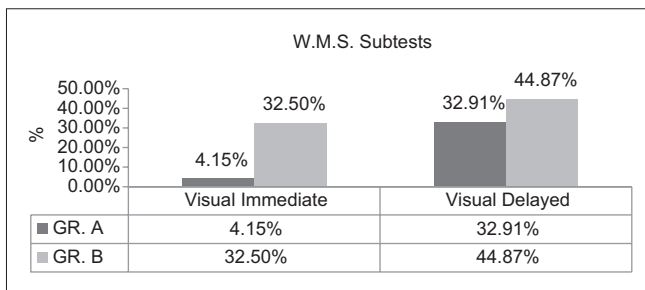


Figure 3: Visual immediate and delayed test result

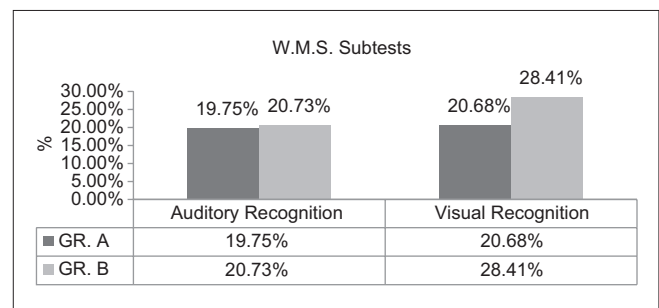


Figure 4: Auditory and visual recognition test result

Table 5: Effect of *Satvavajaya Chikitsa*+placebo (group A) and *Shankhapushpi* tablet on WMS

WMS tests	Paired t-test				Unpaired t-test	
	Group A		Group B		t	P
	t	P	t	P		
VRSP	5.27	<0.001**	3.093	<0.001**	2.07	<0.01*
VRDP	7.52	<0.001**	2.067	<0.01*	2.16	<0.01*
AI	12.17	<0.001**	2.207	<0.01*	7.99	<0.001**
AD	9.50	<0.001**	1.409	<0.10*	4.34	<0.001**
VI	9.83	<0.001**	3.636	<0.001**	2.97	<0.001**
VD	7.43	<0.001**	0.678	<0.10*	5.89	<0.001**
AR	2.66	<0.01*	0.838	<0.10*	2.00	<0.05*
VR	3.54	<0.01*	0.297	<0.10*	2.57	<0.01*

**P<0.001: Highly significant, *P<0.01 or P<0.05: Significant.

WMS = Weschler's memory scale, VRSP = Verbal retention for similar pair, VRDP = Verbal retention for dissimilar pair, AI = Auditory immediate, AD = Auditory delayed, VI = Visual immediate, VD = Visual delayed, AR = Auditory recognition, VR = Visual recognition

Group B (*Shankhapushpi* tablet) [Tables 3 and 4] showed significant result ($P < 0.01$) in comparison to *Satvavajaya Chikitsa* in AD, VD, AR and VR tests [Figures 1 and 4]. *Medhya* and *Tridoshashamaka* (balancing all three body humors) properties of *Shankhapushpi* helps to improve whole memory process that is, *Cintya* (things requiring thought), *Vicarya* (consideration), *Uhya* (logic), *Dhyeya* (attention) and *Samkalpya* (determination) consecutively.^[6] When a person wants to take any decision, he always passes through these five stages namely *Cintana* (thought process), *Vimarsha* (to discriminate good and bad thought), *Tarka* (logical thinking), *Dhyana* (meditation) and *Samkalpa*. The person making firm and fast decision may have powerful capacity of all these five. Here, *Shankhapushpi* via its *Tridoshashamaka* properties and *Vata* (regulator of *Manas*) controlling activity, helped to normalize the *Rajas* and *Tamas* properties of *Manas*. In addition, *Shankhapushpi* raises mental awakening by decreasing *Avarana* over *Manas* because of its properties which in turn improves retention power and *Indriyabhigraha* (to control over all senses) and *Svanigraha Karma* (withdrawal of mind from unwholesome objects) of *Manas*.^[6] As a result, *Manas* can recognize the thing properly and this way *Shankhapushpi* does AR function also.

The probable mode of action of *Satvavajaya Chikitsa* in memory enhancement can be understood by recent reports on effect of different Yoga practices (including cleansing techniques, *Asana*, *Pranayama*, relaxation techniques, vedic chanting and meditation) on improving concentration, self-esteem,^[34-41] neuro-cognitive functions,^[12] attention level,^[42,43] visual and spatial memory,^[13] reducing daily stress and enhancing the academic or professional performance.^[44,45]

To understand the nootropic activity of *Shankhapushpi*, several mechanisms have been postulated: (i) Via increasing acquisition which increases brain protein

content and enhances neuro-peptide synthesis of the brain^[46] (ii) as nervine tonic^[47] (iii) anti-stress activity (due to reduction in exploratory behavioral pattern and suppression of aggressive behavior, reduction in spontaneous motor activity, hypothermia, alterations in the general behavior pattern and potentiation of pentobarbitone sleeping time)^[48] (iv) anti-depressant activity (via its interaction with adrenergic, dopaminergic and serotonergic systems)^[19,49] (v) nootropic effects of flavonoids.^[50] and (vi) potent anxiolytic,^[51,52] anti-acetylcholinesterase and neuroprotective activities.^[47,53]

To sum up, on overall comparison of both therapies, a significant result was found in both groups. *Satvavajaya Chikitsa* found to be better tool to increase memory in immediate response while *Shankhapushpi* respond in long-term memory. Therefore, the value of *Yoga* as an effective memory enhancer cannot be denied and it offers a much safer and affordable therapeutic option in mental ailments.

Limitation of study and future perspectives

In the present study, the sample size was limited and to account for heterogeneity among participants, the trial must be quiet large with a long duration of follow-up to achieve more fair statistical significance. Nevertheless, the outcomes of this study can be considered as lead for further well-stratified studies covering larger population. Future trials with similar nootropic herbs mentioned in classical texts should be encouraged to validate and ascertain the claims of traditional healers and ancient literature. A consorted management approach in psychotherapy by bridging *Aushadhiya Chikitsa* and *Yoga* would be highly desirable, which may explore new dimension of scientific research which is a reliable avenue to have holistic health. Emphasis should also be given toward integrated approach to understand the probable mode of action and mechanistic aspect of *Yoga* and this botanical.

CONCLUSION

Overall results for both the intervention viz. *Satvavajaya Chikitsa* (as *Yoga* therapy) and *Aushadhiya Chikitsa* (*Shankhapushpi* tablet) were significant for all the subtests of WMS. *Satvavajaya Chikitsa* shows remarkable improvement in immediate recollection in terms of short-term memory while *Shankhapushpi* found much better in long-term memory enhancement. Since both therapies also showed improvement in concentration, attention and self-esteem levels among volunteers, thereby enhancing their academic and professional performances, an integrative approach of management would provide a light of hope toward search of ideal treatment for memory impairment. This study

seems to be first of its kind in making comments on short-term and long-term memory. This knowledge once supported by more evidence can be used for population with specific targets.

REFERENCES

- Lanni C, Lenzken SC, Pascale A, Del Vecchio I, Racchi M, Pistoia F, *et al*. Cognition enhancers between treating and doping the mind. *Pharmacol Res* 2008;57:196-213.
- Gazzaniga MS. *The Ethical Brain: The Science of Our Moral Dilemmas* (P.S.). New York: Harper Perennial; 2006. p. 184.
- Beg S, Swain S, Hasan H, Barkat MA, Hussain MS. Systematic review of herbals as potential anti-inflammatory agents: Recent advances, current clinical status and future perspectives. *Pharmacogn Rev* 2011;5:120-37.
- Kajaria D. An introduction to *Sattvavajaya: Psychotherapy in ayurveda*. *Unique J Ayuvedic Herb Med* 2013;01:10-3.
- Murthy AR, Singh RH. The concept of psychotherapy in ayurveda with special reference to *satvavajaya*. *Anc Sci Life* 1987;6:255-61.
- Acharya YT. *Charaka Samhita*. 7th ed. Varanasi: Chaukhambha Orientalia; 2002.
- Mishra V. *Patanjala's Yoga Sutra*. 4th ed. Varanasi: Chaukhambha Orientalia; 2002.
- James HW. *Guide to effective Self Hypnosis*. East Dubuque, IL: Wand Enterprises; 1985.
- William AS. *Implicit Emotional Memory and the Effects of Positive Suggestion during Colonoscopy*. Doctoral Thesis, School of Psychology, University of Leicester; 2011. Available from: <http://www.hdl.handle.net/2381/9889>. [Last accessed on 2014 Sep 30, at 23:28].
- Anonymous. *Guidelines for Counselling Children and Adolescents, A Training Manual for Teachers and SOFIE Club Leaders*, SOFIE Publications, Institute of Education, University of London; 2009. p. 26-30. Available from: http://www.sofie.ioe.ac.uk/materials/SOFIEcounselling%20materials_Malawi.pdf. [Last accessed on 2014 Sep 30, at 22:16].
- Sailer HR, Schlacter J, Edwards MR. Stress: Causes, consequences, and coping strategies. *Personnel* 1982;59:35-48.
- Sharma VK, Das S, Mondal S, Goswami U, Gandhi A. Effect of *Sahaj Yoga* on neuro-cognitive functions in patients suffering from major depression. *Indian J Physiol Pharmacol* 2006;50:375-83.
- Naveen KV, Nagarathna R, Nagendra HR, Telles S. Yoga breathing through a particular nostril increases spatial memory scores without lateralized effects. *Psychol Rep* 1997;81:555-61.
- Wallace RK, Mills PJ, Orme-Johnson DW, Dilbeck MC, Jacobe E. Modification of the paired H reflex through the transcendental meditation and TM Sidhi program. *Percept Mot Skills* 1993;76:1264-6.
- Sethi JK, Nagendra HR, Sham Ganpat T. Yoga improves attention and self-esteem in underprivileged girl student. *J Educ Health Promot* 2013;2:55.
- Lobo SJ, Dudhmal TS, Gupta SK, Bhuyan CB. A randomized comparative trial of Yoga and Naturopathy to reduce occupational stress. *Int J Ayuvedic Med* 2011;2:99-106.
- Prasad GC, Gupta RC, Srivastava DN, Tandon AK, Wahi RS, Udupa KN. Effect of *Shankhpushpi* on experimental stress. *J Res Indian Med* 1974;9:19-27.
- Nahata A, Patil UK, Dixit VK. Effect of *Convolvulus pluricaulis* Choisy. on learning behaviour and memory enhancement activity in rodents. *Nat Prod Res* 2008;22:1472-82.
- Nahata A, Patil UK, Dixit VK. Anxiolytic activity of *Evolvulus alsinoides* and *Convolvulus pluricaulis* in rodents. *Pharm Biol* 2009;47:444-51.
- Sarokte AS, Rao MV. Effects of *Medhya Rasayana* and *Yogic practices* in improvement of short-term memory among school-going children. *Ayu* 2013;34:383-9.
- Hoelzle JB, Nelson NW, Smith CA. Comparison of Wechsler Memory Scale-Fourth Edition (WMS-IV) and Third Edition (WMS-III) dimensional structures: Improved ability to evaluate auditory and visual constructs. *J Clin Exp Neuropsychol* 2011;33:283-91.
- Sharma S. *Rasa Tarangini*. 11th ed. New Delhi: Chaukhambha Sanskrit Sansthana; 2009.
- Amin H, Vyas HA, Vyas MK, Harisha CR. A comparative pharmacognostical and phytochemical study of *Shankhpushpi (Convolvulus pluricaulis)* tablet with *bhavana* and without *bhavana*. *Int J Res Ayuvedic Pharm* 2011;2:1457-60.
- Tennant C. Work-related stress and depressive disorders. *J Psychosom Res* 2001;51:697-704.
- Rasch B, Born J. About sleep's role in memory. *Physiol Rev* 2013;93:681-766.
- Roth T, Costa e Silva JA, Chase MH. Sleep and cognitive (memory) function: Research and clinical perspectives. *Sleep Med* 2001;2:379-87.
- Acharya YT. *Sushruta Samhita*. 7th ed. Varanasi: Chaukhambha Orientalia; 2002.
- Kyizom T, Singh S, Singh KP, Tandon OP, Kumar R. Effect of pranayama and yoga-asana on cognitive brain functions in type 2 diabetes-P3 event related evoked potential (ERP). *Indian J Med Res* 2010;131:636-40.
- Available from: <http://www.yogajournal.com/article/beginners/asanas-for-the-chakra-system/>. [Last accessed on 2014 Sep 30, at 22:16].
- Anonymous. *Hathayogapradipika*. Reprint. Lonavala: Kaivalyadhama Shrimanmadhav; 2002.
- Telles S, Nagarathna R, Nagendra HR. Autonomic changes during "OM" meditation. *Indian J Physiol Pharmacol* 1995;39:418-20.
- Heriza N. *Yoga: A Complete Guide to the Medical Benefits of Yoga (Yoga for Health)*. Los Angeles, CA: Tarcher; 2004.
- Wampold BE. *Psychotherapy: The humanistic (and Effective) treatment*. *Am Psychol* 2007;62:857-73.
- Narasimhan L, Nagarathna R, Nagendra H. Effect of integrated yogic practices on positive and negative emotions in healthy adults. *Int J Yoga* 2011;4:13-9.
- Vandana B, Saraswathy L, Pillai GK, Sunadaram KR, Kumar H. Meditation induces a positive response during stress events in young Indian adults. *Int J Yoga* 2011;4:64-70.
- Ganpat TS, Nagendra HR. Yoga therapy for developing emotional intelligence in mid-life managers. *J Midlife Health* 2011;2:28-30.
- Rani K, Tiwari S, Singh U, Agrawal G, Ghildiyal A, Srivastava N. Impact of *Yoga Nidra* on psychological general wellbeing in patients with menstrual irregularities: A randomized controlled trial. *Int J Yoga* 2011;4:20-5.
- Deshpande S, Nagendra HR, Raghuram N. A randomized control trial of the effect of yoga on Gunas (personality) and Health in normal healthy volunteers. *Int J Yoga* 2008;1:2-10.
- Deshpande S, Nagendra HR, Nagarathna R. A randomized control trial of the effect of yoga on Gunas (personality) and self esteem in normal healthy volunteers. *Int J Yoga* 2009;2:13-21.
- Telles S, Hanumanthaiah B, Nagarathna R, Nagendra HR. Improvement in static motor performance following yogic training of school children. *Percept Mot Skills* 1993;76:1264-6.
- Banquet JP, Bourzeix JC, Lesèvre N. Evoked potentials and vigilance states induced during the course of choice reaction time tests. *Rev Electroencephalogr Neurophysiol Clin* 1979;9:221-7.
- Manjunath NK, Telles S. Improved performance in the Tower of London test following yoga. *Indian J Physiol Pharmacol* 2001;45:351-4.
- Telles S, Reddy SK, Nagendra HR. Oxygen consumption and respiration following two yoga relaxation techniques. *Appl Psychophysiol Biofeedback* 2000;25:221-7.
- Wallace RK, Mills PJ, Orme-Johnson DW, Dillbeck MC, Jacobe E. Modification of the paired H reflex through the transcendental meditation and TM-Sidhi program. *Exp Neurol* 1983;79:77-86.
- Parshad O, Richards A, Asnani M. Impact of yoga on haemodynamic function in healthy medical students. *West Indian Med J* 2011;60:148-52.
- Dandiya PC. The pharmacological basis of herbal drugs acting on CNS. *East Pharm* 1990;33:39-47.
- Sharma K, Arora V, Rana AC, Bhatnagar M. Anxiolytic effect of *Convolvulus*

- pluricaulis* petals on elevated plus maze model of anxiety in mice. *J Herb Med Toxicol* 2009;3:41-6.
48. Dhingra D, Valecha R. Screening for antidepressant-like activity of *Convolvulus pluricaulis* Choisy in mice. *Pharmacol Online* 2007;1:262-78.
 49. Dhingra D, Valecha R. Evaluation of the antidepressant-like activity of *Convolvulus pluricaulis* choisy in the mouse forced swim and tail suspension tests. *Med Sci Monit* 2007;13:BR155-61.
 50. Shiksharathi AR, Mittal S, Ramana J. Systematic review of herbals as potential memory enhancers. *Int J Res Pharm Biomed Sci* 2011;3:918-25.
 51. Barar FS, Sharma VN. Preliminary pharmacological studies on *Convolvulus pluricaulis* chois – An Indian indigenous herb. *Indian J Physiol Pharmacol* 1965;9:99-102.
 52. Mudgal V. Studies on medicinal properties of *Convolvulus pluricaulis* and *Boerhaavia diffusa*. *Planta Med* 1975;28:62-8.
 53. Pawar SA, Dhuley JN, Naik SR. Neuropharmacology of an extract derived from *Convolvulus microphyllus*. *Pharm Biol* 2001;39:4.

How to cite this article: Amin H, Sharma R. Nootropic efficacy of *Satvavajaya Chikitsa* and Ayurvedic drug therapy: A comparative clinical exposition. *Int J Yoga* 2015;8:109-16.

Source of Support: IPGTRA, Gujarat Ayurved University, Jamnagar.
Conflict of Interest: None declared.

Author Help: Reference checking facility

The manuscript system (www.journalonweb.com) allows the authors to check and verify the accuracy and style of references. The tool checks the references with PubMed as per a predefined style. Authors are encouraged to use this facility, before submitting articles to the journal.

- The style as well as bibliographic elements should be 100% accurate, to help get the references verified from the system. Even a single spelling error or addition of issue number/month of publication will lead to an error when verifying the reference.
- Example of a correct style
Sheahan P, O'leary G, Lee G, Fitzgibbon J. Cystic cervical metastases: Incidence and diagnosis using fine needle aspiration biopsy. *Otolaryngol Head Neck Surg* 2002;127:294-8.
- Only the references from journals indexed in PubMed will be checked.
- Enter each reference in new line, without a serial number.
- Add up to a maximum of 15 references at a time.
- If the reference is correct for its bibliographic elements and punctuations, it will be shown as CORRECT and a link to the correct article in PubMed will be given.
- If any of the bibliographic elements are missing, incorrect or extra (such as issue number), it will be shown as INCORRECT and link to possible articles in PubMed will be given.