

EFFECT OF SAHAJ YOGA ON NEURO-COGNITIVE FUNCTIONS IN PATIENTS SUFFERING FROM MAJOR DEPRESSION

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Abstract : Cognitive functions are impaired in Major Depression. Studies on the effects of Yoga on cognitive functions have shown improvement in memory, vigilance and anxiety levels. 30 patients suffering from Major depression (age 18 to 45 years) were randomly divided into two groups: Group 1: (10 males and 5 Females) Patients who practised Sahaj Yoga meditation and also received conventional anti-depressant medication. Group 2: (9 males and 6 Females) Patients who only received conventional anti-depressant medication. Group 1 patients were administered Sahaj Yoga practice for 8 weeks. Neuro-cognitive test battery consisting of Letter cancellation test (LCT), Trail making test 'A' (TTA), Trail making test 'B' (TTB), Ruff figural fluency test (RFFT), Forward digit span (FDS) & Reverse digit span test (RDS) was used to assess following cognitive domains: Attention span, visuo-motor speed, short-term memory, working memory and executive functions. After 8 weeks, both Group 1 and Group 2 subjects showed significant improvement in LCT, TTA & TTB but improvement in LCT was more marked in Group 1 subjects. Also, there was significant improvement in RDS scores in only Group 1 subjects ($P < 0.05$). The results thereby, demonstrate that Sahaj Yoga practice in addition to the improvement in various other cognitive domains seen with conventional anti-depressants, can lead to additional improvement in executive functions like manipulation of information in the verbal working memory and added improvement in attention span and visuo-motor speed of the depressives.

Key words : sahaj yoga major depression neuro-cognitive functions

INTRODUCTION

Major depressive disorder (Unipolar depression) is the most common mood

disorder and is ranked fourth in the list of the most urgent health problems worldwide by W.H.O. with the life time prevalence of depressive disorders of around 10–25% for

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women and 5–12% for men (1). The associated cognitive deficits are frequently viewed as epiphenomena of the disorder and cognitive impairment is likely to be a key factor affecting the subject's ability to function. Cognitive changes in depression span a range of functions, including deficiency in sustained attention, concentration, set maintenance, efficiency of information processing, verbal & non-verbal long term memory, short term retention, visuo-spatial skills and constructional ability (2).

The science of Yoga deals with a man holistically, as this is the only science, which takes into consideration both the 'psyche' and the 'soma' aspects of human framework. Study on the effects of Yoga on cognitive functions has shown improvement in memory, vigilance & anxiety (3, 4). Sahaj Yoga is a form of "Kundalini Yoga" which describes a simple technique to arouse the latent potential of man by a simple meditative process. Sahaj Yoga has shown beneficial effect in the management of Hypertension, Bronchial asthma (5) and epilepsy (6). Previous scientific studies on Sahaj Yoga have also demonstrated its role in reduction in anxiety levels (7), improvement in sensory-motor functioning, reaction time (8) and better autonomic control (9) in healthy practitioners. However, executive functions have not been studied yet and there is paucity of data of the effects of Sahaj Yoga on cognitive functions in patients of Major Depression in whom these functions are affected. Therefore the alternative approaches i.e. Sahaj Yoga with potential cognitive enhancement effects, if any, have been explored in this study.

METHODS

The present study was carried out in the Department of Physiology and Department of Psychiatry, Lady Hardinge Medical College and Smt. Sucheta Kriplani Hospital, New Delhi.

Study design

Thirty patients suffering from Major Depression (19 Males & 11 Females) in the age group of 18–45 years were recruited from out patient services of the Department of Psychiatry, S.S.K.H. and the diagnosis was confirmed independently by two psychiatrists using DSM-IV criteria.

Inclusion criteria

- (i) Patients in the age group of 18 to 45 years utilizing the services of the Department of Psychiatry, Lady Hardinge Medical College with the diagnoses of Major Depression according to DSM-IV criteria.
- (ii) At least six years of formal education.
- (iii) Had not been treated for the current episode of Depression.

Exclusion criteria

- (i) Patients with history of previous or current organic disease.
- (ii) Patients with past history or current evidence of substance dependence.
- (iii) Patients with epilepsy or mental retardation.

- (iv) Patients who were unwilling or unable to participate.

Drop out criteria

- (i) Withdrawal of consent.
 (ii) Exacerbation of symptoms/emergence of newer symptoms.

Experimental design

All the patients were the randomly divided into following groups-

GROUP 1 (n=15) (10 Males and 5 Females) 15 diagnosed patients suffering from Major depression who practiced Sahaj yoga meditation in addition to the conventional antidepressant treatment.

GROUP 2 (n=15) (9 Males and 6 Females) 15 diagnosed patients suffering from Major depression who received conventional antidepressant treatment, but did not practice Sahaj Yoga meditation.

Sahaj yoga meditation

Sahaj Yoga meditation was done for thirty minutes, three times per week for a period of eight weeks by all the subjects of Group 1. To ensure regularity and uniformity in Sahaj Yoga practice, the training of Sahaj Yoga was given in the Department of Physiology, Lady Hardinge Medical College by Sahaj Yogi trained in the art of Sahaj Yoga enunciated by H.H. Shri Mataji Nirmala Devi. The subjects practiced meditation in a quiet, well-illuminated room sitting in a comfortable posture. The technique used for Sahaj Yoga was as described in the literature

(10), (11). A typical session consisted of questions and assertions by the subject. Thereafter, the subjects practiced silent meditation. If a thought came to the mind, they were instructed to simply witness it but not to flow deeper into it. Gradually, with practice the subjects reported to be in a state of "thoughtless awareness". Sahaj Yoga was also practiced at bedtime by sitting in silent meditation with the feet dipped in warm saline water. Group 2 subjects were provided the same environment and attention as Group 1 subjects. However, actual meditation was not practiced by these subjects. The subjects were instructed to simply place their hands at different positions as during Sahaj Yoga practice and thereafter sit quietly with their eyes closed.

Written informed consent was taken from all the subjects. At the start of the study (Pre test value), semi-structured proforma for socio-demographic details was filled in by all the subjects. All the patients were then rated on Hamilton Rating Scale for Depression (HAM-D). Subjects were then assessed on Neuro-Cognitive Test Battery. In the Neurocognitive Battery, the tests were presented to all the subjects in the same order as has been mentioned here :

- Letter Cancellation test.
- Trail making Test 'A'
- Trail making Test 'B'
- Ruff Figural Fluency Test.
- Digit Span Forward and Reverse Test.

The entire assessment took about 2-3 hours. Also, the subjects were not allowed

more than two breaks in the entire session if so desired.

All the above tests were again administered after two months of Sahaj Yoga meditation practice (Post test value at 8 weeks). The data was recorded and analyzed statistically.

Instruments of the study

- *Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (12).*

It is the official psychiatric coding system used in the United States of America and it provides specified diagnostic criteria provided for each mental disorder. These criteria include a list of features that must be present for a diagnosis to be made. These criteria increase the reliability of clinicians' process of diagnosis. It was due to this reason of high specificity that this instrument was used to confirm the diagnosis of major depression in this study.

- *Hamilton Rating Scale for Depression (HAM-D) (13).*

This scale consists of 17 variables with ratings from 0 to 4 for certain variables such as depressed mood, guilt, suicidal tendencies, work and interests whilst other variables like insomnia, agitation, and general somatic symptoms are rated from 0 to 2. The individual scores for each variable are to be added to provide for a cumulative score for the patient. It is used for quantifying the results of an interview. Reliability is good to excellent, including internal consistency and inter-rater assessments. Validity appears

good on correlation with other symptom measures. Thus, it was included in this study to rate the depressive component in the patients suffering from major depressive disorder.

- *Neurocognitive Test Battery :*

In order to facilitate replication, only tests available and frequently documented in the neuropsychological literature were employed (14).

➤ *Letter Cancellation Test :*

This test assesses visual scanning, response speed and sustained attention. The subject is presented with letters of English alphabet, and is instructed to cancel out specific letters. The score is the time taken by subject to actually perform this task. In addition, the numbers of different errors (omissions and commissions) done by the subject are also counted.

➤ *Trail Making Test :*

Part A : assesses visuomotor speed and attention. The subject is instructed to draw a straight line to connect 25 consecutive circles. The score is the time taken by the subject to complete the task.

Part B : In addition to visuomotor speed and attention, it requires the patient to shift strategy and hence, is a sensitive measure of executive function as well. In this the subject is instructed to connect 25 numbered and lettered circles by alternating between the two sequences. The score is the total time taken by the patient to complete the task.

➤ *Ruff Figural Fluency Test :*

This test permits us to study the non-verbal fluency of a subject, which is an indirect measure of subject's ability to form a strategy to complete a given task. The subject is presented with a sheet of paper on which 40 boxes are present. The objective is to draw dissimilar patterns in these boxes by joining dots present in these boxes in a specified period of time. The score is based on total number of dissimilar patterns, and number of perseverations. The rotations were also noted in this test along with Patterns and Perseverations as Rotations are considered to be the hallmark in the strategic approach (A measure of executive function).

➤ *Digit Span :*

Digits Forward : assesses immediate verbal memory span. In the test, subjects must repeat back sequences of digits of increasing length read out by the examiner. The score is maximum number of digits that the patient can recall.

Digits Backward : In addition to auditory attention and short-term retentive capacity this test also assesses the ability to manipulate information in the verbal working memory (and hence is sensitive measure of executive function). The subject has to repeat the sequences of numbers of increasing digit length in reverse order to what was said by the examiner. The score is the maximum number of such digits that the patient is able to reverse.

Statistical analysis

For each group, Mean and Standard Deviation of the scores were calculated.

Inter-group means differences in Hamilton Rating Scale for Depression & neuro-cognitive test parameters were tested for significance by using Students' 't' test. For intra-group comparisons of neuro-cognitive test parameters, Wilcoxon Signed Rank test was used. Chi-square test was used to compare the sex-distribution, modified Kuppuswami socio-economic scale and drug regimes. The interpretation of 'P' values was as follows :

P>0.05 - not significant. P<0.05 - Significant. P<0.01 - Highly significant. P<.001 - Very highly significant.

RESULTS

The subjects' characteristics and their relevant clinical data are shown in Table I. Table I demonstrates that patients in both Group 1 and Group 2 had no statistically significant differences in the age and sex distribution. Revised Kuppuswami's scale was

TABLE I: Showing subjects' characteristics and clinical data.

<i>Parameters</i>	<i>Group 1 (n=15)</i>	<i>Group 2 (n=15)</i>
Age (yrs) (Mean±S.D.)	31.87±8.78	31.67±8.46
Gender		
• Females	5	6
• Males	10	9
Socio-economic status		
• Upper	0	0
• Middle (upper & lower)	12	11
• Lower	3	4
Drug Regimen		
• T.C.A.	9	8
• S.S.R.I.	6	7
HAM-D (Mean±S.D.)	21.27±4.35	19.47±3.98

T.C.A. : Tri Cyclic Anti-depressants.

S.S.R.R.I. : Selective Serotonin Reuptake Inhibitors.

TABLE II: Showing changes in HAM-D scores and Neuro-cognitive test parameters from pre-test to post-test in Group 1 and Group 2 subjects. (Mean±S.D.)

Parameters	Group 1 (n=15)	Group 2 (n=15)
➤ HAM-D		
➔ Pre	21.27±4.32***	19.47±3.98***
➔ Post	8.27±4.37	11.53±4.26
% Change	-60.85±4.97	-42.01±2.81**
➤ Letter cancellation test		
• Time (sec)		
➔ Pre	147.73±29.27**	152.6±35.36*
➔ Post	133.67±32.59	137.8±32.81
• Omissions		
➔ Pre	8.33±5.29**	7.93±5.31*
➔ Post	5.73±4.95	5.93±3.59
• Commissions		
➔ Pre	0.13±0.35	0.4±1.06
➔ Post	0±0	0.13±0.35
➤ Trail making test 'A' (sec)		
➔ Pre	116.8±44.91*	120.07±39.82*
➔ Post	108.4±40.79	113±34.35
➤ Trail making test 'B' (sec)		
➔ Pre	200.6±53.94**	188.13±55.59**
➔ Post	169.2±53.92	166.2±55.74
➤ Ruff figural fluency test		
➔ Pre	12.93±8.51	11.6±8.49
➔ Post	13±6.36	12.53±8.39
• Rotations		
➔ Pre	3.33±2.85	2.6±2.67
➔ Post	3.4±2.69	2.8±2.11
• Perseveration		
➔ Pre	23.73±10.42	26±9.82
➔ Post	23.6±8.38	24.67±9.8
➤ Forward digit span test		
➔ Pre	4.67±0.82	4.93±0.96
➔ Post	4.87±1.13	4.8±0.86
➤ Reverse digit span test		
➔ Pre	3.2±0.68*	3.27±0.88
➔ Post	3.47±0.64	3.47±1.19

Wilcoxon Signed Ranked Test (Pre vs Post). Post Hoc Comparison: Group 1 vs Group 2 - Non significant.

used for determining socio-economic status of the two groups. Both the groups had the majority of patients from middle socio-economic group and no significant difference was found in socio-economic status of the two groups. Table I also shows no significant differences in the number of patients receiving anti-depressants (T.C.A.'s and S.S.R.I.'s). Also, there were no significant differences in base-line (Pre-test) HAM-D scores in the patients of Group 1 and Group 2. So, the two Groups were comparable for the study. Table II demonstrates percentage reduction in HAM-D scores at 8 weeks was significantly more in Group 1 patients than in Group 2 patients (P=0.003). Also, there is more significant change in number of Omissions and Letter cancellation time in Group 1 subject as compared to Group 2 subjects. Significant improvement is seen in Trail making Test 'A' & Trail making test 'B' in both the groups with no inter-group differences. No significant change is seen in Ruff figural fluency test and Forward digit span test in both the groups while there is significant improvement in Reverse digit span test in only Group 1 subjects with no change seen in Group 2 subjects.

DISCUSSION

In the present study, two groups were well matched for age, sex, socio-economic status and drug regime and there was no significant difference in the base line (Pre-test) HAM-D Scores and neuro-cognitive profile of the patients of two groups. So, the two groups were comparable for the study.

Executive functions are performed by Pre-frontal networks which include dorso-lateral prefrontal, medial prefrontal and orbitofrontal components and the sub-

structures with which they are interconnected (i.e. head of caudate and dorso-medial nucleus of thalamus) (15). Dorso-lateral prefrontal cortex (dlpfc) and anterior cingulate cortex plays a uniquely critical role in orchestrating working memory, attention and attentional set-shifting strategies (16, 17).

Previous studies have shown that depression affects the acquisition, memorization, and retrieval of effortful information but spares automatic learning (18, 19) which demonstrates that executive functions and attentional mechanisms are selectively affected by depression (20). This is consistent with the association between depressive mood and activity in the prefrontal and cingulate cortices in neuro-imaging studies (21, 16). Neuro-imaging studies have implicated left dlpfc and orbito-fronto-ventral region as major sites of functional and structural abnormalities in major depression with marked decrease in neuronal and glial density in these regions (22). So, there is a conclusive scientific evidence to demonstrate the impairment of frontostriatal circuitry (Prefrontal network) in the patients of Major depression due to which they lack in their ability to perform the neuro-cognitive tests of attention and executive functions when compared with healthy control subjects.

After 8 weeks of intervention (post test), there was significant reduction in the scores on Hamilton Rating Scales for Depression in both Group 1 (Antidepressants and Sahaj Yoga) ($P < 0.001$) and Group 2 (on Antidepressants only) ($P < 0.001$). However, percentage reduction in HAM-D scores at 8 weeks was significantly more in Group 1 patients than in Group 2 patients ($P = 0.003$). These findings demonstrate the additional

antidepressant effects of Sahaj Yoga in the management of patients of Major depression. The importance of these findings has been discussed in details in our previous study (23).

Also, after 8 weeks of intervention, there was significant decrease in number of omissions in both Group 1 and Group 2 patients in the Letter Cancellation Test, however, change was significantly more in Group 1 ($P = 0.002$) as compared to Group 2 patients ($P = 0.03$). Similarly, more marked improvement was seen in Letter cancellation time in Group 1 ($P = 0.006$) as compared to Group 2 patients ($P = 0.01$). There was significant improvement in Trail making test 'A' in both Group 1 ($P = 0.019$) and Group 2 ($P = 0.017$) patients with not much difference in between the groups. Significant improvement was also seen in Trail making test 'B' in both Group 1 ($P = 0.002$) and Group 2 ($P = 0.002$) patients with not much difference in between the groups. In Ruff Figural Fluency test and Forward Digit Span test, no significant improvement was seen in either of the groups. However, there was significant improvement in Reverse Digit Span Test only in Group 1 patients ($P = 0.04$) with no change seen in Group 2 patients.

So, our findings demonstrate that there is significant improvement in many cognitive domains of attention and executive functions in Group 2 patients, which can only be attributed to the effect of conventional antidepressant medication. Many authors (24, 25) have also reported this improvement in some neuro-cognitive functions with recovery of mood. They have reported that many cognitive deficits, but not all remit upon recovery. Remittance from cognitive impairment in depressives is vitally important, as it is likely to be a key factor affecting

their ability to function occupationally and hence, the timing of their return to work (17).

Our findings also show that Sahaj Yoga practice by Group 1 patients leads to added improvement in attention span, concentration, visuo-motor speed in Group 1 subjects and there was improvement in the executive functioning of verbal working memory, auditory attention & short-term retentive capacity in only Group 1 patients. These findings demonstrate further cognitive enhancement effect in Group 1 depressive subjects (Antidepressants and Sahaj Yoga) on few more executive functions in depressive patients when compared with Group 2 subjects (on Antidepressants only) and these additional beneficial effects can be attributed to the Sahaj Yoga meditation practice by Group 1 subjects.

So, our study shows that although anti-depressants cause improvement in many cognitive domains of attention and executive functions in patients of major depression and remain the main-stay of treatment for the depressive patients, Sahaj Yoga practice by depressive patients can play adjunctive role along with conventional anti-depressant treatment in causing cognitive enhancement in a few additional executive functions and hence, in management of depressive disorders. Sahaj Yoga meditation practice by depressive patients can help in better functioning and earlier rehabilitation of these patients. Our study is in agreement with recent studies conducted on Sudarshan Kriya Yoga which have demonstrated its efficacy in the management of dysthymia,

melancholia and depression (26, 27).

The mechanism by which Sahaj Yoga helps in the management of depression cannot be deciphered from the present study. According to Sahaj Yoga literature, actualization of Kundalini awakening (by Sahaj Yoga) takes place in the Limbic system, giving rise to bliss, deep relaxation and vibratory awareness of cool breeze flowing from the palms and top of the head. It is well known that limbic system has hypothalamus as its major substation (28). Probably, Kundalini awakening conditions the limbic system which modulates the activity of hypothalamic-hypophyseal-adrenal axis. This brings about a better neuroeffector communication thereby, affecting expression of neurotrophic factors, modulating the neurotransmitters like serotonin, nor epinephrine and bringing about an improvement in different cognitive domains in patients of depression.

In the present study, it was not possible to attempt double blind conditions. Ethical constraints also limited the use of a drug free group or placebo group. Therefore, the results can be considered to be preliminary and be viewed with caution of potential rater bias. However, no significant clinical side effects (confusion, CVS accidents, hypomaniac switch etc.) occurred with Sahaj yoga practice in the study. Further research is indicated for longer period and on larger sample size to define the relative place for Sahaj Yoga in the clinical management of depressive disorders. Comparative studies with other forms of Yoga are also required.

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