

Article

Effect of Yoga & Meditation on Consciousness & Mindfulness

Sona Ahuja*

Dayalbagh Educational Institute, India

Abstract

The effect of yoga and meditation on consciousness and mindfulness were examined comparing beginners, intermediate, advanced meditators and a group of non-meditators. The three experimental groups improved from pre-test to post-test compared to control group, highlighting the benefits of yoga and meditation on consciousness and mindfulness. Consciousness of advanced meditators was highest in comparison to other groups at pre-test. Consciousness and mindfulness of beginners increased at a faster rate over time. Further, the effect of intervention was examined on physical, emotional, cognitive, social, spiritual and self-consciousness. There was significant increase in social and self-consciousness after 11 weeks of intervention whereas physical and emotional consciousness increased significantly post intervention which was for 20 weeks. Although there was increase in cognitive and spiritual consciousness but it was not significant. A longer duration of practice may prove helpful for betterment of these faculties.

Key Words: Yoga, meditation, physical consciousness, emotional consciousness, mental consciousness, social consciousness, self-consciousness, spiritual consciousness.

Introduction

Consciousness has been discussed in the last century from varied perspectives ranging from general to domain specific viz. self-consciousness, spiritual consciousness, emotional consciousness, etc. It has become a significant topic of research by neuro-scientists and cognitive scientists in recent years. While the science of consciousness in ancient India as given in Vedas and Upanishads dates back to second millennia B.C.; it is over the past 50 years or so there has been considerable interest in the modern science in the West, in terms of cognitive psychology and neuro-science (neuro-physiology or neuro-medicine) in studying the consciousness (Satsangi, 2010). Neuro-scientists relate consciousness to the brain whereas in modern scientific psychology, the mind is largely equated with consciousness. There is also scientific and philosophical research into the nature and basis of consciousness (Baars, Banks & Newman, 2003; Chalmers, 1996; Crick, 1984; Dennett, 1992). Philosophers sometimes use the technical term 'qualia' to refer to the subjective texture of experience (Dennett, 1988; Chalmers, 1996). Psychologists also claim that consciousness is a subjective experience (Brazdau & Mihai, 2011; Charlton, 2000).

In the past decades, attempts have been made to psychological theorizing of this concept, identifying research methods to define and assess consciousness and to apply statistical methods

*Correspondence: Sona Ahuja, PhD, Dayalbagh Educational Institute, India. sonaahujadei@gmail.com

to quantify it. The subjective knowledge of human sentient entities, if based on facts and correct application of indicative reasoning, should not, even in the abstract, be, relegated to the category of illusions (Satsangi, 2013). The conscious processes can be operationally defined and it has been proved that consciousness can be researched as a variable (Baars, Banks, Newman, 2003; Brazdau & Mihai, 2011). The present scenario of research in consciousness reflects attempts to find the neural and psychological correlates of consciousness. The factors influencing consciousness and factors influenced by consciousness are being studied. In laboratory settings, neuro-scientists are also making efforts to study consciousness of meditators. Meditation holds an important place in experimental framework of consciousness research as it is believed to trigger altered states of consciousness (Lutz, Dunne, & Davidson, 2007; Thompson, 2006; Varela, Thompson, & Rosch, 1999). Scientific interest in meditation also reflect a recent shift in cognitive science toward viewing the integration of consciousness and first-person experience as a valuable object of scientific investigation (Braboszcz, Hahusseau, Delorme, 2010). When meditative awareness deepens—with aid of meditation and other practices (Goleman, 1988)—altered states and psychic phenomena become more common (Wade, 1996). There are different types of meditative practices but self-regulation of attention is the most common among all of them. In the West, the word meditation means a concentrated state of mind in serious reflection. In the East, however, meditation does not mean thinking at all but fixing the mind in a spiritual ideal, to be one with it, or the thought-process dissolving in the consciousness of it. The effect of various meditational practices including transcendental meditation, mindfulness, focused attention, loving kindness meditation, etc. is studied on different domains.

In eastern philosophy, yoga is associated with meditation for spiritual practices. Yoga is a commonly known generic term for physical, mental, and spiritual disciplines which originated in ancient India. In a national survey, long-term yoga practitioners in the United States reported musculo-skeletal and mental health improvements (Birdee, Legedza, Saper, Bertisch, Eisenberg, and Philips, 2008). By practicing yoga, a person is supposed to reach a state of mental equanimity, where responses to favorable or unfavorable external events are well under the individual's control, and responses are moderate in intensity. The science of yoga is a powerful stream of knowledge, which enables the practitioners to achieve radiant physical health, serene mind, continues spiritual uplift, and creates the ability for harmonious social living (Telles, Nagrathna & Nagendra, 1998). Cognitive behavioural therapy and yoga is reported to significantly reduce the stress levels (Granath, Ingvarsson, von Thiele & Lundberg 2006; Smith, Shelley, Dalen, Wiggins, Tooley, and Bernard 2008). Yoga can effectively improve memory after 6 months of practice, along with psychophysiological measurements related to anxiety, depression and stress in healthy subjects (Rocha, Ribeiro, Rocha, Sousa, Albuquerque, Ribeiro, Silva, 2012). Dunn, Hartigan and Mikulas (1999) compared OM and Focused Attention practices with a relaxation control: each produced 'unique frequency patterns,' suggesting that they represent different forms of consciousness, not simply degrees of relaxation.

There have been a number of studies focused on reduction in stress levels, increased processing capacity of visual system, attention regulation and other beneficial effects of yoga and meditation. None of these studies look specifically at the effect these practices have on consciousness, with experimental control. Consciousness may also be influenced by yoga and meditation. This hypothesis is tested in the present study. With the advancement of research in psychology and consciousness studies, consciousness of meditators can be studied using

psychometric tools. Brazdau(2008) introduced Consciousness Quotient (CQ) Theory and developed Consciousness Quotient Inventory (Brazdau, 2009). This is a new concept in researching consciousness as a variable. The psychometric properties of this inventory (CQ-i) was further established (Brazdau, 2012). Consciousness Quotient, along with a psychological and anthropological perspective allows the measurement of consciousness quotient(Brazdau, 2008).

Satsangi (2012) proposed HOT Consciousness – SCANE correlates, where HOT stands not for Higher Order Thought (Gennaro, 2012) but Hierarchical Order Theory of Consciousness and SCANE stand for Spiritual-Cognitive and Neural-Environmental Correlates. This theory is based on spiritual system modeling in cosmology which is generalization to physical system theory (Satsangi, 2006). These theoretical model predictions are scientifically verified using Fuzzy Analytical Hierarchy Process (AHP) and Interpretive Structural Model (ISM) (Satsangi & Sahni, 2012). It is consistent with the modern science. The meditational practices of oriental philosophy of Saints or cosmology of Radhasoami Faith is based on this systemic analytic framework for hierarchization of consciousness.

The present study examined whether the experimental intervention of yoga and meditation based on Hierarchical Order Theory of Consciousness, increased consciousness. To further assess the impact of intervention, it was examined whether the intervention had any effect on self-reported mindfulness. This approach allows the additional investigation of relation between mindfulness and consciousness.

Method

Participants

Sixty participants took part in the experiment. The participants were applicants of yoga and meditation program offered for twenty weeks. Consent was sought from the applicants for the intervention. The age-range of the participants was 17 to 70 years ($M=38.82$, $SD=11.64$) Four groups of 20 each were formed including, 3 experimental groups and one control. The groups did not differ with respect to gender (11males and 9females in each group). Experimental group had three set of subjects as stratified samples viz., pre-initiates(beginners) - those who were not trained for any meditational practices prior to experiment, first initiates (intermediate meditators) - those who were trained for contemplation of divine form at the seat of spirit(between two eyes), second initiates (advanced meditators) - those who were trained for sound practice which consists in concentrating attention at the seat of the spirit and establishing contact with the current of Sabda or mystic word.

Intervention

The experiment was in the form of practice of yoga and meditation for 20 weeks. The practice sessions (one hour) were held on weekdays in the evening for three days a week under the guidance of experienced practitioner. These were conducted by yoga instructor with 10 years of

experience and a facilitator with 30 years of experience in teaching meditation. Each day, the programme commenced with a brief 15 minutes lecture covering different topics to reinforce the subjects for meditation. The topics included body, mind, spirit and consciousness; cosmology; spiritual awakening; nerve centres, chakras, kamals and padmas; attunement with spiritual sounds; main object of meditation and ways to establish contact with the source of spirituality. This was followed by yoga. Seven yogasanas were included in the intervention programme for relaxation Siddhasan, Sarvangasan, Bhujangasan, Paschimottanasan, Padahastasan, Ardhamatsyendrasan and Shavasan. These asanas were selected for relaxation and preparation of body for meditation. After yogasana, the practice of meditation was modeled on practices of oriental philosophy of Saints (Radhasoami Faith). These meditational practices are based on Hierarchical Order Theory of Consciousness(Satsangi, 2013).

Materials and Procedure

The multiple measure design was used as detailed in Table 1. Consciousness Quotient Inventory (CQ-i) was administered in pre-test, mid test and post-test. The CQ-i (Brazdau, 2012) evaluates the global consciousness level of an individual. The construct of CQ-i is based on 6 factors: Physical Consciousness Emotional Consciousness, Cognitive Consciousness, Spiritual Consciousness, Social – Relational Consciousness, Self-Consciousness; and also provides a general consciousness quotient. The secondary factors of CQ-i are internal state awareness, self-reflectiveness, mindfulness, autonomy, personal growth, positive relations with others, purpose in life, verbal expression, and openness toward new experiences. The inventory has 62 items, with the responses evaluated on a six point equal appearing type Likert Scale ranging from 1(strongly disagree) to 6(strongly agree). It has 8 reverse items. The reliability analysis of tool, has a more than satisfactory internal consistency (N=62, Cronbach's Alpha =.920). CQ-i does not measure consciousness directly, but through inference from behaviours and applied life principles that are indicators for conscious awareness experience (Brazdau, 2013).

The Frieberg Mindfulness Inventory (FMI) was used to assess mindfulness of participants. FMI is a 14-item inventory that measures the experience of mindfulness (Walach, Buchheld, Butenmuller, Kleinknecht, & Schmidt, 2006). It is a psychometrically valid instrument with high internal consistency, Cronbach alpha = .93 (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2007). Each item is rated on a four-point scale ranging from 1(rarely) to 4(always). Higher scores on FMI indicate a greater degree of mindfulness. FMI was administered at the end of Phase I and Phase II as mentioned in Table 1.

Table 1. Overview of Procedure

Stage of the Study	Activity	Timing
Pre-intervention	Pre-test measure (CQ-i)	After seeking consent from participants to participate in the study
Phase I	Practice of Yoga and Meditation/ control condition	Three days a week (one hour each day - for 11 weeks)
	Mid test measures (CQ-i, FMI)	After 11 weeks of Practice of Yoga and Meditation
Phase II	Practice of Yoga and Meditation/control condition	Three days a week (one hour each day) for 9 weeks
Post-intervention	Post test measure (CQ-i, FMI)	After 20 weeks of intervention

Results

Data was analyzed using Statistical Package for Social Sciences, Version 16.0. The *p* values are reported for all effects and effect sizes are reported as *d*, *r* calculated from *t*, *z* values respectively and eta-squared for *F*-value (Fritz, Morris and Richler, 2012).

Consciousness Quotient Inventory

The consciousness scores over three measures are presented in Table 2. The analysis of scores on baseline measure shows there were no differences between experimental and control group ($t=1.07$, $p=.28$). A major purpose of this study was to examine the effect of yoga and meditation on consciousness over time. There was effect of experiment over time, $F(2, 36) = 3.37$, $p = .038$, $\eta^2 = .06$ and no change in control group, $F < 1$.

The experimental group improved from pre-test to mid-test ($t=3.400$, $p=.002$, $d= 0.55$). The improvement in this group was also observed in post-test ($t = 3.135$, $p=.003$, $d = 0.51$) from the baseline measure (Fig. 1). The control group showed no significant difference from initial scores to mid-test measure ($t= 0.58$, $p=.567$) and to post-test measure ($t=.021$, $p=.983$).

Table 2. Consciousness scores over repeated measures

Group	Pre-test		Mid-test		Post-test	
	M	SD	M	SD	M	SD
Control	270.30	24.99	272.90	23.22	270.20	27.96
Experimental	261.11	34.39	278.93	30.13	278.64	33.69

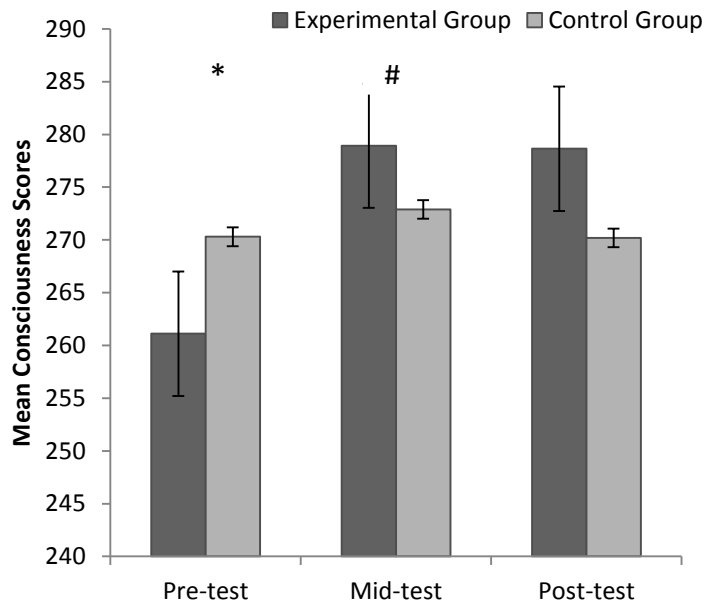


Figure 1. Consciousness scores of experimental and control group over repeated measures. The error bars represent standard errors. * $p = .002$ and # $p = .003$ compared to baseline measure.

For experimental group, the participants’ meditation training before intervention could potentially affect results. Hence stratified random assignment was done to control this variable. The mean scores of these groups are presented in Table 3. The strata-wise gain in scores over time is reflected in fig. 2. The analysis shows that post intervention there is significant increase in consciousness of pre-initiates ($z = 2.04, p = .041, r = .58$) and first initiates ($z=2.35, p = .01, r = .71$). Although there is increase in mean consciousness scores of second initiates but the difference is not significant, $z = 1.42, p = .15$.

Table 3. Strata-wise Means (standard deviations) of consciousness scores over repeated measures

	Pre-test	Mid-test	Post-test
Pre-initiates	241.75 (39.59)	267.75 (29.02)	264.25 (29.13)
First initiates	262.62 (26.30)	278.46 (27.49)	279.62 (26.05)
Second initiates	280.45 (26.87)	289.82 (32.73)	293.18 (41.73)

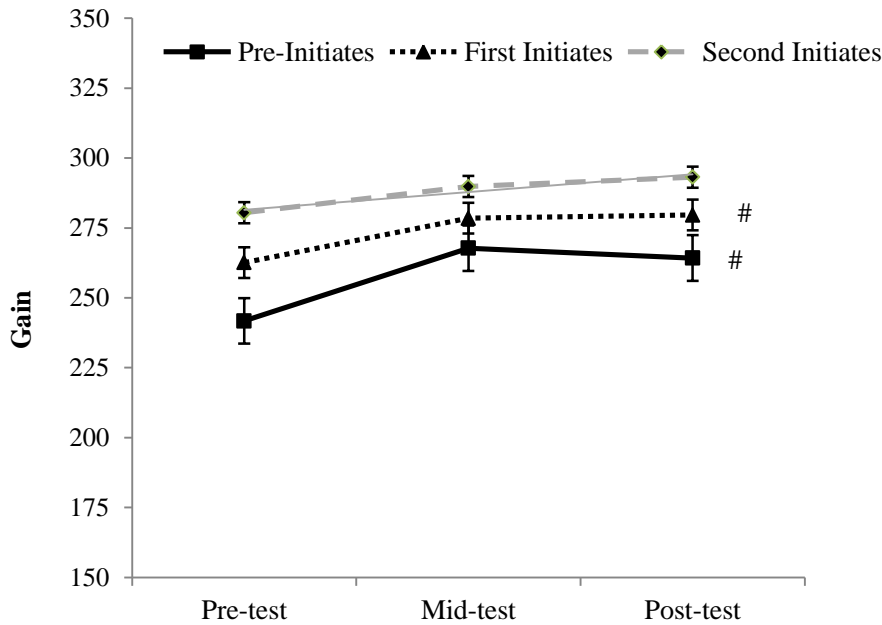


Figure 2. Gain in consciousness scores over pre-test, mid-test and post test of pre-initiates, first initiates and second Initiates. Error bars reflect the standard errors.
 # p <.05 compared to baseline measure.

In order to find the change in specific dimension of consciousness as a result of experiment, the scores were analyzed dimension-wise (Table 4). There is significant increase in consciousness scores for some dimensions from pre-test to post-test (Fig. 3). The difference in mean consciousness score in pre-test and post test is not significant for mental consciousness ($t=0.76$, $p=.45$) and spiritual consciousness ($t=0.63$, $p=.52$). There is significant increase in scores of social consciousness ($t=3.53$, $p=.001$, $r =.73$) and self consciousness ($t=2.56$, $p=.015$, $d = .47$) from pretest to mid-test. Also, the difference in scores is significant from pretest to posttest for social consciousness ($t=4.56$, $p=.000$, $d = .80$) and self consciousness ($t=3.11$, $p=.004$, $d = .61$). The difference in pretest and mid-test scores is not significant for physical consciousness ($t=1.87$, $p=.070$) and emotional consciousness ($t=1.88$, $p=.070$). There is significant gain in the scores of physical consciousness ($t=2.28$, $p=.029$, $d = .43$) and emotional consciousness ($t=2.57$, $p=.015$, $d = .36$) from pre-test to post-test.

Table 4. Means (standard deviations) of consciousness scores for different dimensions

Dimensions of Consciousness	Pre-test	Mid-test	Post-test
	M (SD)	M (SD)	M (SD)
Physical	33.44 (5.68)	35.78 (6.54)	35.97 (6.00)
Emotional	42.08 (6.18)	44.08 (5.22)	44.36 (6.28)
Mental	37.50 (6.07)	39.67 (6.43)	38.69 (8.65)
Spiritual	57.81 (9.58)	59.44 (9.32)	58.69 (10.13)
Social	38.89 (6.47)	43.78 (6.85)	44.19 (6.67)
Self	51.39 (9.90)	55.61 (7.79)	56.72 (7.23)

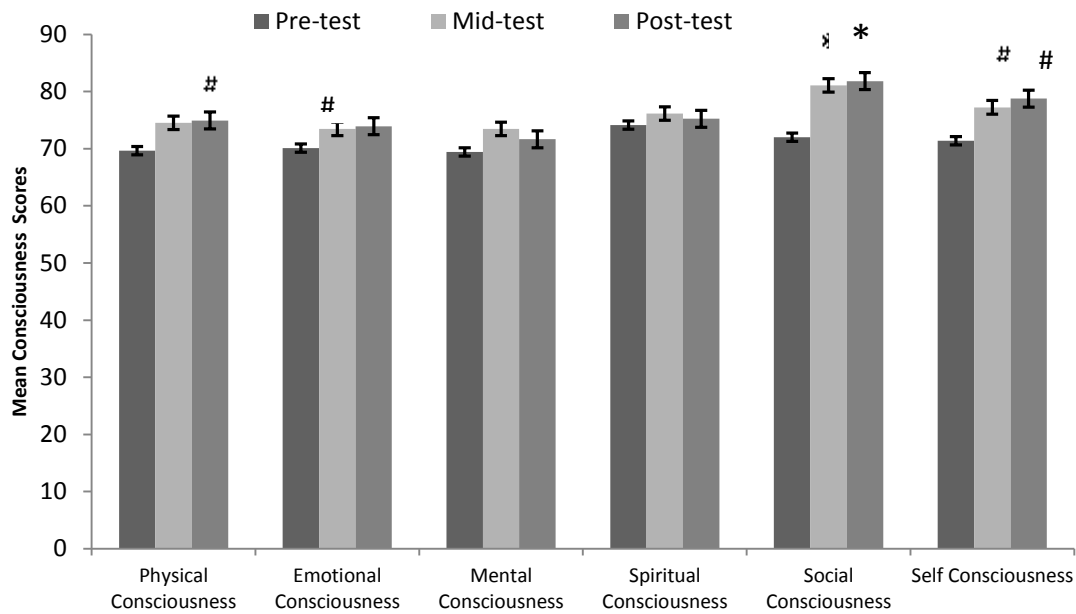


Figure 3. Dimension-wise mean consciousness scores of experimental group in pre-test, mid-test and post test. Error bars reflect the standard errors. * $p < .001$ compared to baseline measure. # $p < .05$ compared to baseline measure.

The analysis of scores on FMI in two phases is presented in Table 5. The first phase was 11 weeks of yoga and meditation practice and second phase was 20 weeks of intervention. The difference in mean scores on FMI of control group in phase I and phase II is not significant ($t = 0.72, p = .48$). There is significant difference in mindfulness scores of experimental group in Phase I and Phase II ($t = 2.41, p = .021, d = 0.35$). Fig.4 reveals that there is effect of experiment on mindfulness ($t = 2.16, p = .036, d = 0.59$).

Table 5. Mindfulness scores of participants

Group	Phase I		Phase II	
	M	SD	M	SD
Control	39.05	4.66	39.65	4.44
Experimental	40.44	6.687	42.56	5.43

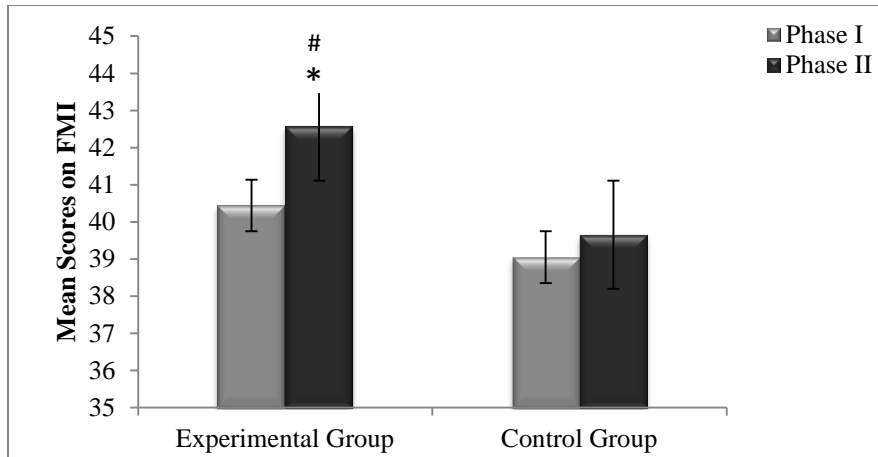


Figure 4. Mean scores of experimental and control Group on Freiburg’s Mindfulness Inventory (FMI). Error bars reflect the standard errors. * $p < .05$ compared to phase I. # $p < .05$ compared to control group.

Table 6 presents strata-wise mindfulness scores. There is significant difference in the scores on FMI of pre-initiates in Phase I and Phase II ($z=1.99$, $p = .046$, $r = .29$). The difference in mindfulness scores of first and second initiates is not statistically significant. Fig.5 reveals that although there was notable difference in mindfulness of pre-initiates from first and second initiates in phase I of experiment, but in phase II this difference has reduced to a considerable extent.

Table 6. Strata-wise Means (standard deviations) of mindfulness scores

Group	Phase I	Phase II
	M (SD)	M (SD)
Pre-Initiates	37.91 (6.00)	41.09 (4.39)
First Initiates	39.67 (7.18)	42.07 (5.44)
Second Initiates	44.40 (5.21)	44.90 (6.19)

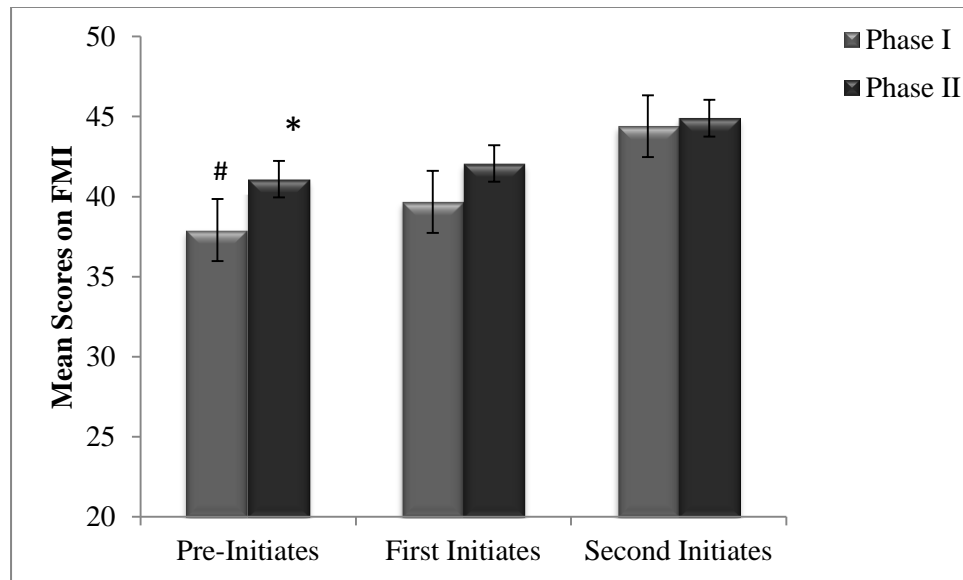


Figure 5. Mean scores on FMI of pre-Initiates, first initiates and second initiates in phase I and phase II of experiment. Error bars reflect standard errors. * $p < .05$ as compared to phase I. # $p < .05$ compared to second initiates.

Further, to examine the relationship between mindfulness and consciousness a correlational approach was employed. The analysis reveals that mindfulness scores are positively correlated to all dimensions of consciousness. There is significant correlation of mindfulness scores with mental consciousness ($r = 0.43$, $p = .009$), social consciousness ($r = 0.39$, $p = .019$), self consciousness ($r = 0.35$, $p = .040$) and spiritual consciousness ($r = 0.34$, $p = .045$). The correlation of mindfulness scores with physical consciousness ($r = 0.15$, $p = .393$) and emotional consciousness ($r = 0.26$, $p = .125$) is not significant. The overall scores of mindfulness and consciousness have significant correlation ($r = 0.44$, $p = .036$).

Discussion

In summary, the results of the study indicate that the practice of yoga and meditation increased the consciousness and mindfulness of individuals. Importantly, the practice has considerable effect on all dimensions of consciousness over time. The impact is more and relatively immediate on social and self-consciousness. Thus, an individual becomes more aware about self as a person and is able to connect oneself with others. Also, initially after ten weeks of practice, the practitioners did not show significant change in physical and emotional consciousness but there was significant increase in these dimensions of consciousness after 20 weeks of practice of yoga and meditation. Though the difference in mental and spiritual consciousness was not significant even after 20 weeks, but there was increase in these dimensions also. A longer duration of practice may have significant effect on mental and spiritual consciousness. Further, the naïve practitioners showed significant gain in consciousness scores after practice of 20 weeks in comparison to those who had exposure to the practice of yoga and meditation. It may be possible that for more gain in consciousness scores, regular practice at length is required. The

study highlights that the practice of yoga and meditation is more effective for pre-initiates who are not trained for any meditational practice. The consciousness of experienced practitioners also increased considerably with the regular practice of yoga and meditation.

These findings corroborate the results of previous studies that report meditation promotes both physical and mental wellbeing and contributes to the development of positive emotional traits (Brown & Ryan, 2003). The regular yoga practice is reported to improve aspects of cognition and quality of life for healthy individuals (Rocha, et al., 2012). The workers reported feeling happier, with a renewed sense of enthusiasm for their life and work after eight weeks of meditation training and practice (Davidson & Lutz, 2008). Meditation effects are conceptualized as a function of the cognitive-attentional processes that are engaged (Austin, 2006; Bishop et al., 2004). Also, in line with the results of present study, it has been reported that experienced meditators generally score higher than novices on most attention measures, including selective (Hodgins and Adair, 2010), executive (Moore and Malinowski, 2009) and sustained attention (Jha, Krompinger and Baime, 2007). Researchers looking at individuals engaging in Focussed Attention meditation found that expert practitioners with an average of 19,000 practice hours displayed more activation in the brain regions than novices, while those with 44 000 hours of practice showed less (Brefczynski-Lewis, Lutz, Schaefer, Levinson & Davidson, 2007).

Further, the correlational analysis indicate that high levels of mental, spiritual, social and self-consciousness are correlated to high level of mindfulness. These results support the hypothesis that mindfulness would correlate positively with consciousness. Mindfulness is inherently a state of consciousness (Brown and Ryan, 2003).

Conclusion

The objective of the study was to examine the effect of yoga and meditation on six dimensions of consciousness of naïve and experienced practitioners in comparison to non-practitioners. The improvement in different dimensions of consciousness showed in this study and effect of yoga and meditation as reported in other researches account for amelioration in cognitive functions and consciousness as a whole. The findings are very optimistic in that meditation practice can alter an individual's social, self, physical and emotional consciousness setting towards the positive, which may then become default state. Although the further investigation is required separating out the effect of both the practices on consciousness and mindfulness.

Acknowledgements: I am highly grateful to Prof. P.S.Satsangi, Chairman, Academic Committee on Education, Dayalbagh Educational Institute, for his incessant guidance throughout this research. I present my gratitude to Coordinator, Centre for Consciousness Studies for his co-operation to conduct this research and to Prof. P.Sriramamurti, Advisor, Centre for Consciousness Studies for co-ordinating the intervention.

References

- Austin, J.H. (2006). *Zen-brain reflections: reviewing recent developments in meditation and states of consciousness*. Cambridge, Mass: MIT Press.
- Baars, B. J., Banks, W. P., & Newman, J. B. (2003). *Essential sources in the scientific study of consciousness*. Cambridge: MIT Press/Bradford Books.
- Baer, R., Smith, G., Hopkins, J., Krietemeyer, J., & Toney, L. (2007). Using self report assessment methods to explore facets of mindfulness. *Assessment*, 13, 27–45. doi:10.1177/1073191105283504.
- Birdee, G. S., Legedza, A. T., Saper, R. B., Bertisch, S. M., Eisenberg, D. M. & Philips, R. S. (2008). Characteristics of yoga users: results of a national survey. *Journal of General Internal Medicine*, 23(10), 1653-1658.
- Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N.D., Carmody, J., et al. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice* 11(3), 230-241.
- Braboszcz, C., Hahousseau, S., & Delorme, A. (2010). Meditation and Neuroscience: from basic research to clinical practice. In R. Carlsdett (Ed.), *Integrative Clinical Psychology Psychiatry and Behavioral Medicine: Perspectives, Practices and Research* (pp. 755-778), Springer Publishing.
- Brazdau, O. (2008). *Research on the consciousness experience. The Consciousness Quotient and CQ Inventory*. Doctoral dissertation, Romanian Academy of Science, Bucharest, Romania.
http://www.consciousness-quotient.com/docs/Consciousness_Quotient_Doctoral_Dissertation_Ovidiu_Brazdau_dec2009%28excerpt%29.pdf
- Brazdau, O (2009, June). The Conscious Experience: Consciousness Quotient (CQ) and the CQ Inventory. Paper presented at Toward a Science of Consciousness Conference, Hong Kong, China. <http://www.consciousness.arizona.edu/TSCHongKong09ProgramUpdated.htm>
- Brazdau, O. & Mihai, C. (2011). The consciousness quotient: a new predictor of the students' academic performance. *Procedia Social and Behavioral Sciences*, 11, 245–250.
- Brazdau, O., Constantinescu, P.M., Constantinescu, I., Butucescu, A., & Sbircea, R. (2012). Consciousness Quotient Inventory Improvement: Qualitative Study Using Cognitive Interviewing Approach, *Procedia-Social and Behavioural Sciences*, 78, 425-530.
- Brazdau, O. (2013). The consciousness quotient: introducing the consciousness experience as a research variable in psychological assessment. Retrieved from <http://www.consciousness-quotient.com/the-consciousness-quotient-introducing-the-consciousness-experience-as-a-research-variable-in-psychological-assessment>
- Brefczynski-Lewis, J. A., Lutz, A., Schaefer, H. S., Levinson, D. B., & Davidson, R. J. (2007). Neural correlates of attentional expertise in long-term meditation practitioners. *Proceedings of the National Academy of Sciences*, 104, 11483-11488.
- Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: Mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, 84(4), 822–848.
- Charlton, B. (2000). Psychiatry and Human Condition. <http://www.hedweb.com/bgcharlton/awconlang.html>
- Chalmers, D. J. (1996). *The conscious mind: In search of a fundamental theory*. Oxford: Oxford University Press.
- Crick, F. (1984). Function of the thalamic reticular complex: The searchlight hypothesis. *Proceedings of the National Academy of Sciences*, 81, 4586–4590.
- Davidson, R.J & Lutz, A. (2008). Buddha's Brain: Neuroplasticity and Meditation. *Signal Processing Magazine, IEEE*, 25(1), 176-174.
- Dennett, D.C. (1988). Quining qualia. In: Marcel AJ, Bisiach E, (Eds.). *Consciousness in contemporary science* (pp. 42-77). Oxford: Clarendon Press.
- Dennett, D. C. (1992). *Consciousness explained*. New York: Basic Books.
- Dunn, B. R., Hartigan, J. A. & Mikulas, W. L. (1999). Concentration and mindfulness meditations: Unique forms of consciousness? *Applied Psychophysiology and Biofeedback* 24(3), 147-165.

- Fritz, C.O., Morris, P. E. & Richler, J.F. (2012). Effect size estimates: current use, calculations and interpretations. *Journal of Experimental Psychology: General*, 141(1), 2-18.
- Gennaro, R.J., (2012). *The Consciousness Paradox: Consciousness, Concepts, and Higher-order Thoughts*. Cambridge, MA: MIT Press.
- Goleman, D. (1995). *Emotional intelligence*. New York: Bantam Books.
- Granath, J., Ingvarsson, S., von Thiele, U., & Lundberg, U. (2006). Stress management: A randomized study of cognitive behavioural therapy and yoga. *Cognitive Behavioural Therapy*, 35, 3-10.
- Hodgins, H. S. & Adair, K. C. (2010). Attentional processes and meditation. *Consciousness and Cognition*, 19(4), 872-878.
- Jha, A. P., Krompinger, J. & Baime, M. J. (2007). Mindfulness training modifies subsystems of attention. *Cognitive, Affective and Behavioral Neuroscience*, 7, 109-119.
- Lutz, A., Dunne, J. D., & Davidson, R. J. (2007). Meditation and the neuroscience of consciousness. In P. Zelazo, M. Moscovitch, & E. Thompson (Eds.), *Cambridge handbook of consciousness* (pp. 480-551). New York: Cambridge University Press.
- Moore A and Malinowski P (2009) Meditation, mindfulness and cognitive flexibility. *Consciousness and Cognition*, 18(1), 176-186.
- Nagendra H.R. & Nagarathna R. (2000). *New perspective in stress management*. Bangalore, India: Vivekananda Kendra Parkashana.
- Patil, S.P & Telles, S. (2006). Cyclic meditation – a moving meditation – reduces energy expenditure more than supine rest. *Journal of Indian Psychology*, 24(2), 44-51.
- Rocha, K.K., Ribeiro, A.M., Rocha, K.C., Sousa, M.B., Albuquerque, F.S., Ribeiro, S. & Silva, R.H. (2012). Improvement in physiological and psychological parameters after 6 months of yoga practice. *Journal of Consciousness and Cognition*, 21, 843-850.
- Satsangi, P.S. (2006). Generalizing physical systems through applied systems research from “real” physical systems through “conceptual” socio-economic-environmental systems to “complete” (physical-mental-spiritual) creational systems”. *International Journal of General Systems*, 35(2), 127-167.
- Satsangi, P.S. (2010). *Expositions on Truth, Ultimate Reality and Supreme Being*. Agra, India : Radhasoami Satsang Sabha.
- Satsangi, P.S. (2012). Neuro-environmental Cognitive Spiritual Phenomenology. <http://www.dayalbagh.org.in/specialTalks/visionTalkQANSAS2012.htm>
- Satsangi, P.S. & Sahni, V. (2012, April). Cosmic Consciousness Hierarchization: Analytic, Experimental and Experiential. Paper presented at Toward a Science of Consciousness, Tucson, Arizona. http://www.consciousness.arizona.edu/documents/TSC2012CCS_BookofAbstracts_forweb2012.pdf
- Satsangi, P. S. (2013). Cosmology from the Twin Vantage Points of Radhasoami Faith and Systems Science. In P. Sriramamurti, P. Prashant & A. Mohan (Eds.), *Spiritual Consciousness* (pp. 21 – 38). New Delhi, India: DK Agencies.
- Smith, B., Shelley, B.M., Dalen, J., Wiggins, K., Tooley, E., & Bernard, J. (2008). A pilot study comparing the effects of mindfulness-based and cognitive-behavioral stress reduction. *The Journal of Alternative and Complementary Medicine*, 14, 251-258.
- Thompson, E. (2006). Neurophenomenology and contemplative experience. In P. Clayton (Ed.), *The Oxford handbook of science and religion* (pp. 226-235). New York: Oxford University Press.
- Telles, S. & Desiraju, T. (1993). Recording of auditory middle latency evoked potentials during the practice of meditation with the syllable _OM. *Indian Journal of Medical Research*, 98, 237-239.
- Telles, S., Nagarathna, R. and Nagendra, H.R. (1998) Autonomic changes while mentally repeating two syllables – one meaningful and the other neutral. *Indian Journal of Physiology and Pharmacology*, 42(1), 57-63.
- Telles, S., Reddy S.K., & Nagendra H.R. (2000). Oxygen consumption and respiration following two yoga relaxation techniques. *Appl Psychophysiol Biofeedback*, 25(4), 221–7.

- Vaitl, D., Birbaumer, N., Gruzelier, J., Jamieson, G. A., Kotchoubey, B. & Kubler, A. (2005) Psychobiology of altered states of consciousness. *Psychological Bulletin*, 131, 98–127.
- Varela, F. J., Thompson, E., & Rosch, E. (1991). *The embodied mind: Cognitive science and human experience*. Cambridge, MA: MIT Press.
- Wade, J. (1996). *Changes of mind: A holonomic theory of the evolution of consciousness*. Albany, NY: State University of New York Press.
- Walach, T., Buchheld, N., Buittenmuller, V., Kleinknecht, N., & Schmidt, S. (2006). Measuring mindfulness: The Freiburg Mindfulness Inventory (FMI). *Personality and Individual Differences*, 40(8), 1543–1555. doi:10.1016/j.paid.2005.11.025.