

Yoga, Cognition and Mental Health

Diya Nangia and Rekha Malhotra

University of Delhi, Delhi, India

Regular practice of yoga is implicated in the healthy development of the body, mind, and spirit, leading to a more fulfilling life. The present investigation was designed to study the influence of regular practice of yoga on cognitive skills and mental health. 19 regular practitioners of yoga were matched with controls on age, gender and education level, and compared on outcome measures of Digit Symbol Test, PGI Memory Scale and Mental Health Questionnaire. An ex-post-facto design using t-test for two dependent means was adopted. Results indicated regular practitioners of yoga perform significantly better on tests of attention and concentration, remote memory, mental balance, delayed recall, immediate recall, verbal retention of dissimilar pairs, visual retention and recognition; and have better mental health. The results were discussed in the light of available research. The limitations of the study were also discussed.

Yoga is one of the six orthodox systems of Indian philosophy. Because of its immense qualities, Yoga is no longer merely a philosophy; instead, it is playing the role of a torch bearer which is enlightening the masses with its spiritual and moral appeal and teaching them the way of life. In the current modern lifestyles, yoga practitioners basically practice three out of the eight limbs of Maharishi Patanjali's Ashtang Yoga, i.e., Asanas, Pranayama and Meditation. Research has proven that regular practice of Yoga helps in the development of the body, mind, and spirit, leading to a healthier and more fulfilling life (e.g., Bhole, 1983; Ray and others, 2001).

For many, yoga is viewed as a physical, mental, and spiritual discipline that confers a sound body and a sound mind (Mohan, 2002). Allegedly, the practice of yoga can help a person achieve his or her full potential and help increase spiritual consciousness. A relationship between the practice of yoga and benefits related to mental health and overall wellness is apparent (Schaeffer, 2002). Apart from the achieving physical health through breathing techniques and postures (Hatha

Yoga), one of the mental aims of the practice of yoga, is the ability to maintain cognitive control, specifically in the areas of attention, memory, and arousal control. A common claim is that yoga helps clear the mind and this may have an effect on the ability to attend to relevant stimuli and recall information subsequently (Heriza, 2004). One mechanism by which this may occur is the impact of yoga on improvement of mood and reduction in the levels of stress. It is also known that the practice of yoga emphasizes body awareness and involves focusing one's attention on breathing or specific muscles or parts of body, possibly improving attentional abilities in general (Oken and others, 2006). Specifically, inverted yoga positions have been associated with claims of increased memory and attention due to increased blood flow to the brain. For example, Schaeffer (2002) claimed "yoga can prevent memory lapses by calming you and enhancing your concentration. It can also improve your powers of recall by increasing circulation to your brain."

Studies have been conducted to analyze the effect of yogic practices on

attention-concentration and memory (e.g., Anantharaman and Kabir, 1984), psychomotor perception (e.g., Manjunath & Telles, 1999). There have been studies to examine the role of yoga in improving cognitive functions in populations with existing dysfunctions, e.g. in ADHD (e.g., Jensen and Kenny, 2004); in multiple sclerosis (e.g., Kishiyama et al., 2002); in diabetes (e.g., Kyizom et al., 2010); or with healthy seniors (e.g., Oken et al., 2006); and most other studies on healthy groups have utilized a short term practice of yoga (e.g., Waelde and Thompson, 2004). Little work has been done to examine the effect of regular yogic practice on healthy individuals, and on various aspects of memory such as remote memory, recent memory, mental balance, delayed recall, immediate recall, and verbal recall for similar and dissimilar pairs, visual recall and recognition. This study has been designed to examine the effect of regular yoga practice on various aspects of memory and to also analyze the effect of yogic lifestyle on the overall mental health of individuals, covering diverse aspects such as anxiety level, self concept, stress management, mood states, self control, happiness, attitudes, adjustment, acceptance of reality, integration of personality, subjective well-being, etc, that have been examined separately in different studies previously. Much research has been conducted to analyze the effects of yogic practices on younger age groups and for shorter periods of time.

The present investigation was designed to examine the effect of regular practice of yoga on a variety of cognitive skills and mental health, in a group of healthy individuals belonging to wider age range, practicing yoga daily, for prolonged duration of time ranging from 6 months to 30 years. Furthermore, since the study aimed at analyzing the effect of a yogic lifestyle, yoga teachers were chosen as the experimental group, who were not only regular practitioners but also adhered to other important aspects

on a daily basis, for e.g., a controlled diet, disciplined lifestyle, etc.

Method

Subjects:

The subject consisted of two groups, regular practitioners of yoga (Experimental group) and non-practitioners of yoga (Control Group). Their age ranged from 22 to 56 years, mean age being 39.68 years (SD=3.26).

Experimental Group (Yoga Group): This consisted of 19 yoga teachers from reputed institutes, e.g., Sivananda Yoga Institute, Morarji Desai Institute of Yoga and JawaharLal Nehru University. Their practice of yoga ranged from 6 months to 30 years, duration of daily practice ranging from 1½ to 4 Hours. It included 13 males and 6 females. On a daily basis, the group was involved in practice of *asanas, pranayama, dhyana, and shatkriyas*.

Control group (Non-practitioners Group): This consisted of 19 participants, each matched with those of the yoga group on age, sex and education level. Of the 13 males, 10 were businessmen, 2 in service and 1 a college student. Of the 6 females, 1 was a teacher, 1 in service and the other 4 were housewives.

Participation was voluntary and no incentives were offered.

Tools:

Digit Symbol Test: Digit Symbol test, a subtest from Wechsler's Adult Intelligence Scale (Wechsler, 1997), which required subjects to copy symbols within a particular time limit, was used to measure attention and concentration in terms of the scores on speed and accuracy.

PGI Memory Scale (PGIMS) (Pershad & Wig, 1994): A short, simple, objective and valid test of memory, standardized on the Indian Population, equally valid for both sexes and applicable and acceptable to illiterate and unsophisticated subjects, not unduly

dependent on intelligence of subjects, was used in the present study. It contains 10 subtests, viz, Remote Memory, Recent Memory, Mental Balance, Attention and Concentration, Delayed Recall, Immediate Recall, Verbal Retention of similar pairs, Verbal Retention of dissimilar pairs, Visual Retention and Recognition, and is suited for this study.

Mental Health Questionnaire (Sharma, 1996): This scale containing 60 statements related to Mental Health, standardized on the Indian Population, was used in the present study. The scale takes into account various aspects of mental health, such as, positive attitude towards self, acceptance of reality, competencies for dealing with life problems, integration of personality, autonomy and direction towards growth. It is a comprehensive tool to assess mental health and is thus, suited for this study.

Semi Structured Interview: This was designed with an intention to obtain qualitative information from the yoga group about participant's sense of psychological wellbeing. The findings of the interview were used to substantiate the quantitative findings obtained on the Mental Health Questionnaire.

Procedure:

The tools were administered to each subject of both the groups individually. The experimental group of yoga teachers was tested in the institutes where they were teaching. The testing session was followed by a short interview where each subject was individually interviewed. The subjects of the control group were tested in their respective homes, for the sake of their convenience. The total time taken by each subject in one session was about 45 – 50 minutes. Informed consent was taken from each participant. Results were arrived at by using the t-test for two dependent means.

Results

Table 1. Difference between Means of the Experimental Group (Yoga Practitioners) and Control Group (non-practitioners) on outcome measures

Subtest	ExpI Group	Control Group	Mean Diff	t-Value
Digit Symbol	221.26	190.68	30.58	5.29**
Remote Memory	5.84	5.47	0.37	1.85 [†]
Recent Memory	5	4.84	0.16	1.37
Mental Balance	8.89	8.26	0.63	2.86**
Attention-Concentration	10.39	8.29	2.1	7.78**
Delayed Recall	10.00	9.42	0.58	3.22**
Immediate Recall	10.63	8.95	1.68	7.30**
Verbal Recall (Similar Pairs)	5	5	0	0
Verbal Recall (Dissimilar Pairs)	13.89	10.89	3	4.92**
Visual Retention	12.42	11.31	1.11	3.81**
Recognition	9.84	11.31	1.11	3.81**
Mental Health	95	74.26	15.74	3.73**

*p<.05. **p<.05.

Data obtained is represented in the Table 1. Results indicated that regular practitioners of yoga perform significantly better on the test of attention and concentration (digit symbol test and subtest IV of PGIMS), remote memory, mental balance, delayed recall, immediate recall, verbal retention of dissimilar

pairs, visual retention and recognition. Significant difference was not found on tests of recent memory and verbal retention of similar pairs. Regular practitioners of yoga were found to have higher scores on measure of the mental health than the controls.

The qualitative analysis of the semi-structured interview revealed the themes of 'positive state of mind', 'enhanced coping' and 'life satisfaction'. These themes substantiate the findings obtained on the Mental Health Questionnaire, revealing improved mental health subsequent to the practice of yoga, especially in terms of having a positive state of mind, enhanced resources for coping and increased sense of satisfaction.

Discussion

The aim of the present study was to examine the effect of regular practice of yoga on cognitive skills and mental health on a group of healthy individuals practicing yoga daily, for a prolonged duration of time. The results obtained clearly show the association of regular yoga practice to concentration, memory and mental health (Table 1). The yoga group was observed to perform significantly better on the test of attention and concentration, remote memory, mental balance, delayed recall, immediate recall, verbal retention of dissimilar pairs, visual retention and recognition. The results are consistent with previous research in this area. Regular practice of yoga has shown to improve scores on tests of attention and concentration (Sahu and Bhole, 1983; Sahasi, 1984). Manjunath and Telles (2004) suggested that yoga practice, including physical postures and yoga breathing improve delayed recall of spatial information; Naveen and others (1997) found that uni-nostril yoga breathing (nadi-shodhan pranayama) enhances spatial memory scores on test of visual retention and recognition. Subramanya and Telles (2009) reported yoga practice involving cycles of yoga postures and cyclic meditation was found to improve scores on test of attention and concentration and associate learning, and reduced state anxiety. Kumar and Telles (2009) observed that focus meditation influenced selective attention, concentration, visual scanning abilities, and a repetitive motor response. Pradhan and Nagendra

(2009) observed improvements in memory and selective attention, as measured by the Digit–Letter Substitution Task (DLST) following practice of cyclic meditation.

Attention is a phenomenological consequence of activating cognitive processes, especially perceptual processes to their threshold. This attention is limited and selective since the available resources are sufficient only for activating perceptual and other cognitive processes necessary to pay attention to one channel of information at a time. While paying attention to stimuli like those in digit symbol tests and the digit span test, the most activated systems are that of perceptual ones. In the digit symbol test, in order to substitute a symbol for each number that appears, the subject has to scan through an array of 9 digits to identify the symbol written underneath the digit and to write it in the box.

Regular practice of yoga seems to have a generalized (rather than task specific) effect on ability to allocate attentional effort to any novel stimulus. Meditation requires the individual to practice direction of attention to awareness of inner self while inhibiting any sensory response to external stimuli. In a way, it is a practice in inhibiting the neural channels considered relevant for that moment of time and keeping active information from channels that bring to the brain, awareness of inner processes such as, movement of breath through different parts of the body. Thus, one acquires better ability to focus attention on any stimulus or stimulus characteristics when involved in a perceptual task, since the control over possible, irrelevant distracters has been acquired in general. This kind of skill also implies conservation of mental effort so that efficient use of cognitive resources can be made increasing one's power of attention and concentration. It can also be understood as the effect of stress. Stress or increased arousal states lead to over selection of attention wherein a person may not focus on the most important aspects of a task. Since

yoga helps to decrease the level of stress and calms the mind, changing the turbulent nature of consciousness into a tranquil nature, it indirectly aids in enhancing our mental capacity.

The observed effects of yoga on most aspects of memory may be explained using the newer model of working memory proposed by Guenther (2002). Working memory is a collection of skills or processes, like any other cognitive process, such as perceiving, remembering, reasoning etc, with the main function of prolonging the activation of other cognitive processes. It is an operation that stimulates other operations until the task at hand is completed. One of the strengths of working memory model is that it claims that selective attention and a limited short term memory are manifestations of the same process, i.e., limited cognitive resources. Meditation gives practice to working memory operation to sustain the activation of relevant cognitive operations, thereby improving encoding and processing of information leading to better performance on subsequent recall test.

Yoga practitioners group did not perform significantly better on test of recent memory and verbal retention of similar pairs because these tasks were not very demanding. And these explanations given above are applicable to tasks that demand a substantial amount of mental effort of resource allocation. For example, some questions on the recent memory subtest were, "what did you eat last night?" or "who came to visit you yesterday?". These questions centered on personal information which could not be confirmed since subject himself was the sole respondent and the information could not be checked.

Another factor affecting memory is the way in which information is encoded. Factors that included encoding process will lead to better memory and recall. Improved power of attention and concentration leads to better encoding of information. According to the

arousal hypothesis of memory consolidation, the amount of memory consolidation that occurs in a given situation is related to the degree of neural activity in certain areas of the brain, directly following learning. This neural activity or arousal is believed either to make chemical reactions occur in brain that encode the memory or to reflect changes that occur during learning. Thus, if neural activity is low or disrupted, or if too much stimulation is given, it results in disruption and impairs retention. As per Yerkes - Dodson Law (1908), optimal performance is related to moderate level of arousal.

Moreover, different types of arousers (such as stimulants, vigorous exercises, noise, anxiety or amount of sleep deprivation) can have different effects on cognitive tasks. Practice of yoga, calms the mind and the body. It makes the person resistant towards stress and helps to develop mechanisms to cope more efficiently with difficult situations. Through the practice of asanas and pranayama one acquires the ability to concentrate on the inner self, which when practiced regularly results in a continued pattern of alertness. Thus, regular practice of yoga leads to a state where a person becomes alert and focused having effective coping mechanism and the ability to deal with stressful situations.

Yogic lifestyle propagates the practice of asanas (isometric exercises) that help to enhance the bodies resistance, pranayama (balances the mind and the body and soothes the nerves and muscles), and meditation (that helps to relax the mind). Yoga propagates a lifestyle, i.e., ridding from alcohol or drug intoxication, emphasizes on a controlled diet and fixed routines with adequate sleep durations this in turn has a positive effect on memory (Udupa, 1985).

Anxiety decreases short term functions and hence, hinders retrieval (Eysenck, 1984). Optimal levels of catecholamine and other neurotransmitters are associated with high

levels of memory performance. Emotional state of depression resulted in low levels of arousal which is associated with poor memory (Johnson and others, 1987). Moreover, other aspects of mental health are also associated with memory performance, for e.g., memory performance is enhanced by changing a person's attitude. According to resource allocation hypothesis, depression decreases the number of cognitive resources for performing mental activity, including memory (Ellis & others, 1988).

Practice of yogic asanas helps to decrease anxiety by reducing the sympathetic nervous system activity, increase catecholamine, improve thyroid functioning and microcirculation of the body. This leads to increased levels of glucose to the brain and other parts of the body which helps to enhance mental and physical efficiency. Practice of pranayama helps to soothe the nerves, regulate emotional states, enhances microcirculation of the body and stabilizes the mind. Practice of meditation relaxes the mind, increases blood neurohumors and decreases plasma cortisol levels. This helps to decrease stress and enhance capacity for intellectual work. Studies have shown that regular practice of yoga enhances activity of the right hemisphere (Pagano & Frumkin, 1977). Since cognitive processes such as memory are primarily functions of the right cerebral cortex, yogic practices enhance such mental capacities. Thus, yogic practices improve ANS functioning, regulate endocrine glands and help to maintain the equilibrium levels of the body. Thus, improved information processing at thalamo-cortical pathway, better attention and concentration, and emotional stability forms the basis for better registration and retrieval.

Studies have revealed that yoga practice promotes primary health care (e.g. Bhole, 1983). Harvey (1983) found that yogic breathing exercises result in decreased tension, fatigue, depression and higher

stabilization of affective states. Bhavi and others (1996) found a significant improvement in mental health following regular yogic practices. A similar study revealed that regular practice of yogasanas decreases anxiety, improves coping behavior and adjustment (Rangan & Rajesham, 2004).

For one to be mentally healthy is important to be physically fit, mentally stable, personally satisfied, spiritually motivated, emotionally balanced, socially adjusted and vocationally successful. A person who is physically fit is bound to be mentally alert, competent, active, energized, sharp, relaxed, content and happy. Yoga practice such as meditation helps to relax the mind riding it of all thoughts, tensions and thus, refreshes the mind. Practice of pranayam helps to stabilize emotional states, bring the mind and the body on an integrated platform, soothes the nerves and helps to connect with the inner self. It enhances the microcirculation of the body. Thus, enabling the oxygen to reach each tissue of the body and hence enhances the efficiency of the body. A person who is physically fit and is content with his or her physical appearance and health (positive self concept), one who is confident about himself and is more competent to venture into new tasks, tries to give his/ her best in whatever task is undertaken. Such a person is likely to meet success. Another important aspect of yoga is the faith in god. The practice of meditation is an attempt to merge one's consciousness with the almighty. This faith in god serves as an important coping mechanism and enhances well being of an individual. Some other aspects of mental health are emotional stability, self evaluation, focus in life, disciplined lifestyle, a zest for life and foresight. A yogic lifestyle propagates and enhances all these aspects for a healthy life (Udapa, 1985).

The responses of the yoga group were qualitatively analyzed using thematic analysis to substantiate the findings obtained on the

Mental Health Questionnaire. One theme that emerged from the analysis of the interview was 'positive state of mind'. This was related to subthemes of calmness, optimism, confidence, being active, feeling happy, state of harmony and sense of control. For e.g., the participants responded saying, "yoga has made has calm. There is a sense of inner balance"; "There is a positive energy around me. I can sense it. It gives me strength". The analysis revealed the theme of 'enhanced coping'. This was related to subthemes of competence, management of emotions, management of impulsivity, resilience, management of stress. For e.g., respondents reported, "I feel so much more relaxed, my anger has come down... I am no longer impulsive; I take time and react to situations in a more balanced way. I think one important thing is the control that I have over stressful situations, I don't lose it like I used to". Another theme that emerged was, 'life satisfaction'. This was related to subthemes of sense of service, contentment, efficiency, and life productivity. For e.g., they responded, "Yoga enriched my life. I feel I am so much more productive than I used to be some years back, even thought I am older now", "I feel content because I am helping people cure so many problems, physical and mental. I think it is no less satisfying than how a doctor must be feeling".

Thus, the present investigation found that regular practice of yoga leads to better attention and concentration, and mental health and improvement on most aspects of memory except recent memory and verbal retention for similar pairs. However, there are certain limitations of the study. The confounding factors could not be controlled for and the generalizability may be limited owing to a small sample size.

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Diya Nangia, Department of Psychology, University of Delhi, Delhi, India

Rekha Malhotra, PhD, Associate Professor, Department of Psychology, University of Delhi, Delhi, India