

Yoga for improving mood and cognitive functions – A brief review

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ABSTRACT

Generally speaking, people are vulnerable to face rigorous work and learn how to enhance cognitive functions by improving mood state. The extant research evidence appears to support the proposition that yoga may improve mood and cognitive functions of the various populations. Balanced mood state plays a precious role in cognition, quality of life, and successful life. This review highlights the effect of yoga practices on improving mood and cognition and also provides inculcation of various yogic practices as a therapy to improve mood that leads to better cognitive function. It has been found that mood disturbance may lead to poorer cognition and cognitive impairment. Good cognitive functions depend on healthy frontal lobes of the brain and mood states. Therefore, there is need to populate the insights that healthy mood may lead to better cognition as a result of yoga interventions.

Key Words: Cognitive functions, mood, Yoga

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INTRODUCTION

Mood disturbance (e.g., anxiety and depression) is the most common problem among patients and youths (Pedrelli, Nyer, Yeung, Zulauf, & Wilens, 2015) and considered as hallmark for the lack of cognition and psychomotor ability (Canbeyli, 2010; “Psychomotor Symptoms of Depression,” 1997; Whybrow & Mendels, 1969), and adults with lowered mood decreased motor speed (Schwartz et al., 1989; Wolff, 1985). Mood disturbance can take either in the form of elevated (anxiety) mood or reduced (depression) mood (Gene-Environment Interactions in Psychiatry, 2016). Authors found that lack of cognitive function may be because of mood disturbance (Young, Parsons, Stein, & Kringelbach, 2015). Mood state is characterized by feelings and thoughts that person possesses over time (Lischetzke, 2014; Matthews, Jones, & Chamberlain, 1990). Moods are usually transient things that change moment to moment, and it is known as

bipolar disorder characterized by episode of mania and depression that brings changes in one’s energy, emotion, and behavior (Yik, Russell, & Barrett, 1999). It has been found that disturbed mood may lead to poorer cognition and it also affects people’s response pattern (Robinson, 2016). Mood disorder is state of a person that is unfocused, which is not directed toward a specific object. It fluctuates over time. The term “mood” describes the emotional situation that people feels in their daily life. Generally, mood state is considered as mood swing that people possess in terms of happiness or sadness; energized or sluggish; tense or relaxed; awake or tired (Lischetzke, 2014; Matthews et al., 1990). It has been found that mood state has an impact on person’s performance. For instance, low mood may lead to poorer cognition and it also affects how people response against demanding situation (Robinson, 2016). Major mood disorders lead to cognitive impairment and certain difficulties in cognitive functions, such as attention, memory, and concentration.

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Mood disorder is a disabling prevalent and common mental illness and bipolar disorder affecting large proportion of society worldwide. Nearly all psychiatric illnesses are related with mood disorders. It has been shown that there is high rate of comorbidity among mood disorders across the people. The simultaneous presence of two or more illnesses in a patient is known to be comorbidity. Multiple physical and mental health conditions are found in person with mood disorder (Merikangas & Low, 2004). Bipolar disorder is another term used for mood disturbance. People with bipolar disorders sometime feel energized and sometimes very sad, hopeless. This illness causes unusual alterations in mood, energy, and day-to-day activities (National Institute of Mental Health, 2020).

The elevated form of mood is known as anxiety and lower mood is known as depression. Hence, the prevalence rates of mood disorders are presented in terms of anxiety, depression, and bipolar disorder. Estimated global prevalence of depression says that 322 million people (nearly 4.4% population of the world) around the world are affected with depression (World Health Organization, 2018), and it is known to be major cause of disability in the world with an increase of 18.4% from 2005 to 2015 (Depression Is the No. 1 Cause of Ill Health and Disability Worldwide, 2018). Out of 322 million people, almost half of these people belong to Pacific countries (~66.21 million nearly 21%) and Southeast Asian countries (~85.67 million nearly 27%), which also include India and China. Rest of the people with depression (~170.6 million nearly 52%) belong to African region, Eastern Mediterranean region, European countries, and American countries (World Health Organization, 2017). Recent study has shown that the global prevalence rate of depression varies and nearly 3.2%–4.7% of world population are suffering with this mental illness. The international prevalence of mood disorders was 5.4% from the period 1980 to 2013 (Steel et al., 2014) and the WHO reported in its mental health survey that mood disorders varied from 0.8% to 9.6% across the world (Demyttenaere et al., 2004).

A systematic analysis for global burden of disease study (including anxiety, depression, and bipolar disorders) has found that more than 264 million people of world population suffered with depression, 284 million people with anxiety, and 45.5 million people with bipolar disorder in 2017. There is an increase in the count of these mood disorders, for depression 33.4% from 1990 to 2007 and 14.3% from 2007 to 2017, for anxiety 32.3% from 1990 to 2007 and 12.8% from 2007 to 2017, and for bipolar disorder 34% from 1990 to 2007 and 15.2% from 2007 to 2017 (James et al., 2018). In a study by the WHO, 6.5% of the Indian population are suffering with depression (“India Is the Most Depressed Country in the World,” 2018). The estimated prevalence of depression in India has ranged from 1.6% to 3.8% (den Boer, 1997). Authors have shown that the current prevalence of depression in India is 2.68% and the overall lifetime prevalence is 5.25% (Arvind et al., 2019). It was found that the estimated prevalence rate of mood disorder ranges from 0.5% to 20.78% per thousand people. In 2017, the prevalence of mood disorders varies wherein nearly 45.7 million had suffered with depression,

44.9 million had suffered with anxiety, and 7.6 million people had bipolar disorder in India (Shidhaye, 2020). In 2017, the global prevalence rate of anxiety says that 264 million people (~3.6% population of the world) of world population are affected with anxiety (World Health Organization, 2017).

Estimated global prevalence of cognitive impairment ranges from 17% to 34%. Authors have reported that cognitive dysfunction and aging are associated which vary from 3.2% to 19.3% (Ritchie, Artero, & Touchon, 2001). People with cognitive impairment might develop dementia across the life span. Dementia is the standard term used to describe the multiple cognitive dysfunctions of the people. Annual rates of cognitive impairment and dementia vary from 4% to 25%. The majority of studies reported the prevalence rates between 10% and 15%. The 1-year prevalence rate of elderly persons with cognitive dysfunctions ranged from 5% to 15%, and nearly 25 million of world population have cognitive impairment (Burns & Zaudig, 2002). Cognitive impairment is increasing worldwide and nearly 35.6 million (~57.7% world population) of world population have the dysfunction in cognition, which will reach 115.4 million (~70.5% world population) by 2050 (World Health Organization & Alzheimer’s Disease International, 2012). Cognitive dysfunction is the major issue in low- or middle-income countries, nearly 60% was in 2001, and it is estimated to increase 71% by 2040. Estimated prevalence rate in high income countries is found to be 100 % over the decades, whereas the prevalence rate of increase of cognitive dysfunctions is 300% over the decades for India. The prevalence rate of cognitive impairment of elderly persons in India was 7.7% in 2001 which is estimated to increase 12.30% by 2025. Nearly 150 million elderly persons will suffer with cognitive impairment. In 2000, the prevalence rate of cognitive impairment was 4.5 million in the United States and 3.5 million in India (Sengupta, Benjamin, Singh, & Grover, 2014).

Cognitive processes of human brain such as problem-solving, attention, memory, concentration span, logic, psychomotor speed, and reasoning ability are the antecedents to enhance the academic and executive performance. There are distinct techniques that are discussed in various investigations to enhance these functions. The ancient Indian practice of yoga is an effective mind–body practice to increase cognitive function of students (Hardy et al., 2015; Subramanya & Telles, 2009). Structured yogic practices include various forms of meditations that appear to have the potential for cognitive enhancement (Rocha et al., 2012; Brunner, Abramovitch, & Etherton, 2017). Continuous practice of yoga leads to the better connectivity of mind and body. Yogic practice is an ancient Indian wisdom associated with cognitive benefits (Woodyard, 2011). Various researches reported interventions, such as yogasanas, pranayamas, relaxation techniques, and cleansing techniques on the mind–body complex. It was found that these sets of practices balanced mood states across different population (Innes & Selfe, 2012; Bowden, Gaudry, An, & Gruzeliier, 2012). Distinct components of yoga such as breathing techniques, meditations, and postures were found to be the best interventions to enhance affective states, decrease mood disturbance, decrease stress symptoms, and improve quality of life (QOL) across the

people (Specia, Carlson, Goodey, & Angen, 2000; Targ & Levine, 2002).

Good cognitive functions depend on healthy lobes of the brain and mood states (Khalil, Godde, & Karim, 2019; Salzman & Fusi, 2010). Yoga incorporates techniques to enhance mood (da Silva, Ravindran, & Ravindran, 2009; Woodyard, 2011) that may lead to better brain functioning (Listunova et al., 2018). Scientific literature suggests that there is positive effect of yoga on better brain health (Gothe, Khan, Hayes, Erlenbach, & Damoiseaux, 2019). If yogic practices enhance mood states, is there a place for yogic inputs in therapy for the patients? Yogic science is an ancient mind–body intervention that leads to holistic living. Simply, yoga is a technique to get mastery over the modifications of the mind (Satyananda Saraswati, 2011), to achieve a good lifestyle, and to reach a balanced state of mind–body complex (Vireshwarananda, 2000).

EFFECT OF YOGA ON MOOD

Growing bodies of research evidences have shown that yoga may play a vital role in mood disorder and improvement in quality of life across different population. The impact of yoga practice on mood disorders has been computed by many researchers. Yoga is considered as an approach for the management of mood disturbance that includes postures, breathings, cleansing techniques, and meditation practices (Salmon, Lush, Jablonski, & Sephton, 2009). The research findings suggest that hatha yoga is well suited as an intervention for mood disorders that reduces psychological distress (Dhananjai, Sadashiv, Tiwari, Dutt, & Kumar, 2013; Shohani et al., 2018). Recent empirical studies in India and other countries have found that yoga practice improves mood state and cognitive function of different populations, such as healthy volunteers, elderly persons, and patients. Majority of studies were performed on patients with diseases.

In a review article, yoga is found to be an effective intervention to enhance mood states of the patients (Vollbehr et al., 2018). In a randomized controlled study, the results showed that yoga subjects reported better improvement in mood than the walking group (Streeter et al., 2010). In another study, there was significant reduction in mood disturbance, stress symptoms, and improvement in QOL of cancer patients after 6 months of follow-up yoga program (Mackenzie, Carlson, Ekkekakis, Paskevich, & Culos-Reed, 2013). In a randomized trial study, the results demonstrated that QOL revealed a significant improvement in some domains such as physical, psychological, and mood profile in nursing population after 6 weeks of yoga practices (Patil et al., 2018). In another study by Lau, Yu, & Woo, 2015, the results showed that there was significant improvement in health-related QOL (e.g., mood, anxiety, and depression) of Chinese adults after 12 weeks of hatha yoga intervention.

In a randomized control trial, the result findings showed that depressive symptoms (mood disorder) of the elderly reduced significantly after 24 weeks of yoga practice (Krishnamurthy & Telles, 2007). Another randomized control study found that

Sudarshan-kriya yoga is effective in reducing moderate depressive symptoms (Rohini, Pandey, Janakiramaiah, Gangadhar, & Vedamurthachar, 2000). Three open trial studies found that Sudarshan-kriya yoga is significantly effective in reducing major depressive symptoms. In two open trial studies, the results showed that there was significant reduction in major depressive symptoms after 12 weeks of yoga intervention (Murthy, Gangadhar, Janakiramaiah, & Subbakrishna, 1997; Naga Venkatesha Murthy, Janakiramaiah, Gangadhar, & Subbakrishna, 1998). In the third open trial study, the results reported that there was significant reduction in depressive symptoms after 4 weeks of yoga practice (Gangadhar, Janakiramaiah, Sudarshan, & Shety, 2000). Depressive symptoms are considered to be the part of mood disturbance. In a randomized control trial by Khumar, Kaur, & Kaur, 1993, the results showed that 4 weeks of yoga practice found significant reduction of depressive symptoms in participants with mood disorders. All studies found mood balance in the subjects participated for the study.

EFFECT OF YOGA ON COGNITIVE FUNCTIONS

A line of research studies (systematic review and meta-analysis) demonstrated that yoga is found to be an effective practice to enhance cognitions (Bhattacharyya, Anel, & Small, 2021; Gothe & McAuley, 2015). In a randomized control study, there was significant improvement in psychomotor speed of the elderly following 1 month of *trataka* - candle flame meditation (Jagannathan, Raghuram, & Talwadkar, 2014). In another study, practice of *kapalbhati*, *bhastrika*, and *nadisodhana* improved cognitive functions of healthy volunteers (Subramanian, 2014). In a comparative study, cyclic meditation has been found good for cognitive parameters. Result findings showed that there was significant improvement in cognitive functions of patients with multiple sclerosis (Bhargav, Bhargav, Raghuram, & Garner, 2016).

Gothe, Kramer, & McAuley, 2014 found that certain *yogasanas*, *pranayamas*, breathing techniques, and meditations had positive influence on psychological functions and cognitive functions. 8 weeks of hatha yoga improved cognitive functions such as working memory and mental flexibility in older adults. One study by Luu & Hall, 2017 showed that hatha yoga and mindfulness meditation improved the cognition. There was significant improvement of executive function in practitioners immediately after the hatha yoga and mindfulness meditation of breath, emotions, and thoughts. In another study, Marciniak et al., 2014 showed that meditation resulted in significant improvement in cognitive functions of older people suffering with neurodegenerative diseases.

PHYSIOLOGICAL MECHANISM OF YOGA ON MOOD

How yoga affect in balancing mood is a prime question that bothers majority of people. Brain chemicals influence the mood state and mental health. Yoga being a mind–body practice

might affect the brain chemicals (neurotransmitters) which lead to better brain functioning, resulting mood balance in individuals. The brain chemicals such as serotonin, dopamine, norepinephrine, and gamma-amino butyric acid (GABA) are associated with mood state. These neurotransmitters play a precious role in mood regulation in a person (Kalueff & Nutt, 2007; Krishnakumar, Hamblin, & Lakshmanan, 2015). Alteration in these brain chemicals leads to mood disorder in individuals (Syvälahti, 1994). Research evidence demonstrates that yoga practice can increase dopamine release, serotonin, GABA, and serotonin levels in patients with mood disorders (Devi, Chansauria, & Udupa, 1986; Kjaer et al., 2002; Streeter, Gerbarg, Saper, Ciraulo, & Brown, 2012). The biological mechanisms have been shown to underlying effects of yoga on mood disorders. The effects might occur during the yoga practice or immediately after yoga practice as well as due to the longer duration of yoga practice. Physiology also includes that yoga regulates the hypothalamus, pituitary, and adrenal axis and sympathetic activity, enhances the parasympathetic activity, and boosts the secretion of neurotransmitters such as serotonin, dopamine, and GABA (Prathikanti et al., 2017; Syvälahti, 1994; Walton, 2011). Thus, yoga practice leads to better mood by regulating these brain chemicals.

PHYSIOLOGICAL MECHANISM OF YOGA ON COGNITIVE FUNCTION

Literature provides evidence of yoga enhancing the cognitive functions. The underlying cause of how yoga improves cognition is associated with few brain parts and network of neural structures. The brain parts including cerebral cortex, prefrontal cortex, anterior cingulate cortex, temporal lobe, and parietal cortex are associated in cognitive functions, such as memory, attention, psychomotor performance, processing speed, visual reaction time, and perception (Bush, Luu, & Posner, 2000; Carter, Botvinick, & Cohen, 1999; Culham & Kanwisher, 2001). A person is said to show cognitive impairment when he or she faces difficulty in remembering, learning new things, concentrating, discriminating, maintaining attention, perceiving, processing, and memorizing. The alteration and deactivation of these brain networks are the major causes of cognitive dysfunction or cognitive impairment. Brain waves (e.g., alpha, beta, theta, and gamma) and structural activation and cerebral blood flow are physiological markers in cognitive operations (Desai, Tailor A, & Bhatt, 2015). Yoga is found to be an effective technique that stimulates the brain structures, rejuvenates the cognitive area, and improves the cerebral blood flow and generates brain waves. Research evidence shows that yoga intervention activates the central nervous system and helps enhance their cognitive functions (Mandanmohan, Jatiya, Udupa, and Bhavanani, 2003). Yoga has also positive impact on temporal lobe, frontal lobe of brain, and yoga increases the cerebral blood flow in these brain areas, which lead to the better cognitive functions (Ali, Balaji, and Varne, 2012).

SUGGESTED EVIDENCE-BASED YOGIC PRACTICES FOR MOOD AND COGNITIVE FUNCTIONS

The extant research evidence appears to support the proposition that yoga may improve mood states and cognitive functions. Based on findings of previous research studies (e.g., the effects of yoga on mood and cognitive function), yoga therapy program may inculcate following yogic practices for persons to improve mood state and cognitive functions.

- Kapalbhathi kriya
- Postures: Spinal twisting, padahasthasana, parvatasana, vrikshasana, warrior pose, bhujangasana, marjari asana, and gomukhasana
- Surya Namaskar (Sun salutation)
- Nadisodhana pranayama (alternate nostril breathing)
- Bhramari pranayama (humming bee breath)
- Bhastrika pranayama (bellows breath)
- Uninostril breathing
- Mindfulness meditation and cyclic meditation
- Trataka - Candle flame meditation
- Hatha yoga - This yoga form includes various postures, controlled breathing, meditation, and relaxation techniques
- Iyengar yoga - This yoga form focuses on standard, precisely aligned poses. In general, props and bricks are used to maintain proper body alignment.
- Sudharshan-kriya yoga.

CONCLUSION

Above research evidence indicates that yoga improves mood states and various cognitive functions such as attention, working memory, concentration, processing speed, psychomotor performance, and visual scanning. There are many studies in this domain, to build comprehensive theory. However, study investigating the effect of yoga on improving mood that lead to better cognition is lacking. There is a need to populate the domain with many more applied research studies. Improvement of mood states and cognitive functions as the result of yoga practice requires much more factual examination.

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Kumar and Singh: Yoga for mood and cognition

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