

Physiological Effects Of Yoga

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Abstract

Yoga is the science of right living and can be incorporated into daily life. It works on all aspects such as physical, vital, mental, emotional, psychic, and spiritual. The word Yoga is derived from the Sanskrit word “yuj”, which means “to join” or “to unite” (i.e., union of the individual consciousness with the universal consciousness.). It consists of shatkarma, asana, pranayama, mudra, bandha, meditation, etc., (Saraswati, 2008) Yoga is an ancient Indian science which is known to improve health and wellbeing. Although currently Yoga is being practiced for the promotion of health and prevention of various diseases by the people, the information deals with its origin, evolution, philosophy/concepts, and types/techniques are lacking. Previous reviews deal mainly with Yoga and its effects separately. Hence, this particular review provides a summary of the information related to history, philosophy/concepts, types/techniques, and physiological/therapeutic effects in various systems of the body with possible side effects of Yoga based on the available traditional and scientific literature.

Cardiovascular System

In a study on healthy males significant reduction in heart rate (HR), blood pressure (BP), load in heart, myocardial oxygen consumption, low frequency spectrum of HR variability (HRV) spectrum, catecholamines, total cholesterol, cortisol, and adrenocorticotrophic hormone; and increase in high frequency, total power, and time domain parameters of HRV, skin conductance, serotonin, dopamine, and brain-derived neurotrophic factor were noted following yogic practice (Pal, Singh, Chatterjee, & Saha, 2014).

Yoga was shown to decrease BP in pre-hypertensive (Sieverdes et al., 2014) and mild hypertensive (Hagins, Rundle, Consedine, & Khalsa, 2014); BP, HR, body mass index (BMI), waist circumference (Pal, Srivastava, Narain, Agrawal, & Rani, 2013), body fat%, total-cholesterol, triglycerides, and low density lipoprotein in the coronary artery (Pal et al., 2011). There are the pieces of evidence to incorporate Yoga into standardized cardiac rehabilitation programs as an adjunct to improve the management of psychosocial symptoms associated with cardiovascular events in addition to improving patients' cognitive and cardiovascular functions (Yeung et al., 2014).

Respiratory System

Regular Yoga practice increases vital capacity, timed vital capacity, maximum voluntary ventilation, breath-holding time, and maximal inspiratory and expiratory pressures (Vedala, Mane, & Paul, 2014). A combination of Bhramari pranayama and OM chanting alone were shown to improve pulmonary function in healthy individuals (Mooventhan & Khode, 2014).

Yoga significantly improved peak expiratory flow rate, forced expiratory volume in 1 s (FEV₁), forced vital capacity (FVC), forced mid expiratory flow in 0.25-0.75 seconds and FEV₁/FVC% ratio in bronchial asthma (Sodhi, Singh, & Dandona, 2009); and level of infection, radiographic picture, FVC, weight gain and reduced symptoms in pulmonary tuberculosis (Visweswaraiiah & Telles, 2004). According to a meta-analysis, Yoga improves lung function and exercise capacity and could be used as an adjunct pulmonary rehabilitation program in chronic obstructive pulmonary disease (COPD) (Liu, Pan, Hu, Dong, Yan, & Dong, 2014).

Yogic breathing exercises were shown to improve diffusion capacity in COPD (Soni, Munish, Singh, & Singh, 2012); weight gain, BMI, symptom scores, pulmonary function, and health-related quality of life (QOL) with conversion of positive to negative sputum fluorescence microscopic examination for acid-fast bacilli in new sputum positive pulmonary tuberculosis (Mooventhan, Khode, & Nivethitha, 2014).

Children with Duchenne muscular dystrophy die prematurely because of respiratory failure whereas, Yoga breathing exercises were shown to improve pulmonary function in these patients (Rodrigues, Carvalho, Santaella, Lorenzi-Filho, & Marie, 2014). Pranayama and meditation was reported to improve pulmonary functions in hypothyroid along with conventional treatment (Swami, Singh, Singh, & Gupta, 2010).

Nervous System

Yogic relaxation, pranayama, and meditation were shown to improve quality of sleep (QOS) in GuillainBarré syndrome (Sendhilkumar, Gupta, Nagarathna, & Taly, 2013). Yoga practices were reported to improve performance on the executive function measures of working memory capacity and efficiency of mental set shifting and flexibility in older adults (Gothe, Kramer, & McAuley, 2014); alleviate physical pain and improve QOL in multiple sclerosis (Doulatabad, Nooreyan, Doulatabad, & Noubandegani, 2012); and improve physical functioning (i.e., pain, neck range of motion, hip passive range of motion, upper extremity strength, and the 6-min walk scores) after stroke (Schmid, Miller, Van Puymbroeck, & DeBaun-Sprague, 2014).

A study on integrating Yoga with physical therapy exercise, showed 16 points and 11 points improvement in Parkinson's disease questionnaire and in high-level mobility assessment tool respectively. There were also improvements in muscle length (lower extremity muscles), muscle strength (upper and lower extremity), and dynamic balance (Moriello, Denio, Abraham, DeFrancesco, & Townsley, 2013). 8-week Sit "N" Fit Chair Yoga shown to improve Six-Minute Walk Test, Gait Speed Test, and Berg Balance Scale scores in moderate and severe Alzheimer's disease (McCaffrey, Park, Newman, & Hagen, 2014). Yoga-meditation program was reported to be feasible and effective for dementia patient family caregivers (Waelde, Thompson, & Gallagher-Thompson, 2004). According to a review, Yoga was also used as an adjunctive treatment for carpal tunnel syndrome, epilepsy, post stroke paresis, and neuropathy of type-2 diabetes (Mishra et al., 2012).

Mental Health

Adding Yoga intervention to conventional treatment was reported to be feasible and beneficial even in the early and acute stage of psychosis (Manjunath, Varambally, Thirthalli, Basavaraddi, & Gangadhar, 2013). It was shown to be efficacious in improving post-traumatic stress disorder (Mitchell et al., 2014); endogenous plasma oxytocin levels (Jayaram et al., 2013), psychopathology and QOL of patients with schizophrenia (Visceglia & Lewis, 2011); subjective wellbeing, mental health, and executive functioning within prison populations (Bilderbeck, Farias, Brazil, Jakobowitz, & Wikholm, 2013); mood status and QOL for women undergoing detoxification for heroin dependence (Zhuang, An, & Zhao, 2013); smoking cessation among women (Bock et al., 2012); and decrease depression in women with major depression with a unique trend in decreased ruminations (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013).

In a study, Yoga subjects were reported greater improvement in mood and greater decreases in anxiety than the walking group. The Yoga group had positive correlations between changes in mood scales and changes in gamma-aminobutyric acid levels (Streeter et al., 2010). A workplace Yoga was reported to reduce perceived stress and improve psychological well being (Hartfiel et al., 2012). In army personnel naive to Yoga, Yoga-based intervention or listening to meditation music could reduce anxiety while increasing performance on an attention task (Telles, Bhardwaj, Kumar, Kumar, & Balkrishna, 2012).

Musculoskeletal System

According to a study, Yoga was as effective as Tai-chi and standard balance training for improving postural stability in elders with a history of falling (Ni et al., 2014). Yoga was reported to be effective in reducing neck pain intensity and disability and improving health-related QOL, functional status of neck muscles in chronic neck pain (Cramer et al., 2013); reducing pain, anxiety, and depression, and improving spinal mobility in chronic low back pain more effectively than physiotherapy (Tekur, Nagarathna, Chametcha, Hankey, & Nagendra, 2012). Moreover, it was safe and beneficial for patients with nonspecific low back pain or sciatica, accompanied by disc extrusions and bulges (Monro, Bhardwaj, Gupta, Telles, Allen, & Little, 2015).

Workplace Yoga was shown to reduce back pain and improve psychological well-being (Hartfiel et al., 2012). In knee osteoarthritis, Yoga was shown to be better than therapeutic exercises as an adjunct to transcutaneous electrical stimulation and ultrasound treatment in improving walking pain, range of knee flexion, walking time, tenderness, swelling, crepitus, and knee disability (Ebnezar, Nagarathna, Yogitha, & Nagendra, 2012). Add-on yogic prana energization technique was reported to accelerate fracture healing (Oswal, Nagarathna, Ebnezar, & Nagendra, 2011).

Gastrointestinal System

Iyengar Yoga was shown to be a feasible and safe adjunctive treatment for irritable bowel syndrome. It significantly improved symptoms, global improvement, disability, psychological distress, QOS, and fatigue in young adults (Evans et al., 2014).

Obstetrics and Gynaecology

Yoga was shown to be effective in reducing stress and anxiety in mastectomized women (Bernardi, Amorim, Zandonade, Santaella, & Barbosa, 2013); improving urinary incontinence in women (Huang, Jenny, Chesney, Schembri, & Subak, 2014); lumbopelvic pain intensity (Martins & Pinto-e-Silva, 2014), anxiety, depression, pregnancy-related uncomfortable experiences in pregnant women (Satyapriya, Nagarathna, Padmalatha, & Nagendra, 2013); and hypertensive related complications of pregnancy with improvement in fetal outcomes in high-risk pregnant women (Rakhshani, Nagarathna, Mhaskar, Mhaskar, Thomas, & Gunasheela, 2012).

Yoga Nidra practice was reported to be helpful in patients with hormone imbalances, such as dysmenorrhea, oligomenorrhea, menorrhagia, metrorrhagia, and hypomenorrhea (Rani et al., 2013). In patients with menstrual disturbances, significant improvements in BP, postural hypotension, sustained handgrip, and HR expiration inspiration ratio were reported after Yoga (Monika, Singh, Ghildiyal, Kala, & Srivastava, 2012).

Yoga was found to be more effective than physical exercises in reducing anti-Müllerian hormone, luteinizing hormone, and testosterone, Modified Ferriman and Gallway score for hirsutism; and improving menstrual frequency (Nidhi, Padmalatha, Nagarathna, & Amritanshu, 2013), glucose, lipid, and insulin values, including insulin resistance values in polycystic ovarian syndrome (Nidhi, Padmalatha, Nagarathna, & Ram, 2012). Three Yoga poses (Cobra, Cat, and Fish Poses) were shown to reduce the severity and duration of primary dysmenorrhea (Rakhshae, 2011). In obese post-menopausal Korean women, Yoga was reported to improve adiponectin, serum lipids, and metabolic syndrome risk factors which will be effective in preventing cardiovascular disease (Lee, Kim, & Kim, 2012).

Oncology

Yoga was shown to reduce inflammation-related gene expression in breast cancer survivors with persistent fatigue (Bower et al., 2014); depression in breast cancer patients undergoing conventional treatment (Rao et al., 2015); improve QOS and reducing sleep medication use among cancer survivors (Mustian et al., 2013); and improve QOL and physiological changes associated with breast cancer radiotherapy (Chandwani et al., 2014).

Yoga was reported to be feasible in prostate cancer patients during radiotherapy (Ben-Josef, Wileyto, Chen, & Vapiwala, 2016); safe, feasible, acceptable, and subjectively useful for lung cancer patients and their caregivers (Milbury et al., 2015). Laughter Yoga was shown to decrease stress in cancer sufferers before chemotherapy (Farifteh, Mohammadi-Aria, Kiamanesh, & Mofid, 2014) and Yogic breathing was reported to be feasible and a dose-response relationship was shown between pranayama use and improvements in chemotherapy-associated symptoms and QOL in patients receiving chemotherapy (Dhruva et al., 2012).

Metabolic Disorders

Yoga was shown to improve anthropometric variables and serum lipid profile in overweight and obese persons (Telles, Sharma, Yadav, Singh, & Balkrishna, 2014); control oxidative stress in pre-diabetes (Hegde, Adhikari, Shetty, Manjrekar, & D'Souza, 2013); reduce weight, waist circumference, BMI, BP, total-cholesterol, anxiety, depression, negative affect and perceived stress in subject with elevated fasting blood glucose (McDermott et al., 2014); and sexual dysfunction in women with metabolic syndrome as well as for metabolic risk factors (Kim, Ryu, Kim, & Song, 2013).

Immunology

At 3 months post breast cancer treatment, increasing Yoga practice was reported as associated with a decrease in IL-6 and IL-1 β production but not in TNF- α production (Kiecolt-Glaser et al., 2014). A brief daily yogic meditation was shown to reverse the pattern of increased NF-kB-related transcription of pro-inflammatory cytokines and decreased IRF-1 related transcription of innate antiviral response genes previously observed in healthy individuals confronting a significant life stressor (Black et al., 2013).

Barriers of Yoga

Irregularity in lifestyle, family commitments, occupational commitments, dullness, excessive talking, strictly adhering to rules, laziness, physical, and mental overexertion, fickleness and wandering of mind, unsteadiness of mind, procrastination, and oversleeping are considered as significant barriers to moderate nature. Modern lifestyle is the major challenge for Yoga practitioners to adhere to the regular practice of Yoga (Dayananda, Ilavarasu, Rajesh, & Babu, 2014).

Adverse Effects of Yoga

A large-scale survey demonstrated that approximately 30% of Yoga class attendees had experienced some type of adverse event. Although most adverse events were mild, some individuals experienced severe events, which caused them to discontinue the class (Matsushita & Oka, 2015). Followed a Yoga exercise called “pranayama,” which had involved a vigorous Valsalva maneuver, a 40-year-old man developed swelling of the face and neck associated with respiratory distress of sudden onset (Kashyap, Anand, & Kashyap, 2007). A case study reported the development of basilar artery occlusion 2 months after adopting unusual neck postures during Yoga practice in a female (Fong, Cheung, Yu, Lai, & Chang, 1993). Although many forms of Yoga practice are safe, some are strenuous and may not be appropriate for everyone. In particular, elderly patients or those with mobility problems (Sengupta, 2012). Injury due to Yoga is an infrequent barrier to continued practice and severe injury due to Yoga is rare (Holton & Barry 2014). Yoga, although not entirely risk-free, can be considered a safe form of exercise if practiced under the guidance and supervision of a qualified trainer (Sengupta, 2012).

Conclusion

The ancient Indian science has its own philosophy/concepts, different techniques that spread almost worldwide. The pieces of scientific evidences for its health benefits on various systems are increasing and encouraging its use in the health-care system.

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