

# YOGA AS AN ADJUNCT THERAPY THROUGH THE LENS OF POSITIVE PSYCHOLOGY THEORY AND NEUROSCIENCE

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## Abstract

Therapeutic interventions incorporating mindfulness have proliferated as complementary treatment. One adjunct mindfulness intervention that warrants further study is Yoga; a physical and spiritual practice to facilitate a mind-body connection. Research has shown a consistent yoga practice can affect cognitive, behavioral, and emotional wellbeing and may be effective for reducing symptoms of anxiety and depression. Neuroimaging studies have begun to explore the neurophysiological benefits to determine whether these are specific to yoga or present in metabolically equivalent forms of exercise. The objective of this paper is to review empirical literature on the benefits of yoga and examine whether current positive psychology theory and neuroscience research offer support for yoga as an adjunct therapy.

## Introduction

Randomized control trials of yoga have illuminated how yoga can make a positive impact on health by emphasizing the importance of the mind-body connection. Wei and Groves (2017), authors of The Harvard Medical School Guide to Yoga and trained psychiatrists, find building the mind-body connection provides the capacity to handle mental and physical stress by redirecting thoughts and increasing self-awareness. Under stress the body releases the hormone cortisol along with catecholamines which trigger the heart to beat faster, pupils to dilate, and the breath to become accelerated and shallow. The fight, flight, or freeze physiological responses are facets of the sympathetic nervous system. The parasympathetic system, the counter response, releases acetylcholine to slow heart rate, relax muscles and return the breath to its normal respiration rate. These two physiological responses of the autonomic nervous system aim to balance each other. However, when the sympathetic nervous system is hyperactive for too long the body becomes unbalanced in a stressful state. Meditation and yoga can elicit a relaxation response of the parasympathetic system by manipulating the breath and redirecting one's thoughts (Toschi-Dias et al., 2017; Villemure et al., 2014). Yoga has many lessons to offer but arguably the most important is the realization of the mind-body connection.

Many studies of yoga and stress have centered around cortisol, a steroid termed the stress hormone and end product of the hypothalamic-pituitary-adrenal-axis. Cortisol has served as an important evolutionary protection by setting off an alarm in the body to subside

nonessential fight or flight bodily functions. One effect of cortisol includes the sudden burst of energy in response to perceived threats. Modern day chronic activation of the HPA in neuroendocrine studies has shown to impact cognition, mental health and affect brain structures (Lupien, McEwen, Gunnar & Heim, 2009; Gothe, Keswani, & McAuley, 2016). By limiting nonessential fight or flight responses such as digestion, immune response, and sleep other systems become affected. The research of yoga interventions suggests mind body activities play a down regulatory effect in response to stress. The exact mechanism of action is unclear but it appears yoga attenuates the deleterious effects of prolonged stress from cortisol activation which could lead to mental health abnormalities.

The practice of yoga is an ancient discipline originating in India. In the United States yoga is most often practiced following the tradition of Hatha Yoga, an umbrella term emphasizing physical postures. Some other forms of yoga include Iyengar, Yin, and Ashtanga which differ in style, rigor, pace, and breathing techniques. However, across all types of yoga one predominant characteristic is the focus on a philosophy of gratitude and acceptance of oneself to bring balance to physical, mental, and emotional states. For instance, yoga incorporates mindfulness; the intention of bringing awareness to the present moment to develop a non-judgmental attitude or relationship to thoughts, feelings, and sensations as they occur (Holzel et al., 2011). Cognitive behavior therapy follows these same principles of redirecting thoughts and feelings to a desired behavior (Greenberger & Padesky, 1995). Thus, many researchers have begun to investigate the impact of yoga as an adjunct treatment for anxiety and depression. Meanwhile, neuroscientists have also begun to explore if the benefits of yoga effects the brain's biochemistry, morphology, and function. The objective of this paper is to consider empirical research from positive psychology theory and neuroscience, for analysis of yoga as an adjunct therapeutic intervention.

## Positive Psychology and Yoga

Positive psychology, the scientific study of human potential and positive aspects of life, focuses on the positive emotions of human character and subjective wellbeing (Peterson, 2006; Butzer, Ahmed & Khalsa, 2015). Author and clinical psychologist Alan Carr (2013) suggests, one of the major concerns within the field of positive psychology is the distinction of hedonic and eudaimonic wellbeing. The hedonic approach to

wellbeing is through pain avoidance and the eudaimonic approach focuses on meaning and self-realization. Carr believes the hedonic tradition of pleasure may lead to addiction because of pleasure seeking through the overindulgence in material goods, alcohol, drugs, or food that can lead to mental or physical health ailments. The approach of yoga to subjective wellbeing is through the tradition of eudemonic aspects; personal growth, connectedness of mind-body-spirit, and meaning in life. Momentary experiences of pleasure through materialism, that are characteristic of hedonic happiness, do not have a sustainable impact on subjective wellbeing compared to the eudaimonic aspects of happiness obtained through realizing one's potential. Yoga is an ideal practice to conceptualize one's own potential, build resiliency, and increase eudaimonic pleasure for sustainable happiness.

Positive psychology and yoga are intertwined because of the emphasis provided on constructs related to wellbeing such as meaning in life and gratitude. In a study by Ivtzan and Papantoniou (2014), researchers found a positive correlation between a consistent yoga practice and meaning in life and gratitude as reported by self-surveys. Their research also suggests the longer individuals practice yoga, the higher their levels of reported gratitude are. As a positive emotion, gratitude also contributes to the concept of Frederickson's (2001) "broaden and build" theory. As one broadens positive emotions, a positive repertoire is built through increased resiliency, social integration, and willpower. Consequently, this new positive repertoire contributes to positive intrapersonal growth and development. Positive emotions can also undo the effects of negative ones, while spanning intellectual activity through more creative, flexible, or efficient patterns of decision making (Ivtzan & Papantoniou, 2014; Armenta, Fritz, & Lyubomirsky, 2017). Thus, by providing meaning in life, a space to practice gratitude and setting the structural framework for fostering intrapersonal growth, yoga is incorporated into many constructs of positive psychology.

Other elements of positive psychology include self-discipline and self-awareness, both related to the concept of flow (Ivtzan & Papantoniou, 2014). Flow is a positive psychology construct involving a state of complete engagement and immersion in the moment (Nakamura, J., & Csikszentmihalyi, M., 2009). According to Csikszentmihalyi, psychologist and author, flow experiences require a balance of challenges and skill. From a perspective pointed out by Waterman, flow is one indicator of eudaimonia particularly when talents or skills are expressed as the best aspects of an individual's potential (American Psychologist, 2007). The extensive research on flow has stemmed from the experiences of musicians, athletes, and artists who have coined their experiences of flow as being in the groove or in the zone. One randomized control study on young adult musicians by researchers Butzer, Ahmed, and Khalsa (2016) found a yoga and mindfulness intervention induces states of flow. The experimental group also reported a decrease in performance anxiety compared to controls. The absorptive state experienced in yoga, flow, and

mindfulness can also foster creativity and persistence in a task. These positive outcomes can also lead to enhanced self-esteem to combat against negative outcomes or feelings of anxiety. Butzer and colleagues' study is inconclusive, however, based on their findings inferences can be made to improve human potential and increase the positive aspects of life.

### Yoga and Brain Health

Advances in neuroimaging have provided non-invasive measures to study the underlying mechanisms of the brain. One area of interest is how the brain responds to experience and rewires itself, a term neuroscientists refer to as neuroplasticity. Theories on neuroplasticity suggesting 'neurons that wire together fire together' detail the malleability of the brain's capacity to change according to conditions based on the environment and alterations of thinking patterns (Power & Schlagger, 2017). Neuroscientific and psychological research have been particularly interested in the malleability of the hippocampus from experience, a structure associated with learning, memory, and emotional regulation. Another area of focus is the structure known as the amygdala, credited for motivation and intense emotions such as fear and aggression. Non-invasive measures such as magnetic resonance imaging or MRI can show detailed images of tissues inside the body to gain a better understanding. Magnetic resonance spectroscopy or MRS complement MRI scans to quantify selected metabolites (Buonocore & Maddock, 2015). Other techniques such as voxel-based morphometry or VBM reveal concentration of gray matter for comparisons between participants (Ashburner & Friston, 2000). An increase in gray matter could indicate a denser neuronal network from repeated exposure due to training or experience. The research on neuroplasticity and yoga have focused on structures such as the hippocampus and amygdala using MRI, MRS, and VBM to better understand motivation, behavior, and emotional processing for possible therapeutic interventions.

In one study by Holzel and colleagues (2011) involving an 8-week mindfulness-based stress reduction intervention, gray matter or GM in the hippocampus increased and GM in the amygdala decreased. Participants in their study were randomized into groups and scanned using a MRI with an image analysis performed by VBM before and after the program. The experimental group consisted of mediation naive individuals who engaged in a body scan, mindful yoga, and sitting meditation. Participants followed 45-minute guided mindfulness exercises daily at home using audio recordings. Techniques were also taught to carryout mindfulness into everyday activities. These techniques were taught in weekly meetings over two and a half hours. Their findings were compared with a waitlist control group. Morphological differences could support the role of mindfulness to ameliorate mental functioning based on previous research suggesting the hippocampus' role on learning, memory, and emotional regulation. These findings provide support of theories on

neuroplasticity and make inferences on possible mechanisms of action as to how yoga and mindfulness could be influencing morphological differences impacting brain function.

Regular exercise has shown to prevent numerous health problems including the mitigation of depressive symptoms such as ruminative thoughts, restless sleep, and apathy. However, little research has been done on the effects of metabolically matched exercise to determine if yoga is unique to other methods of physical activity. Depression has been correlated with decreased activity levels of the inhibitory neurotransmitter  $\gamma$ -aminobutyric acid or GABA (Brambilla et al., 2003). Research by Streeter and colleagues (2010), using MRS, conducted a study on healthy subjects who were randomized to a 12 week intervention of Iyengar yoga or a metabolically matched walking exercise for 60 minutes three times a week. Iyengar yoga puts an emphasis on alignment with poses held for extended amounts of time to build strength. Results of the study, comparing yoga to walking, found higher GABA activity in the yoga and meditation group. In a similar previous study by Streeter and others (2007), a comparison between a 60 minute yoga session and a reading session found experienced yoga practitioners had increased GABA levels after a session of yoga compared to reading alone. Therefore, yoga could not only serve as an outlet for stress but help rebuild the brain and serve as adjunct treatment options for depression and anxiety.

Yoga may also impact different regions of the brain depending on the type of practice and act as a preventative mental and physical exercise to guard against age related GM degradation. A study by Villemure et al. (2015) evaluated participants based on their yoga practice according to years and weekly/hourly devotion. Controls were excluded based on previous yoga experience to maintain the integrity of the study. Results revealed through analysis of MRI and VBM that the numbers of years of yoga practice was positively correlated with specific regions such as the left mid-insula, left frontal operculum, right middle temporal gyrus, and left orbital frontal cortex. Weekly yoga practice was positively correlated with GM volume increases in the right primary somatosensory cortex, hippocampus, and primary visual area. There was also a negative correlation with age and GM volume seen in controls that was not reflected in the yoga practitioners suggesting yoga could be neuroprotective against GM volume loss. Researchers attribute these differences to neuroplasticity training and the skill acquired through yoga of self-regulation.

### Yoga as a Therapeutic Intervention

Ashtanga, a specific type of yoga meaning eight-limbed path, is often depicted as a metaphorical tree with the limbs representing moral guidelines (Wei & Groves, 2017). These limbs aim to lead the practitioner to spiritual enlightenment or samadhi, the original goal of yoga. The asanas or postures are the most practiced branch, however, ashtanga emphasizes other branches

such as pranayama (breathing), dhyana (meditative absorption) and dharana (focused concentration). All of these branches share common goals to improve self-discipline, willpower, and self-control. Self-discipline, like a muscle, becomes stronger with practice (Baumeister & Tierney, 2011). Ashtanga also parallels programs such as the 12-step program for addiction therapy (Shankar et al., 2014). The 12-step program begins by introducing the concept of a symbolical staircase with each step focusing on an area of self-improvement leading to a spiritual awakening. Both yoga and the 12-step program include aspects of eudaimonic wellbeing (spirituality) considered to have significant dimensions for virtuous behavior; humility, forgiveness, altruism, gratitude, and compassion (Carr, 2013; Ivtzan & Papantoniou, 2014). These objectives in the context of the 12-step program or eight-limbed path, aim to change patterns of thinking and decision making for improving overall wellbeing.

Anxiety is an ordinary emotion characterized by the apprehensive feeling about an event of uncertain development. However, excessive fear, stress, worry, or anxiety may be indicative of anxiety disorder (American Psychiatric Association, 2013) that could lead to concerns about health and quality of life. Studies of individuals with anxiety and emotional disorders have found low levels of mindfulness (Curtiss & Klemanski, 2014). Therefore, targeting one area such as mindfulness through yoga could help alleviate some symptoms of anxiety or mitigate the progression of generalized anxiety disorder. One form of yoga emphasizing mindfulness is Yin yoga. Yin yoga is arguably one of the most credited for reducing anxiety as it is a slow practice modifiable for everyone. Hylander, Johansson, Duakantaite, and Ruggeri (2017) conducted a randomized control trial of mindfulness and yoga in a non-clinical sample to evaluate the precursors of anxiety such as stress and worry. Their study of Yin yoga and mindfulness excluded participants having ongoing or previous yoga/mindfulness experiences for longer than six months. The experimental group participated in a five-week practice two times a week while the control was waitlisted. Their study was unique as Yin yoga was combined with evidence-based psychotherapy which consisted of 10 content specific themes to teach individuals a better self-directed practice. Consistent with their hypothesis, results suggested that the Yin yoga and mindfulness group established a setting where individuals showed improved mental health by decreased self-reports of perceived stress and worry from self-report surveys.

Depression is one of the most common psychiatric disorders presenting with symptoms that could affect cognitive, behavioral, and physical health. One study worth recognition is by Schuver and Lewis (2016) who conducted a study to determine the efficacy of yoga relative to a walking control group. Their study found in a sample of women with history of diagnosed depression and current depression, over a 12-week mindfulness-based yoga intervention, had decreased depressive symptoms and less ruminative thoughts from baseline to post intervention. Unique to their study, participants were sent home with a DVD guide of yoga focusing on pranayama, meditation, and asana. Participants were instructed to do 60-75 minutes twice a week of guided yoga designed for the management of depression and anxiety symptoms. A mindfulness education session was also provided over the phone. Even though participants were instructed to complete the DVD guide twice a week, they were encouraged to do more in their free time. Phone calls by the experimenters recorded yoga frequency and answered questions.

The notion that yoga could act as a preventative practice for psychiatric symptoms is also consistent with other research that compared yoga to another exercise group of stretching. Gaiswinkler and Unterrainer (2016) found highly involved yoga practitioners have less psychiatric symptoms such as depression compared to moderately involved practices of stretching in a gymnastics control group. Participants were asked over an internet survey to rate their degree of yoga involvement and compared to a group of gymnastic practitioners. Both sample groups were female. The total sample size included 362 yoga practitioners and 93 gymnasts. The majority of the yoga practitioners (68.2%) stated they followed Hatha yoga. The study found empirical support for the positive impact of yoga when the individual is highly involved in the practice by exhibiting the lowest amount of mood pathology in comparison to other groups with less involvement. Yoga is multifaceted and the exact cause for the reduction in depressive symptoms is unclear. However, it is credited to be the encouragement of self-awareness, mindfulness and the mind-body connection which elicits the change.

### Limitations

The research on yoga as an adjunct treatment has many strengths but there are several limitations to be considered. Much of the research on the benefits of yoga are correlational and directionality is unclear (e.g., the directionality of flow and mindfulness associations with performance anxiety in young adult musicians is inconclusive (Butzer et al., 2016). Another limitation in the research of yoga worth addressing involves self-report surveys. For example, in the study by Schuver and Lewis the participants in the intervention knew of the researcher's intentions prior to completing self-report surveys. Informing participants of the study's hypothesis or goals could increase demand characteristics; leading the participant to respond in ways that unconsciously

change their behavior to fit the study. Self-report surveys can also be problematic because of framing effects (cognitive bias) and social desirability other experimental artifacts of unconscious behavior.

### Conclusion

Stress is a common obstacle in everyday life yet prolonged stress can be detrimental to mental and physical health. Yoga can offer coping strategies for alleviating anxiety, mitigating depression and providing tools on how to better respond to stressful stimuli. Research on the positive benefits of yoga has been gaining popularity and slowly becoming integrated as an adjunct treatment. Many of these effects remain to be understood but with the help of positive psychology theory and advancing technology in neuroscience, science can help explain the neurobiological processes and cognitive changes of yoga's influence.

Yoga has shown a lot of potential as an adjunct therapy for anxiety and depression for use in recovery. However, more research is needed. Wei and Groves (2017) note research in promoting alternative therapies is important in gaining the attention of insurance companies to offer affordable coverage. Thus, more studies should be conducted to evaluate how yoga can be a preventative and a neuroprotective practice to promote yoga as an adjunct option. This review supports how yoga can be implemented as a complementary therapy to enhance constructs from positive psychology, such as meaning in life and gratitude, while also providing objective findings from brain research on yoga and brain health.

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