YOGA PRACTICE EFFECTS ON THE NERVOUS SYSTEM AND POTENTIAL AS AN ADJUNCTIVE THERAPY FOR MOOD, STRESS AND ANXIETY DISORDERS:
A LITERATURE REVIEW

By

HANNAH KAREN GODFREY

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Dr. Douglas Keen
Department of Physiology
Abstract

Yoga is an immensely popular practice in Western society today, characterized by its attempt to bridge the body and mind through breathing techniques, meditation and yoga postures. This mind-body connection makes yoga a particularly compelling interventional therapy for the management of mental health, notably mood, anxiety and stress disorders. A search of relevant literature using online research databases was completed in order to determine if a physiological basis exists for any perceived mental health improvement due to yoga. The findings suggest that yoga has a positive effect on autonomic, limbic, and endocrine system regulation -- evident in decreases in sympathetic activation, limbic activation, and stress hormones, combined with increases in mood enhancing hormones. The findings also suggest positive structural and functional changes to the brain in response to yoga therapy that may be protective against depression, anxiety and stress. Importantly, the evidence suggests the mind-body connection component of yoga as a critical mediator of these potential benefits to mental health. These results provide evidence that there is likely a correlation between beneficial alterations to the nervous system due to yoga practice and the perceived improvement of mental health symptoms.
Introduction

Yoga originated thousands of years ago as a spiritual practice restricted to being taught by religious leaders in India and Tibet. However, it has only recently gained immense popularity and accessibility in Western culture and produced many different avenues of practice (Brown and Gerbarg, 2009). Although there are many types of yoga the typical modes of practice in the United States, Hatha and Vinyasa yoga, are known for their effort to bridge the body and the mind. Both, although slightly different in execution, focus on the use of guided breath to link together physical yoga postures, and asanas, which are aimed at quieting the mind and relaxing the body (Sherman, 2012). In the last decade, the popularity of these forms of contemporary yoga has nearly tripled, growing to roughly 55 million yoga practitioners in the United States alone. There are many benefits that account for yoga’s explosion in popularity including general wellness and improvement in strength and flexibility, but potentially the most compelling being a perceived improvement of mental health disorders.

Managing mental health, such as depression, anxiety and stress disorders is extremely important due to the rise in patients dealing with these conditions as well as the detriment to health when they are left untreated. Yoga is considered one of the only meaningful mind-body interventions and is commonly prescribed for patients dealing with these disorders, typically in addition to other therapeutic means, such as cognitive-behavior therapy or pharmaceutical intervention (Cramer et al., 2013; Hofman et al., 2016). Particularly for anxiety, stress or mood related disorders yoga has demonstrated a strong subjective component to alleviation and management of these disorders (Cramer et.al, 2017). The goal of this literature review is to provide physiological evidence of nervous system changes that contribute to the perceived reduction of stress, anxiety and mood symptoms in patients undergoing yoga intervention.
Relating the Nervous System to Yoga Practice

The nervous system is the major connection of mind and body, and therefore it is likely the source of the potential effect yoga has on mental health. The brain and spinal cord innervate all parts of the body, including those responsible for both movement and breath. This provides a reasonable assumption that analysis of yoga’s effect or lack of effect on the key features of the nervous system will determine if the perceived mental health improvement has a physiological basis. The autonomic nervous system, limbic system and endocrine system work together under the regulation of the nervous system to control important aspects of mental health. Each part of this system has the potential to affect perceived mental health status, as well as physiological changes that induce regulation of mood, anxiety and stress. Analyzing the physiological changes to the nervous system due to yoga interventional studies published in the relevant literature will provide a better understanding of the origin of perceived improvement in mental health symptoms in patients that practice yoga.

The Autonomic Nervous System Response to Yoga Therapy

The autonomic nervous system is greatly responsible for the body’s maintenance of homeostasis in response to physiological stressors making its alterations key in determining if the effects of yoga therapy have a basis in physiology. The sympathetic and parasympathetic branches of the autonomic nervous system counter each other in controlling heart rate, blood pressure, catecholamines and neurotransmitters to meet the needs of the body (Barrett et al., 2019). Each of these factors have their own effect on an individual’s perceived mood, stress level and anxiety and thus will be analyzed further.
Heart Rate (HR) and Heart Rate Variability (HRV)

The adaptation of heart rate to accompany the needs of the body depending on the situation is not only a physiological mediator of homeostasis, but it can influence an individual’s perception of mood and stress. The sympathetic nervous system will raise heart rate in response to stress in order to increase blood flow to meet the needs of the body. A meta-analysis of 42 yoga based interventional studies found with statistical significance that following 12-week yoga asana intervention resulted in decreased resting HR of the participants compared to the control groups (Pascoe et al., 2017). This lower resting HR found in the yoga practitioners could provide decreased perception of anxiety/stress because of the decreased sympathetic activation. Another 6-week yoga interventional study also found that HR was lowered following the mind-body practice, in comparison to no change in the aerobic cycling control group (Ross and Thomas, 2010). The ability of yoga to adapt HR beyond the ability of a solely physical exercise group could suggest the mind-body connection in yoga, as important for eliciting nervous system alterations, such as decreased HR.

Heart rate variability, the measure of the change in time between each heartbeat, is also an important element of HR that influences mental health. A low heart rate variability is associated with increased panic disorders, anxiety and depression, so increasing HRV could have a protective effect on mental health (Brown and Gerbarg, 2009). The same meta-analysis of 12-week yoga interventions found preliminary evidence suggesting increased HRV in the yoga asana group (Pascoe et al., 2017). One review found that the implementation of Ujjayi breathing, slow, mindful nostril breathing, during Hatha yoga improved HRV beyond the effects of typical slow breathing (Brown and Gerbarg, 2009). This suggests that the mindful focus on breath during Ujjayi breathing allows for an increase in HRV seen in other yoga interventional studies.
Blood Pressure (BP)

The alteration in blood pressure is an important factor in determining if yoga is causing changes to occur to sympathetic nervous system activation. A meta-analysis of 12-week yoga based interventional studies found significant evidence of resting systolic blood pressure (SBP), resting diastolic blood pressure (DBP) and mean arterial pressure (MAP) decreases in the yoga group compared to a variety of control groups (Pascoe et al., 2017). It was also discussed that the yoga group showed a greater decrease in SBP when compared to an exercise-based control group (Pascoe et al., 2017). This suggests that the mindfulness component of yoga may play a role in the decrease to BP. Another review of exercise and yoga comparison studies found that Hatha yoga compared to solely meditation had a much greater effect on decreasing blood pressure (Ross and Thomas, 2010). This gives the reverse perspective that the physical practice of yoga affects the sympathetic system in a way solely the mental aspect of yoga cannot. Thus, there is evidence to suggest that the bridge of mind and body gives yoga a superior ability to affect sympathetic activation compared to exercise or meditation alone. Lower blood pressure, like HR, also gives the perception of calm and decreased stress due to the activation of the parasympathetic system. This suggests that the decrease in BP due to yoga has an improving effect on a practitioner’s mood and feelings of stress.

Epinephrine and Norepinephrine

Epinephrine and norepinephrine are both catecholamines that increase release in response to activation of the sympathetic nervous system in times of stress. They work to vasoconstrict blood vessels to raise blood pressure and increase heart rate to allow the heart to better meet the needs of the body during fight-or-flight situations. Since catecholamines act indirectly on HR
and BP, lower levels of circulating catecholamines will result in decreased sympathetic activation. A 12-week yoga intervention pilot study found a significant decrease in plasma epinephrine in the yoga group compared to the control group (Lim and Cheong, 2015). The same study found no change to plasma norepinephrine and suggested that both effects should be studied further. This study provides preliminary evidence that yoga has some effect on circulating catecholamines, due to decreased sympathetic activation, but there is little other research looking into this relationship. The decreased epinephrine in response to the yoga training may contribute to the decreased perception of stress and anxiety if this relationship exists.

**Gamma-Aminobutyric Acid (GABA)**

Gamma-aminobutyric acid (GABA) is the primary inhibitory neurotransmitter of the central nervous system. Its release inhibits the SNS causing activation of the PSN and increased feeling of relaxation and decreased stress. A pilot study using magnetic resonance spectroscopy to look at cortical changes to GABA in yoga practitioners found a 27% increase in GABA after 60 minutes of yoga (Streeter et al., 2007). A study by the same group also attempted to find a correlation between the increase in GABA and improvement to mood and decreased anxiety -- they used various scales to assess both anxiety and mood changes in response to GABA. They found a statistically significant increase in left thalamic GABA levels and improvement in mood and a decrease in anxiety according to the scores on each of the scales they measured (Streeter et al., 2010). This provides evidence that yoga not only has a seemingly profound effect on the release of GABA, but because of this causes improvement to mood and reduction in anxiety. They made this same comparison for a control group that only received metabolically equivalent
walking training and found that this relationship between GABA and changes to mood and anxiety did not exist (Streeter et al., 2010). This suggests yoga therapy has a more profound effect on sympathetic activation than equivalent exercise, meaning that the qualities of yoga that allow for mind and body connections increase the effect that exercise alone has on mental health improvement.

The same group did another similar study published in 2020 and found that there was a significant increase in thalamic GABA following not only 12-week Hatha yoga intervention, but also a single 90-minute Hatha yoga class (Streeter et al., 2020). This suggests both short term and long-term effects on the release of GABA following yoga intervention. Depressed individuals often have lower GABA concentration in the brain than nondepressed individuals (Mehta and Gangadhar, 2019). Therefore, this increased GABA release following yoga could have an important effect on bringing depressed patients up to baseline GABA levels.

**The Limbic System in Response to Yoga Therapy**

The limbic system is another central nervous system component that plays an important role in mental health. It is composed of the emotional regulatory centers of the brain, including the thalamus, hippocampus, hypothalamus, and amygdala (Waxman, 2020). These brain regions each have different functions in the regulation of mood and emotion -- controlling aspects of behavior, hunger, pain, memory, aggression and other emotions. These structures act together as an emotional mediator and elicit effects on a person’s mood, anxiety, and stress. One study found that om chanting, like that done in many yoga practices, demonstrated deactivation of several limbic structures, most significantly the amygdala on a blood-oxygen-level-dependent (BOLD) functional MRI (Gangadhar et al., 2011). Deactivation of the amygdala in particular is associated
with increased cognitive control over emotional states (Froeliger et al., 2012). Another study using fMRI imaging found greater activation in the medial/orbitofrontal cortices in individuals practicing yoga meditation, indicating improved emotional regulation capabilities (Holzel et al., 2007). This suggests that mindfulness during the yoga practice can increase the ability of individuals to regulate their mood. A different study looking at changes to emotional regulation in practitioners of yoga meditation found an uncoupling of the activation of the amygdala with changes in positive affect after viewing negative emotional stimuli (Froeliger et al., 2012). This suggests that yoga meditation may allow practitioners to process negative emotional stimuli without it affecting their mood in the long term, which could allow for better regulation of mood.

The Endocrine System Response to Yoga Therapy

The endocrine system is an important component in the regulation of mood and anxiety; thus, it is important to investigate the effect that yoga has on this system. The endocrine system is highly integrated with the nervous system -- they work together to regulate the function of all systems in the body (Tortora and Derrikson, 2017). This system helps to maintain the body’s homeostasis through the release of hormones that act on many target organ systems. Hormones play a critical role in regulating emotional processes, stress, and mood generating a different effect on an individual’s mental health. The hormones most critical in mental health regulation are cortisol for its role in stress and dopamine and serotonin for their roles in mood.

Cortisol

Cortisol is a critical hormone in the regulation of stress, mediated by the hypothalamic-pituitary-adrenal (HPA) axis. Emotional and/or physical stress causes activation of the
sympathetic system which stimulates the hypothalamus to release corticotropin-releasing hormone (CRH). CRH acts on the anterior pituitary to release adrenocorticotropic hormone (ACTH) which causes the release of cortisol by the adrenal cortex (Tortora and Derrikson, 2017). Cortisol then increases the body’s stress response and allows the body to better meet its needs during the sympathetic response. A meta-analysis of yoga interventional studies found that the studies that integrated yoga asanas showed decreased waking, afternoon and evening levels of salivary cortisol (Pascoe et al., 2017). This demonstrates yoga’s ability to reduce the body’s baseline levels of cortisol during non-stressful events. Studies have shown that increased salivary cortisol has been associated with social anxiety and lower levels may be protective against stress related mental illness (Mehta and Gangadhar, 2019; Pascoe et al., 2017). Another study that compared 90 minutes of African dance to 90 minutes of Hatha yoga intervention found that both activities demonstrated a perceived decrease in stress and improved mood following one session, but only the yoga group showed a significant decrease in salivary cortisol (West et al., 2004). This demonstrates yoga’s ability to have a tangible effect on the release of cortisol that has the potential to decrease response to stress and protect against stress related mental illness, such as clinical depression and post-traumatic stress disorder.

Another review detailed an 8-week Hatha yoga interventional study that demonstrated a decrease in salivary cortisol levels compared to an increase in cortisol levels in a group that underwent 8 weeks of equivalent stretching (Rivest-Gadbois and Boudrias, 2019). Since the physical practice of yoga heavily relies on stretching this gives evidence that the mind-body integration in yoga is likely a major factor in the decrease of the body’s response to stress following yoga intervention. A pilot study comparing meditative yoga practice to power yoga, a form of yoga that does not have a strong mindfulness component, found a similar relationship
demonstrating significant decreased salivary cortisol in only the meditative yoga group (Marshall et al., 2020). This provides more evidence to suggest that the regulation of cortisol release that is demonstrated in the yoga interventional study groups has much to do with the mindfulness component of the practice. Another review examined a study in which participants that underwent 60-minute Hatha yoga showed decreased levels of blood serum cortisol following the practice (Desai et al., 2015). Higher plasma cortisol, like higher salivary cortisol, has been shown in patients with depression (Devi et al., 1986; Mehta and Gangadhar, 2019). This provides evidence that yoga elicits both short term and long-term effects on salivary and plasma levels of cortisol.

**Dopamine**

Dopamine is a neurotransmitter/hormone that is highly important in the regulation of mood and is active in the response to pleasurable stimuli. Dopamine imbalance is linked to several mental illnesses and disorders, namely clinical depression (Tortora and Derrikson, 2017). A study looking at the changes in the dopamine release in areas of the brain during Yoga Nidra, meditative yoga practice, found that compared to the control subjects the yoga group showed significant increased dopaminergic tone in the ventral striatum and trending increases in other brain regions (Kjaer et al., 2002). The brain regions mentioned in the paper the right and left caudate, right and left putamen and the ventral striatum are all involved in motivation, and thus the increased release of endogenous dopamine in these areas will likely influence mood and behavior (Kjaer et al., 2002). Additionally, since lower levels of dopamine release are typically present in depressed individuals this increased release following the yoga meditative practice could help individuals with depression reach baseline dopamine levels. A different 12-week yoga
interventional study found that plasma dopamine was increased in the yoga group compared to the control, but with no statistical significance (Lim and Cheong, 2015). This suggests that there may be a relationship between circulating plasma dopamine and yoga practice, but more research is necessary to know for sure.

**Serotonin**

Serotonin is another neurotransmitter/hormone involved in controlling mood, and like dopamine, its dysregulation is linked to mental illnesses, such as depression (Tortora and Derrikson, 2017). Since, low levels of serotonin are often found in depressed individuals the most common pharmaceutical treatments for depression are selective serotonin reuptake inhibitors (2017). A Kundalini yoga interventional study, a form of Hatha yoga, found that at 3- and 6-month intervals during the intervention there was a significant increase in plasma serotonin (Devi et al., 1986). This demonstrates yoga’s potential to bring patients up to more normal levels of the hormones that affect mood, which could be associated with the perceived improvement in mood following yoga practice. A more recent 12-week yoga interventional study also found a statistically significant increase in plasma serotonin compared to the control group which showed no change (Lim and Cheong, 2015). They suggest that this increase in serotonin could have a beneficial effect on patients with anxiety and depression because of its positive effect on mood. There is little research surrounding the changes to release of serotonin due to yoga treatment outside of these two studies, so future research is needed to further elucidate the relationship.
Structural and Functional Changes to the Brain in Response to Yoga Therapy

Identifying if there are functional and/or structural changes to the brain in response to yoga therapy is critical in determining if there are potentially more long-term changes associated with this adjunctive treatment. These alterations could include visible differences in the size of brain regions, in brain wave activity, and/or in functional connectivity of brain regions. These relationships will be investigated further to determine if yoga practice not only indirectly affects brain processes, but directly elicits changes to brain activity and structure.

Gray Matter Volume

Gray matter makes up about 10% of brain volume, including the cerebral cortex, cerebellar cortex and deep basal nuclei (Tortora and Derrikson, 2017). Decreased gray matter volume is a common characteristic of several mental illnesses and neurodegenerative disorders, like Alzheimer’s disease (Minkova et al., 2017; Goodkind et al., 2017). A cross sectional study of yoga practitioners found a positive correlation between gray matter volume and yoga experience, due mainly to increases in volume within the insular cortex (Desai et al., 2015). This suggests that yoga practice likely elicits long term effects on the volume of gray matter in different regions of the brain, which can be protective against mental illness, like depression and many neurological disorders. One study has shown that specifically lower volume of gray matter in the anterior insula of children is a predictor for major depressive disorder (Belden et al., 2015). Another study looking at adults presenting with mental illnesses, including anxiety and mood disorders, found that these patients also had a lower volume of gray matter in the right and left insula compared to normal adults (Goodkind et al., 2015). The potential ability of yoga to increase gray matter volume, specifically in the insular cortex, could suggest a decreased
likelihood of developing symptoms of depression or anxiety. Another study of Hatha yoga practitioners, who reported at least 45 min of yoga 3-4 times per week for at least 3 years, demonstrated increased gray matter in frontal, limbic, temporal, occipital, and cerebellar regions, whereas the control group showed no changes to these regions (Rivest-Gadbois and Boudrias, 2019). This provides more evidence of yoga’s potential long-term ability to increase gray matter volume in various brain regions.

One longitudinal study with a 6-month yoga intervention for elderly adults (ages 69-81), found significant increases in bilateral hippocampal gray matter volume post-intervention (Hariprasad et al., 2013). The hippocampus is a limbic system region of the brain involved in memory and learning. The hippocampus is also highly important in regulating the body’s response to stress, and lower hippocampal volumes and atrophy have been shown in adults and children with clinical depression and stress disorders, like PTSD (Barch et al., 2019; Desai et al., 2015; Sala et al., 2004). This suggests yoga as potentially protective against hippocampal volume loss and atrophy associated with both mental illness and the aging process. Another review referenced three Hatha yoga based interventional studies and two cross-sectional studies all showing a positive correlation between yoga practice/intervention and hippocampal gray matter volume (Gothe et al., 2019). One particularly intriguing study comparing yoga to equivalent exercise found that while the yoga group had increases in right hippocampal gray matter density following intervention, the exercise group actually demonstrated declining density overtime (Garner et al., 2019). This provides more evidence to suggest yoga’s effect on the brain beyond the effects of equivalent exercise, demonstrating the mindfulness component as likely critical to yoga’s therapeutic potential.
While the majority of studies have demonstrated a similar relationship between yoga practice and beneficial changes to gray matter volume, there are some that have found decreases in regions such as the left posterior insula, left thalamus, left putamen and left hypothalamus (Gotink et al., 2018; Yuan et al., 2020). However, the authors of these studies make note that each has their own limitations, and the causation for this correlation they found is unknown. One postulates that the correlation may have to do with the study population being adolescents, and the other that participants with a smaller hypothalamus might be naturally drawn to yoga practice due to the perceived benefits to mood. These two studies suggest that more research must be done in order to further clarify this relationship and perhaps experimental studies may provide stronger evidence due to the control of these variables.

**Brain Wave Activity**

The measurement of brain waves by an electroencephalogram (EEG) can give information on patterns of brain activation and electrical activity in the cerebral cortex. Distinguishing different types of brain waves on an EEG can suggest the activation of different mental and physical processes over others. The three types of brain waves that are most useful in identifying a variety of mental health disorders are alpha, beta and theta waves (Tortora and Derrikson, 2017).

Alpha waves are lower frequency waves, around 8-13 Hz, that when active are associated with increased perception of calm and cognitive function (Desai et al., 2015). One pranayama/asana-based yoga intervention found that over the course of 30 days alpha wave activity in the occipital and prefrontal cortices significantly increased in the pranayama-asana group (Desai et al., 2015). Many studies have established a correlation between decreased alpha
wave activity and depression, anxiety and high stress (Abhang et al., 2016; Desai et al., 2015; Kan and Lee, 2015). Therefore, this increased alpha wave activity following yoga practice could be protective against depression, anxiety and stress disorders, increasing feelings of relaxation.

Another 6-month yoga asana-pranayama interventional study reported significantly increased alpha wave prominence post-treatment compared to the control group that received no intervention (Bhavanani et al., 2013). This provides increased evidence to suggest that Hatha yoga-based therapies' potential effect on alpha wave activity could help alleviate symptoms of anxiety, depression and stress.

Beta waves are higher frequency waves, around 12-38 Hz, that are shown on an EEG during periods of increased alertness and concentration. These waves have been linked to beneficial effects on cognition, mood and emotion and fatigue, but this effect only occurs in mid-range (15-20 Hz) beta stimulation (Desai et al., 2015; Abhang et al., 2016). Due to this variation by range of stimulation they have a dual effect on mental health -- high beta activity is associated with increased anxiety and extremely low beta wave activity is associated with depression (Abhang et al., 2016). One 6-month interventional yoga asana-pranayama study found a significant increase in beta wave stimulation post-intervention (Bhavanani et al., 2013). This study did not indicate the range of beta wave activity in the participants pre and post study, therefore it is difficult to ascertain the effect that this increase could have on mental health. However, they did not mention that the participants displayed better visual discriminatory reaction times suggesting increased alertness and neural processing (Bhavanani et al., 2013). Therefore, though they do not provide the exact changes in beta wave activity that would better elucidate the direct effect to mental health, this finding suggests that the increased beta waves activity following yoga has a beneficial effect on mental processing.
Theta waves are lower frequency waves, around 4-7 Hz, that similar to alpha waves, are associated with decreased perception of anxiety symptoms, likely due to their association with increased parasympathetic activity (Desai et al., 2015; Rivest-Gadbois and Boudrias, 2019). However, like beta waves they have a dual effect on mental health depending on the particular range -- too high theta wave prominence is associated with depression, whereas too low activity is associated with anxiety (Abhang et al., 2016). Therefore, it is important to identify the baseline activity of the participants in the interventional studies in order to determine the relative potential effect that changes to theta wave activity could have on mental health. The same meditative yoga study that reported increased dopaminergic tone in the ventral striatum found that there was also a correlated 9% increase in theta wave activity during meditation (Kjaer et al., 2002). This increased theta wave activity could be associated beneficial effects on anxiety, due to the increased parasympathetic activity, however the study does not provide enough information on the baseline theta wave ranges of participants to make an accurate prediction. Additionally, the study that reported increased beta wave activity after a 6-month intervention also found a significant increase in theta wave activity (Bhavanani et al., 2013). This study also does not detail the specific ranges of theta wave activity, therefore more information is needed to determine the potential positive or negative effects of this change on mental health of the participants.

*Functional Connectivity (FC)*

Resting state functional connectivity (FC) is essentially a statistical measurement of the temporal correlation of the activity in separate brain regions (Woodward and Cascio, 2015). Dysfunctional connectivity is correlated with a variety of psychiatric and neurological disorders,
depending on the specific neural network that is being analyzed. One study comparing experienced yoga practitioners to a control group found that when comparing data from fMRI imaging there was increased caudate connectivity in the yoga group suggesting increased FC in the basal ganglia cortico-thalamic feedback loops (Gard et al., 2015). Dysfunctional connectivity in these loops, together referred to as the salience network (SN), is associated with issues regulating behavior, mood and cognition, all of which can directly lead to symptoms of anxiety, mood and stress disorders (Peters et al., 2016). Therefore, the greater functional connectivity in the SN established in yoga practitioners could have a beneficial effect on patients presenting with these symptoms of mental illness.

Another study using a 12-week yoga intervention found increased functional connectivity within the default mode network (DMN) and language network that correlated with significant improvements in depression and memory scores (Eyre et al. 2016). Studies have found a negative correlation between symptoms of depression and language network FC (Buchanan et al., 2014; Schultz et al., 2018). This suggests that if yoga has the ability to increase FC in the language network, in turn it may have a positive effect on mood. Studies have also correlated decreased functional connectivity in the DMN with patients with symptoms of depression, anxiety, and increased social dysfunction (Saris et al., 2020; Yan et al., 2019). This suggests that the potential of yoga to increase connectivity within this network could be protective against symptoms of depression and anxiety. Loss of FC in the DMN is also common during the aging process -- a study investigating this relationship found that elderly women who practiced yoga for 8 or more years showed greater FC than women in the control group (Santaella et al., 2019). This provides evidence for yoga practice as potentially beneficial in protecting against not only the development of depressive/anxiety symptoms, but also age-related cognitive decline.
Since this is a newer field of interest there are some limitations in this research, including the fact that many studies focus on meditation changes alone without looking at the physical component of the yoga practice. Future research is necessary in order to strengthen the preliminary correlation between yoga and improved functional connectivity that is noted in this review.

**Conclusion**

This review of literature suggests yoga as a promising potential therapy for mood, anxiety and stress disorders. The studies analyzed suggest a variety of beneficial alterations to the nervous system in response to yoga training, in many cases beyond the effects of equivalent exercise. The positive effects reported on the regulation of the autonomic, limbic and endocrine systems suggest the potential of yoga as an interventional therapy. In addition, the reported positive structural and functional changes that may be associated with yoga training could protect against not only mood, anxiety and stress disorders, but potentially age-related cognitive decline. These studies demonstrate preliminary evidence that the mind-body connection component of yoga may be the key to achieving the nervous system changes -- setting yoga apart from other exercise-based therapies. Future research is necessary to make conclusions on this relationship and the benefits to mental health, these studies being some of the first of their kind in the field. The emerging field of alternative/adjunctive mental health therapies is still in its infancy -- however, the literature discussed in this review reveals encouraging evidence suggesting the potential of yoga to not only have an effect on perceived mental health, but to have a positive physiological effect on practitioners.
References


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