

# **Brain-Yoga Relationship**

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“The following is provided as a basic guide on the complicated relationship of yoga to the human brain. It is keenly understood this is only a basic guide and the full complexity of such inner neural workings with such behavior remains beyond our understanding at this time.”

Dr. Nussbaum

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The human brain is a highly complex and interconnected set of neural networks that contain highly specific regional specificity while maintaining general role and functions throughout.

Our understanding of this helps us to realize there is not one cell or one region that is responsible for a particular thought, feeling, or behavior. Indeed, there are multiple anatomic and neurochemical/electrical contributions to any thought, feeling, or behavior. At the same time, we do believe the brain has “primary” regions and structures of responsibility for different behaviors.

Yoga is a symphony of behaviors to include cognition, emotion, motor, and relational aspects all originating from the brain with particular outcomes that tend to be rewarding.

Consider the following organizational schema for Yoga and the Brain:

<b>Yoga</b>	<b>Brain</b>
<b>Intention:</b>	Intention is a conscious and deliberate cognitive process by which one establishes a purpose or goal. The frontal lobes of the brain are certainly involved here as this part of our brain, often called the “Executive System” is critical to focus, attention, decision-making, analysis and

deliberation. Positioned in the Cortex (outer ruffled shell-literal translation is “bark of tree”), the frontal lobes are involved in highly complex conscious acts such as intention.

**Witness to Self:**

My ability to observe or witness myself and to monitor my self, is a very complex function most likely highly specialized in humans. The insula is a small structure in the brain that helps us recognize our inner wellbeing and whether we are emotionally balanced or not. The same is true of the precuneus, located deep in the parietal lobes near the back of the brain. This structure helps us with social awareness, consciousness, and self-reflection. Interestingly, yawning is a great behavior to stimulate the precuneus that will bring a calm and nurturing feeling to the brain. Yawning is also contagious!

Our Frontal lobes will analyze and contribute to any judgments made about our wellbeing while our Limbic System will foster emotional surges such as distress, joy, passion, alarm, etc.

The ability to balance the analytic frontal lobe with the emotional limbic system is often compared to the negotiation between a parent and teenager. The structure critical to obtaining Peace between the Frontal Lobes and the Limbic System is the Anterior Cingulate Gyrus. Our mindfulness exercises, breathing, and witness of self stimulate the Cingulate Gyrus and help to bring an inner peace to our brain and balance the Frontal Lobes with the Limbic System.

**Breathing:**

Breath has been called the spirit and even holy spirit in historical and religious terms. It is a necessary physiological function and our brains require about 25% of the oxygen and nutrients from each heartbeat!

Our brain processes information from at least five sensory pathways, this information travels through the thalamus, our grand sensory relay station sitting in the middle of the brain, and then our frontal lobe interprets the information

to make a reasonable decision on it. This is based on prior experience and consequences via our memory and learning system (hippocampus and cortex).

This is the underlying higher order cognitive mechanism as to why our breathing can be calm, rhythmic and natural or perhaps rapid, panicked, and desperate. There is also a more fundamental and primitive region of our brain critical to functions of life and this includes respiration.

The brain stem is a highly important structure emerging from the spinal cord and includes 12 cranial nerves that serve different functions such as respiration, body temperature, metabolism, drives, and alertness, sleep regulation vital organ stability. The largest cranial nerve is the 10<sup>th</sup> or Vagus nerve and it plays a particularly important role with rhythmical breathing as it has connection with multiple vital organs throughout our body.

The brains stem is also the home of our autonomic nervous system that is divided into a “parasympathetic nervous system” and “sympathetic nervous system”. The parasympathetic nervous system is responsible for our inner emotional balance and wellbeing and will help us with rest and digestive functions. It is a highly healthy state of being and I often teach people to “swim in the parasympathetic waters of life.” Healthy hormones of oxytocin and vasopressin are released and dopamine and serotonin will bathe our brain with feelings of pleasure and wellbeing.

The sympathetic nervous system triggers our “fight or flight” response, causes hormones to explode including cortisol that can do structural and functional damage to our brains and behavior if it is chronic, and leads to release of norepinephrine and adrenaline throughout our brain and body. Our amygdala is triggered and

prepares us to fight or flee. The overall result is our body is emotionally out of balance, stressed, and incapable of functioning at peak performance.

Breathing in a slowed, natural, and rhythmical fashion is one of the primary techniques to get us to the parasympathetic, shut off our amygdala, engage our anterior cingulate, and flood our brains and bodies with healthy hormones and neurochemicals. Our frontal lobe will analyze and determine "I am well."

### **Stretching:**

Stretching definitely is action and motor based. Our cerebellum that sits at the base of our brain ("little brain") is responsible for coordination, balance, and fine motor skill. It also has a cognitive ability in that it helps us imagine movement and with nearly the same benefit to that part of our brain and body that would actually move.

Movement that is purposeful involves our primary motor cortex that sits as a band of cells across the top of the cortex in the middle of the brain. It literally has cells that relate directly to specific parts of the body, those parts of the body that need to move such as legs, lips, hands have more cells than body parts that do not need to move (ear lobes). Purposeful movement with a stretch infers conscious processing so think Cortex.

Our subcortex that sits just under the cortex and is sometimes referred to as the "basal ganglia" is a highly complex set of brain cells that helps with routinized or procedural movement. Such action tends to be subconscious such as arm swing while walking, swallowing, eye gaze, etc.

Our sensation or feelings on a physical level while stretching will also include our Primary Sensory System, located just behind the Primary Motor System in the cortex. Prior to getting to the conscious Primary Sensory System that will tell us "this hurts and stop" our experience of

stretching will run through our Thalamus, the sensory relay system of the brain.

As we stretch, our brains might be telling us “stop, this is not comfortable,” or “I don’t like this and I want to stop.” This is your sympathetic nervous system and amygdala at work (see above) and the breathing techniques taught by your instructor will help to engage the parasympathetic nervous system to bring calm and peace and to engage the anterior cingulate gyrus. We now realize, “I am okay and I got through from discomfort to balance.”

Sustaining a pose reinforces my ability to manage my brain and to get me from the sympathetic to the parasympathetic streams of life. I then feel empowered and my dopamine is bringing me joy and reward. Because of my control over my brain via Neural Plasticity, I can use my Yoga to generate the balance within to bring me wellbeing throughout. The “seesaw of life” is now balanced.

Movement that involves bilateral (both sides) movement engages our Corpus Callosum, the large bridge of white matter that connects the two hemispheres or sides of the brain. This is critical and of high value as it helps to engage both sides of the brain and to build a healthier brain with processing that uses both sides. Women tend to have a larger corpus callosum and tend to process information using both hemispheres more often than men.

Bilateral movement also engages the brain cells and regions responsible for the opposite side of the body. As such we are not only strengthening both sides of the body and building coordination and balance to each, we are actually strengthening both sides of the brain, a highly adaptive and brain health promoting exercise.

Finally, the white matter of the brain, that is responsible for connecting deeper regions of the

brain to the cortex, is strengthened and stimulated with movement and with bilateral movement. Once again, this is highly valuable to the brain as it permits new and diverse highways of processing to and by the cortex. Once again, women tend to have more robust white matter than men.

#### General Wellbeing:

Our brains enjoy being stimulated by multiple sensory inputs. Yoga is an activity that engages the cognitive, emotional, motor, and relational parts of the brain. It is typical for the brain to feel better, relaxed, balanced, and with wellbeing at the end of yoga. There is a reason for that as explained above and this is part of the reason why Yoga should be part of your regular Brain Health Lifestyle ®

Our works on self-reflection, inner balance, triumph of emotional blocks, and overall holistic wellbeing limits our brain's ability to be judgmental, moralistic, and comparative. The former is a pathway to brain health and latter is not.