

“Urgent care for our brains”

Austin Prime Timers meeting 5/17/2020 standing zoom talk

The title for this talk, urgent care for our brains, is about the biological toolkit we have to deal with our emotions and actions in challenging times. The biology that regulates being OK, not OK, being calm, being upset, what aspects we might have some control over.

I’m going to deal with approaches that are focused inward, on our observing ourselves, what our bodies are doing, our nervous system that is generating thoughts and feelings. I’m going to talk about a few tools that I have found useful, hoping you might also.

I’m not going to address the many ways we might focus outwards, and find balance and calm in interactions with others. Supportive social activities like all these zoom meetings dial down the anxiety circuits I’m going to talk about.

The point of going inside is to find anchors or some sense of stability within ourselves when events in the external world seem so chaotic. Mental training is a form of disaster preparedness, if you are not aware of your own state, as when you are stressed, you are likely to infect others with it. One thing we can guarantee is that we are all going to be

exposed to increasing challenges and potential stresses in the coming months.

We are in an emergency in which all of the usual considerations are reversed, our contribution is to stay home, avoid the closeness to other humans that is vital and sustaining. We are forced into a retreat, and this is a mental health challenge. We are deeply social creatures. The worst punishment inside a prison is solitary confinement.

An untrained mind, that is, a perfectly normal one, can be an unhappy place to be in. Our own minds can be terrible company, and when that happens, you can be sure we are less than ideal company for others. If we care about our own sanity, and our worth to the people around us, it's worth paying attention to the mechanics of our own mental distress, self concern, agitation. I want to talk some about those mechanics today.

For us to feel a general sense of well-being, a lot of stuff in our brains and bodies has to be going OK. The downstairs and upstairs - older and newer - parts of our brains, have to be getting along with each other. Our rapidly acting downstairs emotional and threat monitoring machinery sometimes proceeds with a life of its own as the slower upstairs systems pay attention, act and sense, or day dream. When these systems get out of balance, we would like to be able to notice that and do something about it.

Actually, I just happen to have a brain, that usually lives on the bookshelf behind me, a wooden German model I got a long time ago to use in teaching. I was thinking of using it today, but it gets kind of klutzy and falls apart easily, so I've decided to use slides. I show you a few features I'll be mentioning..... OK, put this away.

So, I flash up this first slide just to get us started.

-In the window where you see all of us you can change between gallery and speaker view. At the top of the screen you will see a bar that says view options, you can opt to exit full screen get what's going on in a zoom window on your desktop that you can size as you wish, and leave some of your regular screen free.

Urgent care for our brains.

What is happening when we are anxious versus when we are calm?

What behaviors are coming from our upstairs and downstairs?

What is happening in paying attention versus mind wandering?

I'm going to start at the bottom, downstairs of our nervous system, with a simple exercise for all of us to do right now, bear with me, ...

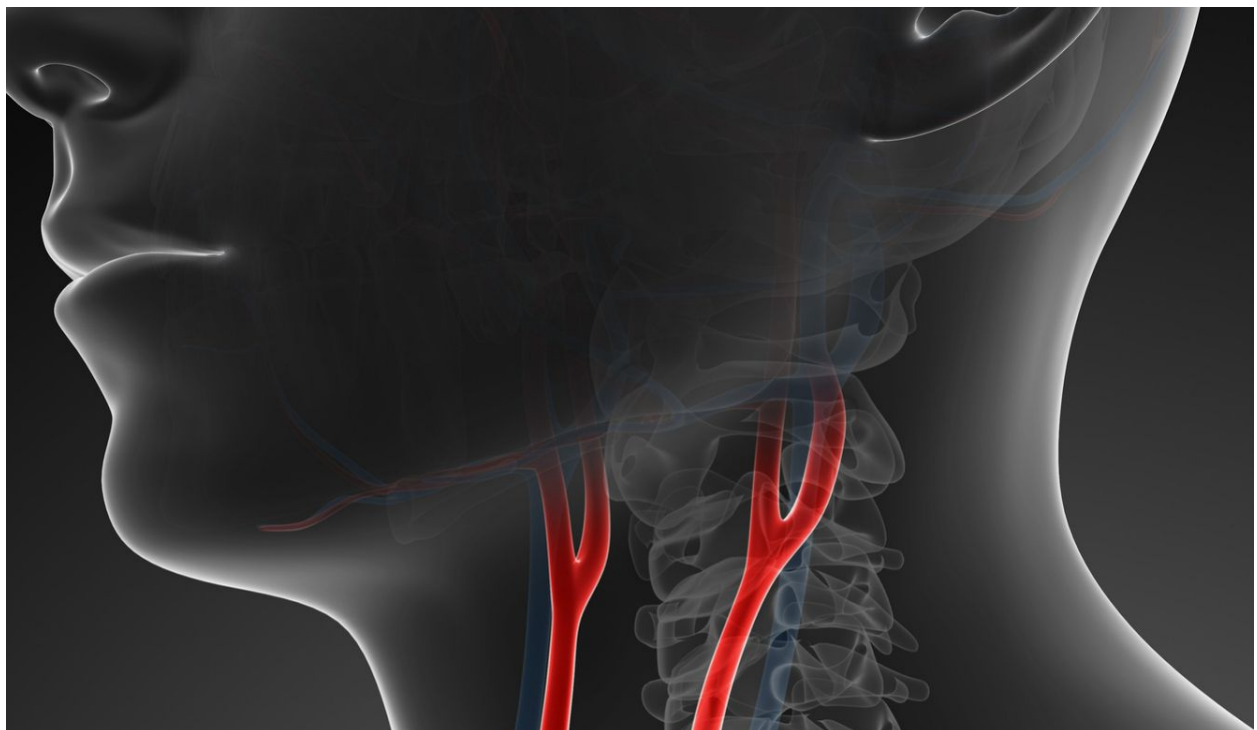
-now, notice, pay attention to, your breathing, OK?, for a few seconds, see if it feels natural to maybe slow it down a bit.

-now, I want you to place a hand along the side of your neck, look at what I'm doing in the thumbnail at the top right of your screen.

-relax the neck muscles into the hand, helps to let your head sag down forward a bit.

-sense the heart beat in your carotid arteries

-if it works, fine, but don't worry if you don't feel it



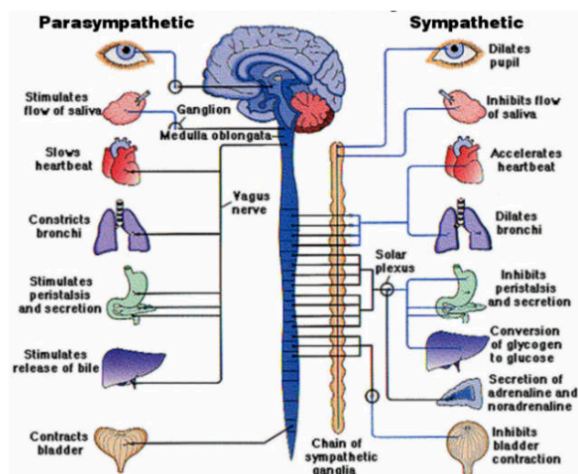
-now, close your eyes, no peeking, and see if you can, soften, relax, the muscles around your eyes, try to soften you face, let it feel kind of saggy. If you aren't finding your carotid pulse, this might help you

-see if you can count your heart beats as you inhale and exhale

- Now, I'm going to be quiet for thirty 30 seconds, I ask you to continue to pay attention to your breathing, but try to have no internal thoughts, emotions, or images. I want to notice how fast your heart beat is as you breath in, and now fast it is as you breath out. If you notice yourself thinking, just return to paying attention to your breathing, and your heart rate as you breathe in, then out. We'll start the 30 seconds now.

-then open your eyes slowly

As you surely realize, we've been doing this exercise to chill you down a bit, to tinker with your calm versus arousal, with the balance between the parasympathetic (calming) and



Autonomic Nervous System

-sympathetic, arousal

-parasympathetic, calm

sympathetic (arousing) branches of your autonomic nervous system.

This cartoon picture here of our autonomic nervous system is the first of a few I'll show of brains and nerves.

Realize that this not something out there, just a picture in a lecture, it is also what is inside you right now, there is a delicate dance always going on between your parasympathetic calming and restorative system, acetylcholine being released by your parasympathetic vagus nerve, and your sympathetic arousal system mobilizing you for action and draining your energy as norepinephrine is released by your sympathetic nerves.

Looking at an image and getting a description of what is going on as you feel certain things is a way to internalize and imagine them as your own and to imagine regulating and controlling them, actually imaging and feeling the upstairs and downstairs in your own brain, how they sometimes conflict with each other. Learning how to sense this can be a very practical thing to do.

Were any of you able to notice a difference in your heart rate when you were breathing in versus breathing out?

Breathing in causes a slight increase sympathetic arousal and heart rate increase, breathing out with parasympathetic calming and decrease in heart rate.

The variability of this heart rate, called HRV, is a good indicator of whether the balance between your calm and arousal is appropriate. There is a particular level of vagus nerve activity, or vagal tone, that is indicative of good heart function. Techniques like meditation or yoga exercises, can enhance vagal tone and heart rate variability. Breathing techniques and instructions are at the core of most meditation regimes and yoga exercises.

Let me also ask how many of you were able to have no thoughts during the 30 seconds as I instructed? Any hands, no hands? OK, remember this, I'm going to come back to this later.

During a panic episode, or if you are feeling stress, or having a post traumatic stress experience, this heart rate variability is dampened down and average heart rate is increased and becomes more inflexible. A self numbing occurs. If you're having a panic attack or feeling stress a good first instruction is just to stop and pay attention to your breathing, try to slow it down, etc.

This is, in terms of urgent care for your brain, the first and most important instruction. Just stop, notice your breathing, notice how fast your heart is beating, and as you continue doing that, you're going to find that they slow down.

The exercise we just did was about calming down, I'll spare you from the opposite exercise, which I used to do in some of my university classes, of going through a scenario that gets you anxious and stressed out so you can feel the body correlates of that.

This ANS slide starts us off with our downstairs, and a general theme is that what is happening downstairs is faster than upstairs, which I show you here:

Our Brain



- this is the surface you see when you pull apart our two cerebral hemispheres to see the inside surface, what I was doing with the wooden brain.

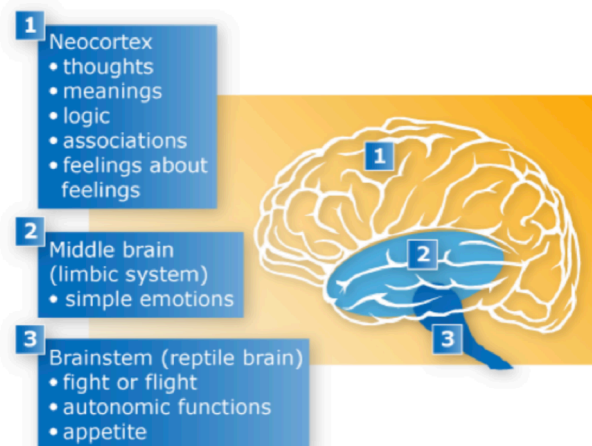
The pink portion here is our later evolved version of a simple mammalian brain, usually called the limbic system. On top of that is our newer, or neo-cortex. It is hugely folded to cram a lot of stuff into a small space. This is the self conscious thoughtful part of our brain. It works much more slowly than the downstairs, part of urgent care for our brains consists of training it to be aware, in the first place, of what is going on downstairs, and then maybe to do something about it.

What runs our show?

BASEMENT (brain stem) - RAPID

DOWNSTAIRS (middle brain) - RAPID

UPSTAIRS (neo-cortex) - SLOWER



When we lie down on a psychiatrist's couch, an alligator and a horse lie down with us. We have brains inside us that have been around for millions of years before our recent

hominid highly folded neocortex started self consciously thinking about things.

The bulges at the top of our spinal cord, our brain stem, are our evolved derivative of a reptilian brain, regulating breathing, swallowing, body temperature, heart beat, visual tracking, hearing, drives, motivations, and the four F's that medical students learn - feeding, fighting, fleeing, and fucking.

A new kind of cortex appears in mammals, that regulates nurturing and emotional behaviors, and our subsequent version of this simple mammalian brain is the pink stuff in the slide I just showed, the limbic system.

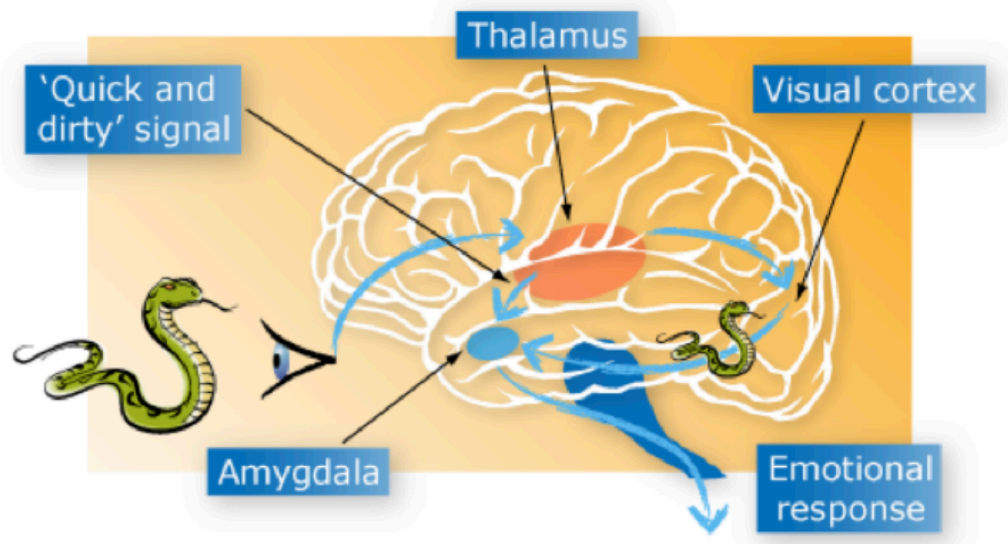
The genius of Donald Trump is that he can speak straight through to that pink stuff, our primitive emotional brain, not to mention to our even more primitive reptilian brain stem that regulates the four f's.

The downstairs parts of our brains can react more rapidly to what is happening than the more thoughtful upstairs. You might find yourself jumping to avoid a sudden looming overhead movement, or a squiggly object in your peripheral side vision just in case they might be due to a large object about to fall on you, or a snake on the ground beside you, nothing lost if it your upstairs machinery perceives just a bit later that it is actually a cloud darkening the sun or a twisted rope rather than a snake.

Downstairs -rapid

The 'amygdala hijack'

Upstairs- slower



Things we see take a fast unconscious route through a part of the brain called the amygdala, sort of where your thumbnail is if you make a fist with your hand in the shape of our brain, this route can command a rapid unconscious behavior like jumping away. More slowly, the upstairs part of our brain forms our conscious perception of what is there.

We have upstairs cognitive frontal inhibitory controls that can regulate more rapid medial lower areas like the amygdala where habitual routines and learned emotions reside. It takes increased activity in our medial prefrontal

cortex to override addictions and cravings fueled by deeper structures in our old mammalian brains, or to dampen inappropriate reactivity of our amygdala.

Once a fear reaction or emotional aversion is established it can become permanent unless the cortex learns that it is no longer relevant and inhibits the amygdala's reactivity, by sending chill it signals down nerve fibers connecting it to the amygdala. In post-traumatic stress syndrome this cortical inhibition has been impaired.

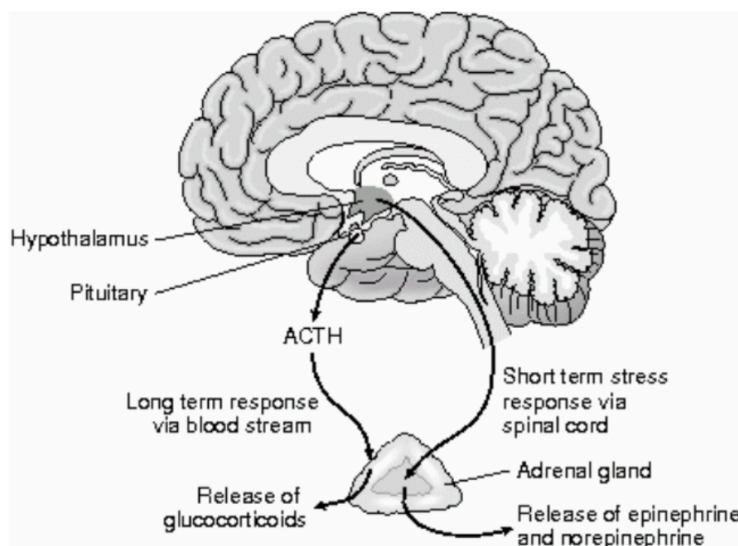
Now, a very important point: The normal condition, the default condition - for this fearful threat seeking part of our brain, the amygdala - is to be turned on more than it really needs to be, better to be safe than sorry. This can lead to a feeling of anxiety, one of the best definitions of anxiety being that it is fear in search of a cause. To feel safe, when there is actually no realistic threat present, continuous suppression or inhibition of this amygdala activity by the upstairs medial prefrontal part of our brain is required, using the nerve fibers it sends downstairs.

This is the system I was trying to dink with in the exercise we did, play with dial of the amygdala's "command central" that in turn speaks to the autonomic nervous system I just talked about.

We have a calming "positive-making system" that correlates with enhanced left frontal activity that connects down to and can suppress amygdala activity, and from there on down to the sympathetic and parasympathetic part of our nervous system.

Ideally we find an upstairs downstairs balance that doesn't let either uninhibited limbic emotional reactivity or a frontal control freak run the show.

In reacting to danger not only the amygdala but also the HPA axis, hypothalamus, pituitary, adrenal axis turns on.



HPA axis
-hypothalamus
-pituitary gland
-adrenal gland

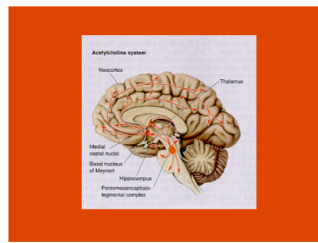
The immediate response to a stress is release of adrenaline by the adrenal medulla which ramps up heart

rate, blood glucose, sympathetic activation. More slowly there is a dialup of corticosteroid release by the adrenal cortex that stimulates metabolism and suppresses the immune system. This system is designed for short term emergencies. If it stays turned on, a long list of bad things happen, brain cells are killed, immune system is suppressed, digestive disorders, atherosclerosis.

Humans are masters at inappropriately leaving this system turned on all the time, as if the tiger is continuously at the door. We don't have the common sense of zebras, who don't get ulcers. They chill out while munching grass, and go into high-gear stress only when the lion really shows up.

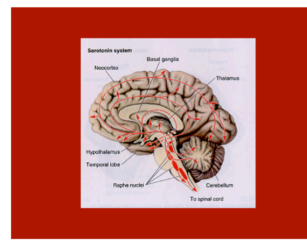
The COVID-19 crisis is a perfect setup for letting this evolved ancestral emotional machinery screw us up. If we really immerse ourselves feeling anxious about, ruminating over, the uncertain future we have no control over, if we ruminate over counterfactuals, what might have been if covid 19 had not happened, we risk ramping up this chronic stress circuit in damaging ways.

Continuing the list of players that ramp us up or chills us down, this slide is shows downstairs brainstem and basal forebrain has clusters of cells that send axons all over the



Acetylcholine system

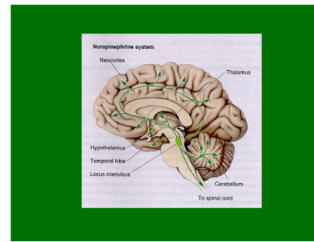
-cortical arousal



Raphe nuclei

-serotonin spritzer

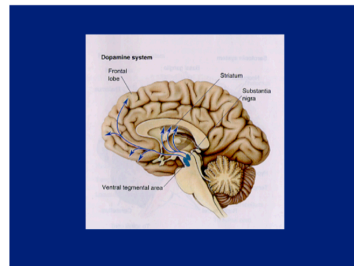
-calming system



Locus coeruleus

-norepinephrine spritzer

-sympathetic outpost



Mesolimbic dopamine system

-motivation

-desire

upstairs to diffusely spritz different areas with chemicals to chill or arouse them, to toggle attention, alertness, anxiety, elation, depression, aggression, appetite and motivation.

These are the chemicals that carry messages between nerve cells, doing this like acetylcholine, dopamine, serotonin, norepinephrine. The details aren't important for what I want to say today.

All of these systems are regulated by our conscious cognitive response to aspects of our environment, especially whether it is safe or threatening.

But they also can have internal reasons of their own for changing, like daily on/off cycles, cholinergic systems more active in sleep, adrenergic systems in wakefulness. They can generate feelings for which "there is no reason" in the usual sense, they are calling the shots, and our fertile imaginations are usually making a cover-up story, a

confabulation to explain what is not accessible to our consciousness.

Numerous experiments have shown that we will cheerfully confabulate bogus reasons for a behavior if the real cause is not accessible to our consciousness.

Some patients with damage to the right parietal lobe display a condition called anosognosia, and will deny the existence of the left side of their body. “Oh, that’s not my arm, it must belong to someone else.” The language system in our left brain, which is not damaged, is making up the best cover story it can to preserve the sense of an intact self.

You wake up in the night with elevated heart rate, feeling anxious, assume it’s about COVID 19 anxiety, when what really happened is that you drowned your worries last night with an amount of booze sufficient to raise your blood alcohol to the level that turns on the amygdala and HPA axis Tiger at the door alarms. They are going to take their own sweet time to dial down as your liver alcohol dehydrogenase detoxifies your system, breaking down alcohol, and that process is slowed down if your upstairs thinking insists on festering over bogus causes for your anxiety.

Now, I want you to recall that exercise we started off with. I had two agendas to pursue with that. The first was to get us into experiencing the calm versus arousal stuff I’ve been rambling on about. My second agenda item has to do

with the end of the exercise where I asked you to just pay attention to your breathing and have no thoughts for 30 seconds, and when you noticed thoughts or emotions intruding, to just return your awareness to your breathing.

Most of you found that thoughts or emotions just kept popping up from somewhere. Hey, what's the problem, if we are running our own show, as we usually suppose we are, why can't we follow the instruction, pay attention only to our breathing. It's because our brains are sitting there, generating ideas or feelings, mind wandering, in spite of our conscious effort to pay attention to our breathing. This is what they are designed to do, generate stuff, regardless of whether "we" in quotes, want it to or not. In spite of our best intentions, "we" in quotes are not entirely running our own show.

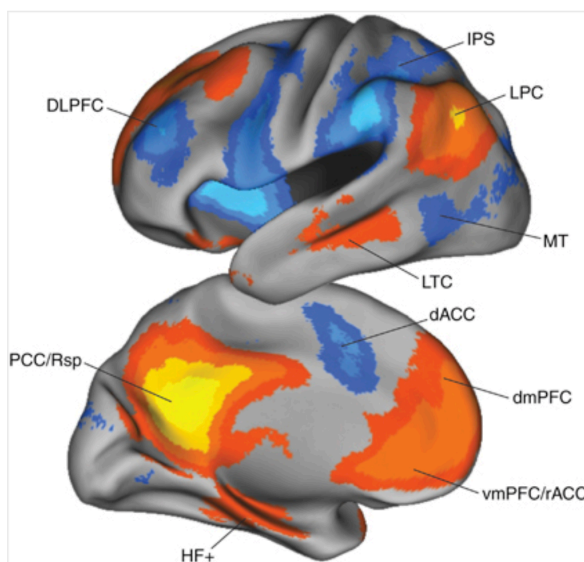
I suspect you've all had the experience of lapsing into thoughts while you were driving, and all of a sudden, realizing that you had gone maybe gone eight blocks, through two traffic lights, and have no recall of having done so, you were paying no conscious attention to what you were doing, the self that normally pays attention to driving vanished and a daydreaming self was in its place.

Now if, while you were lost in thought, a light had turned red, or a kid had run out into the street, the part of your brain that was paying attention, your attentional mode,

would hopefully have snapped you back into focusing on your driving.

What you are seeing here is our brains switching between two major systems of our brains the attentional and default modes. Our attentional network is active when we are actively focusing on tasks, like paying attention to our breathing or watching traffic.

Our default mode network is our inner life, our 'this is me' system, creating narrative about who we are, past and future, randomly wandering, thinking about ourselves and others.



Blue - attentional mode network:
direct experiential focus, task
focused network, mechanical
physical cause/effect reasoning

**Red/Yellow- default mode
network:** mind wandering,
stimulus independent, narrative
focus, social reasoning, self
referential, introspective



When we are paying attention and controlling things, the blue areas in this graphic are more active... that's in the more frontal and side, or lateral part of the cortex. The top figure is looking at the left side of our cortex. When we turn inside of the top half hemisphere around to face us we see the red and yellow areas that are part of the default mode network.

We cycle back and forth between attentional and default modes, between our inner and outer worlds. In mind wandering we lose the sense of ourselves as an active agent. For half to two thirds of our conscious lifetime, are not in control of our conscious thought processes...Hundreds of times a day, we all experience periods when we are no longer directing an outer focus on some activity.

Two Yale psychologists developed an iPhone App, which thousands of people in different countries downloaded, and then when their cell phones 'pinged' they answered a number of questions like "How are you feeling right now?" on a scale from 1 (very bad) to 10 (very good). Or, 'are you thinking about something other than what you are currently doing, is it pleasant, neutral, or unpleasant, and so on. Mind wandering was occurring half the time and people reported being less happy when their minds were wandering than when they were not.

To the extent that the COVID-19 crisis nudges us towards rumination, mind wandering, and taking in passively visual and written information instead of actively doing things directing our attention and activities, it is enhancing our negativity.

Just as with our upstairs/downstairs behavior drivers there is an optimal balance between attentional and default or mind wandering modes.

Our attentional mode, dials down our mind wandering, gets us focused on tasks, but if overdone can turn us into control freaks and suppress our spontaneity and creativity.

Our mind wandering mode enhances self- awareness, creative incubation, improvisation and evaluation. Like night time dreaming, it consolidates our long-term memory and stabilizes our self model.

The downside of staying too long in the default mode network is its passive reactivity and use environmental support rather than focused frontal self initiation.

Environmental support can be both good and bad: it provides structure, like the monthly prime timers momentum newsletter, that helps us old farts chose and carry out activities, but we don't want to let go of our internal controls, let this compromise our frontal brain

initiating and carrying out activities on our own. In the frontal and temporal lobe dementias that can occur on aging, attentional mode is compromised and more time is spent in default mode.

Now....to get to the point....about caring for ourselves

What are some of our options if we are not that happy about feeling anxious much of the time, or find ourselves unable to focus, easily distracted, trapped in repetitive thoughts.

Well, I titled this talk “urgent care for our brains” but the only self-help, tonic, or snake oil that I want to pitch today is to claim we can observe and influence all of these processes by training our attentional muscle to watch what is going on in our mind.

Observing our own minds working is not something that ‘just happens’ like upstairs versus downstairs, attentional versus default activities. We have to work at it.

We have to slow down and quiet ourselves enough to notice things we usually are not paying attention to.

And the first urgent care instruction, I’ve already mentioned earlier in the talk, ... is when you find yourself in a bad emotional space, just to stop cold in your tracks and take a deep breath, tune out whatever else is going on to just

become aware of your sensation of breathing, then see if you can slow it down.

Simply noticing and working with what is going on in the downstairs, independent of the head trips going on upstairs, does things. Demonstrating this was the point of the exercise at the start of the talk. Paying attention to physical body correlates of calming or stressing can influence whether what is going on is encouraged or discouraged. Granting attention space to noticing breathing usually enhances parasympathetic (calming) over sympathetic (arousing) nervous system activities. Holding your breath while focusing on something increases sympathetic activation. Diaphragmatic breathing reduces it.

The instruction in the second part of the starting exercise, was to pay attention only to our breathing, having no thoughts or feelings, and when we noticed our attention had wandered away, to simply return it to our breathing. These are the instruction for one form of mindfulness meditation.

Think about this for a moment. In doing an exercise like this we are placing ourselves in the position of both being a brain process (generating thoughts and emotions) and at the same time being another process observing this first one, and deciding whether to turn the thoughts or emotions off and return to awareness just of breathing. We

switch from moments of quiet without thoughts or emotions to suddenly being the thoughts or emotions, and then on noting that fact can try to switch back to quiet again.

In one moment we might suddenly feel an emotion like anxiety, be an anxious person, in next moment we might mentally step aside and observe ourselves as anxious-ing. And maybe decide to do something else instead. Or, we might get swept up in a surge of desire or lust, but then step back to observe ourselves desire-ing or lust-ing

-being an anxious, angry, afraid, desiring, or happy person

-observing oneself anxious-ing, angry-ing, fear-ing, desire-ing, happy-ing

-choosing whether to cease or continue the emotion

This is not rocket science. From this third person like distance - like putting ourselves in the shoes of someone looking at us, observing our behavior - we have more freedom to choose whether we are going to be an anxious person versus observing ourselves anxious-ing.

There is a subtle difference or distance results from using the “-ing” suffix for familiar emotions. I’m afraid versus I observe myself fear-ing, or I desire versus I see myself desire-ing.

Many regimes of training and practice can be used to train our attentional muscle to do this, from modern psychotherapies, especially cognitive therapy, to different forms of meditation that have very ancient origins. Ancient buddhist procedures and texts offer descriptions of what a human mind is like that are the closest correlate of what modern neuroscience is telling us.

The New York Times

Opinion

You Should Meditate Every Day

Sure, it’s become a wellness fad. But it’s the best way I’ve found to keep digital monsters at bay.



By Farhad Manjoo
Opinion Columnist

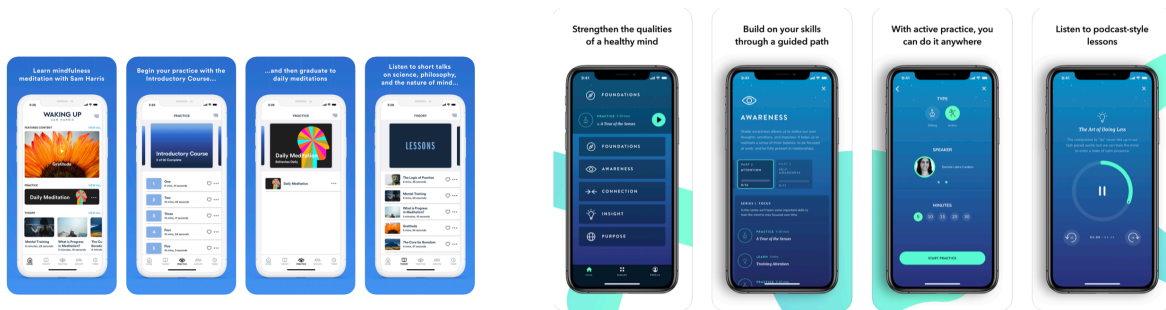
Jan. 9, 2019



Mindfulness meditation has become a huge fad, packaged and marketed as a Buddha pill that will quiet your mind and make you happier.

wakingup.com

<https://tryhealthyminds.org/>




And of course there's an App for that, actually hundreds of apps, and I've actually gone carefully through several of them, and recommend these two, one by Sam Harris called Waking Up, and the other, done by an old colleague of mine at the University of Wisconsin Richie Davidson called healthy minds, which is a bit more user friendly.

And there are now hundreds of studies of effects of different meditation styles,

OPEN ACCESS PEER-REVIEWED
RESEARCH ARTICLE

Divergent effects of brief contemplative practices in response to an acute stressor: A randomized controlled trial of brief breath awareness, loving-kindness, gratitude or an attention control practice

Matthew J. Hirshberg , Simon B. Goldberg, Stacey M. Schaefer, Lisa Flook, David Findley, Richard J. Davidson

Published: December 12, 2018 • <https://doi.org/10.1371/journal.pone.0207765>

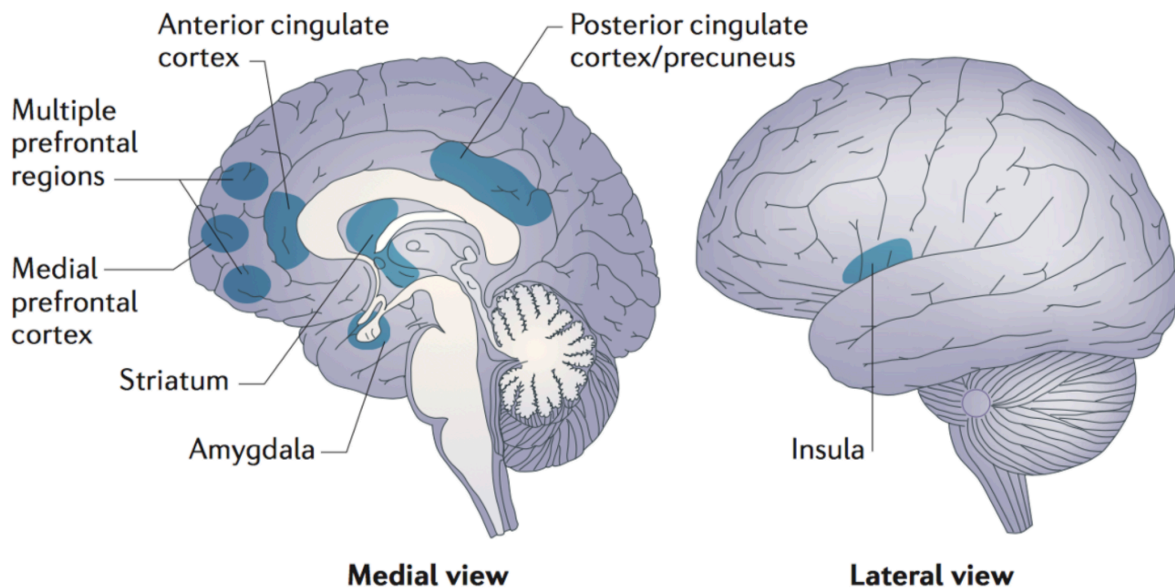
Article	Authors	Metrics	Comments	Media Coverage
				
Abstract	Abstract			

Partial List of assertions that meditation practice:

-reduces stress, emotional arousal, pain, expression of genes involved in HPA stress axis and inflammation

-improves working memory, cognitive performance, attentional expertise and stability, cognitive and emotional plasticity, connectivity in both attentional and default networks, left frontal activation and positive emotions.

The activity in colored areas in this slide are changed in the brains of expert meditators, which I'm not going to get into except to say meditators of any style show deactivation of the mind wandering default-mode network, and more activation



of attentional mode. Any specialized training causes changes in brain structure. I'm a classical pianist, my motor cortex running my hands is larger than normal. If the training stops the brain areas that changed return to their average. It's as simple as "Use it or lose it". It's what happens to all of us senior folks if we don't keep mind and body active.

So a final few points:

- Attention can be trained by meditation-like activities**
- Attention training, like training for other skills, causes brain changes.**
- Skilled awareness allows more autonomy in choosing actions, perceptions, and emotions, making us more pilot than passenger of our ship.**

If you don't allow your attention to notice thoughts and emotions, they simply become you. Helplessly ruminating over things you have no control over is not useful, if you can't notice this process it just feels like what you are, you feel identical to each thought as it arises in your awareness. The virus pandemic and the economy crash feel devastating, part of that emotional arousal is useful, gets you to pay attention to things you should pay attention to, to make decisions, but much of the emotional response can be detrimental to anything you want to do, to your relationships, to your own creative and emotional resources that you'll need. You do want to get a handle on this, whether you think meditation is your cup of tea or not. You can exert control, but it takes training, and it is training that most of us now have time for, or should have time for, in a period when the greatest contribution we can make to society is to stay home.

So, the final message of this talk is simple:

Pay Attention