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creativity, and dedicated study over the past few decades, there are now several tools from the fields of hearing instrument technology, audiology, medicine, and psychology to guide people in their effort to shift their experience of tinnitus from “bothersome” to “non-bothersome.”

Education about what tinnitus is (and isn't) in conjunction with a thorough hearing assessment by an audiologist and appropriate hearing specialist is a good place for someone bothered by tinnitus to start. For those who continue to be distressed by tinnitus, discoveries into the mind's ability to re-perceive “tinnitus bother” in new, more positive ways is an important next step.

Recent research has shown that mindfulness-based approaches to living with tinnitus are effective in helping people modify their perception, leading to reduced tinnitus bother, less emotional struggle, and a greater sense of wellbeing.

Specifically, Mindfulness Based Tinnitus Stress Reduction (MBTSR),^{1,2} an 8-week skill-building program developed and researched at University of California San Francisco (UCSF), teaches participants how to develop more healthful and positive ways of relating to the unpleasant sensation. MBTSR includes in-depth tinnitus education and mindfulness skill building. Each week's class integrates elements of deep breathing, gentle yoga, relaxation, and meditation to help people develop new, more effective ways to relate to the experience of tinnitus and stress in their daily lives.

There are many approaches to the management of tinnitus – few of which are mutually exclusive. Often, management tools can be used independently or in conjunction with treatments to gain maximum benefit, depending on the individual with tinnitus. MBTSR is one of these management tools and will be discussed in the following paper.

Tinnitus is a Riddle Wrapped in a Mystery Inside an Enigma

Some of the habitual thoughts we develop around tinnitus can prevent our mind's ability to change our habitual reaction to the sound. The person with chronic bothersome tinnitus rarely experiences the unpleasant sensation of tinnitus in isolation. Almost always, the tinnitus sensation is wrapped tightly in a cascade of thoughts, judgments, memories, fears, emotions, sadness, regrets, beliefs, and feelings about past, present, and future experiences living with this chronic symptom. Tinnitus gets wrapped in a Gordian Knot of our mind's own creation.

A Gordian Knot is a metaphor for an intractable problem that requires thinking “outside the box” to solve. This is no small task and requires self-discipline, focus, and patience to master. The skill proposed and taught in a mindfulness-based approach to tinnitus management begins with bringing awareness to our habitual thoughts and beliefs about tinnitus. We come to realize that many of these thoughts, judgments, and beliefs are based on how we wish things could be rather than finding creative solutions for living with tinnitus with ease in the present. Instead it is common to hold on tightly to a narrative of how bad life will be if tinnitus persists or how we somehow did something to cause our tinnitus fate. Rather than

experiencing the tinnitus as a bare body sensation, tinnitus often gets wrapped up in a whirlwind of thoughts and beliefs that keep us stuck in stories from the past and predictions for a bleak future. These past and future strivings only serve to cloud our ability to see tinnitus as a present moment body sensation, and we limit our options for choosing healthful and creative ways of managing tinnitus in the moment.

Bringing awareness to how we may, in fact, be helping to create our own suffering—our own Gordian Knot—is not an easy task. Much like going to the gym to build a muscle, a personal trainer can guide us, but ultimately we have to do the heavy lifting to reach our desired results. However, with practice, we can train our minds, rewire old thinking habits, modify our behaviors and reactions, and ultimately, learn to live with tinnitus with greater ease.

The intersection of tinnitus and mindfulness

Tinnitus is most often related to hearing loss, especially that caused by noise damage or head injury. It affects approximately 10% of adults in the United States and an estimated 260 million people globally. Tinnitus is the number-one medical complaint of American military veterans returning from active duty.

The resultant ringing, buzzing, pulsing, whistling, or humming noises can be experienced in one or both ears with varying loudness and pitch and may create a struggle between the person and the tinnitus, leading to symptoms of anxiety, fatigue, sleep disturbance, difficulty with concentration, and depression. Tinnitus patients frequently report poor attention and focus, interference with work, and negative impacts on personal relationships.

Mindfulness is an approach to the present moment, using a special awareness to shape activity in our nervous system to promote integration and well being in our lives. What it involves is approaching each and every moment that arises with a “special” kind of awareness. “Special” in this context means not just an ordinary awareness, but rather full consciousness of immediate experience approached with curiosity, acceptance, openness to whatever arises, and a gentle self-compassion towards one’s self. Approaching the moment with mindfulness is a universal human capacity—the ability to use our focal attention to bring conscious awareness of our immediate experience into the spotlight.

Building the “Awareness Muscle”

Our minds are designed to be “judging” machines. We are constantly using memories and learnings from the past to judge our present experience and plan for the foreseeable future. This process can be life-saving when real danger is present. But it can be a false alarm that causes unnecessary suffering when we continually anticipate threats that keep our minds and bodies overreacting and overworking.

This is likely occurring in the mind of the person who struggles to habituate to the unpleasant ringing we call tinnitus. The alarming—yet often benign and meaningless tinnitus sensation—is misunderstood as a

potential danger, requiring constant vigilance by unconscious fear-determining centers in our brain. The brain is working overtime to determine if the tinnitus stimulus is life-threatening, requiring a fight-or-flight reaction.

This very primitive function in the brain is largely unconscious. It takes patience, discipline, focus, and determination to bring this unconscious activity to our conscious mind. We can then use higher-order executive powers of reasoning and flexibility of response to make reasonable changes to re-perceive what had been automatically mis-perceived all along.

It's Not the Ears but What is Between the Ears

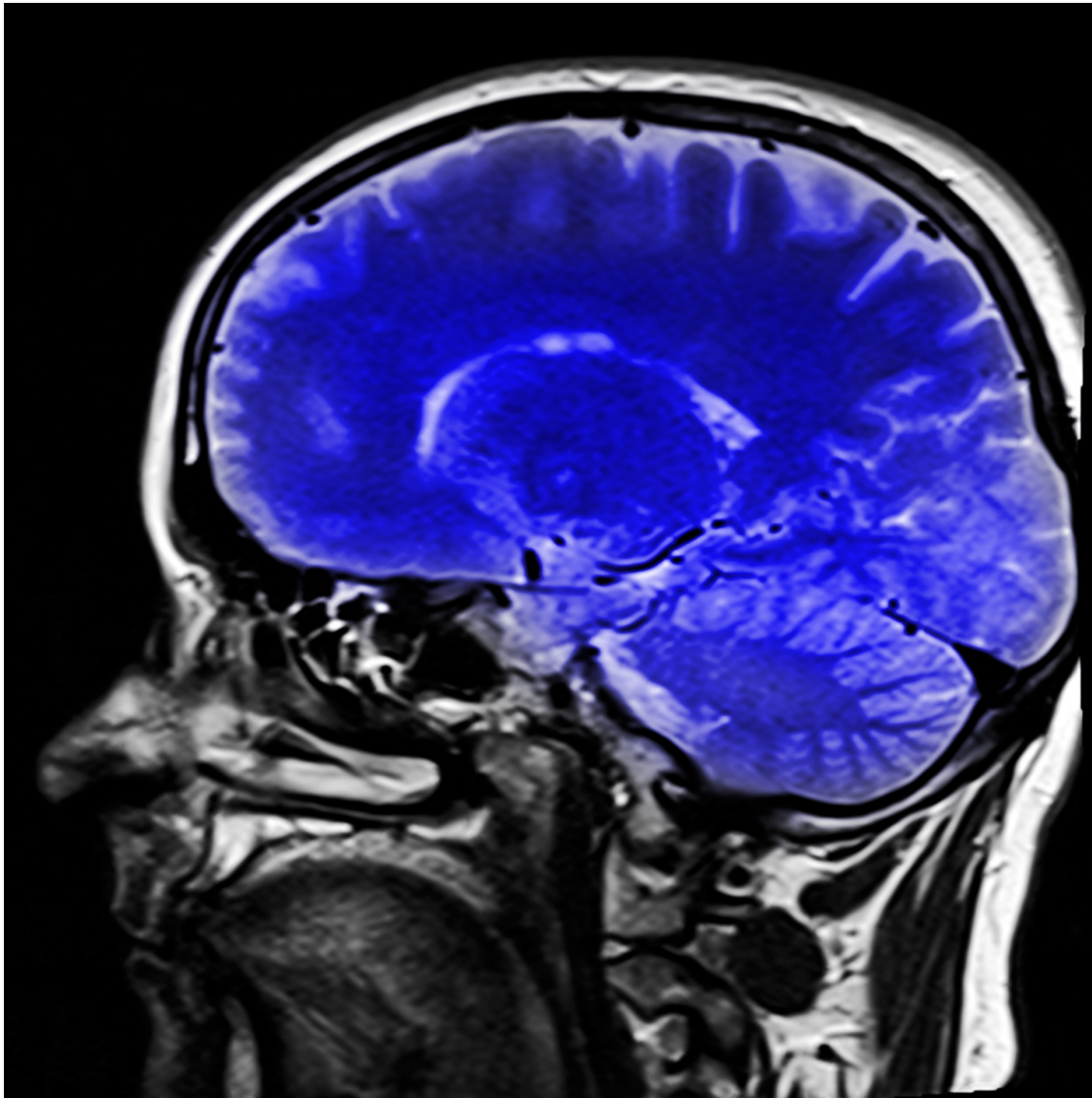
One question to ask is, "What is the difference between the person who experiences bothersome tinnitus versus the person who experiences non-bothersome tinnitus?" Most likely it is not what is happening in the ears, but rather what is happening between the ears—in other words, what the person is thinking and perceiving.

While tinnitus is believed to be initially generated by cochlear damage, it is what happens in the brain next that determines whether tinnitus is considered "non-bothersome" or "bothersome." Non-bothersome tinnitus generally means that, although people hear the sounds associated with tinnitus, they do not develop the frustration, depression, or anxiety associated with bothersome tinnitus.

The science behind change and adaptability in the mind

We have learned from neuroscience that the mind is changeable or "plastic," meaning the actual neural firing and structure of the brain can change with experience. For the person experiencing bothersome tinnitus, this is certainly good news. Using mindful awareness, we can shine a light on the mind's inaccurate habitual reaction to the tinnitus signal and see it for what it really is: a sensation that does not need to be monitored by the mind, poses no credible threat to survival, and, therefore, can safely fade from our conscious awareness.

Quick Tour of the Brain



To better understand how tinnitus becomes bothersome, it can be helpful to get a brief overview of brain anatomy. The human brain has three major parts, which developed in succession over millions of years of evolution:

Brainstem: The most primitive part is the brainstem, often referred to as the “reptilian brain.” It is the first part of the brain to develop and is found in all animals. The reptilian brain controls unconscious bodily functions, such as breathing, heartbeat, and sleep-wake cycles.

Limbic system: The second part of the brain to develop is the unconscious limbic system, which regulates emotion and memory. One important part of the limbic system, the amygdala, has the specific task of taking in information from internal and external sensations, and determining whether these signals present a potential danger that requires attention and monitoring, or if the stimuli can be safely ignored. (Think of our ancestors on the savannah and their need to determine if a sound meant a tiger was about to pounce on them, or if it was just a branch swaying in the wind?)

Cortex: The third part of the brain to evolve is the cortex. In particular, the medial pre-frontal cortex (mPFC) sits directly behind our forehead. It is unique to humans and apes, and allows us to reason, generate conscious thoughts, and regulate emotions. It also enables us to think about thinking (meta-cognition) and become aware of our awareness (meta-awareness), among other higher-order conscious tasks.

Using the Medial Pre-Frontal Cortex to Re-assess the “Threat” of Tinnitus

The mPFC plays a key role in correcting misperceptions of tinnitus, an ability called response flexibility. Response flexibility allows us to stop, pause, think, and then choose a thoughtful response without falling back on old knee-jerk habits. This is an important skill for a person with bothersome tinnitus whose brain misperceives the tinnitus signal as something indicating a threat, and who repeatedly reacts without conscious thought to these unfounded fears and frustrations.

When the unconscious limbic system and amygdala misjudge the tinnitus as a threat, we can use our mPFC to stop, analyze the facts, and essentially calm the limbic system and the reptilian brain. This gives us the opportunity to rethink and respond to tinnitus in a more accurate and life-affirming way.

It is important for people with bothersome tinnitus to remember that their reptilian brain and limbic system are just doing their jobs: constantly scanning the external and internal environment for potential threats. For humans to survive, these automatic systems have been hard-wired to get our attention as soon as possible danger is perceived.

The problem arises when these unconscious automatic systems misperceive the tinnitus signal as a threat. In fact, tinnitus can be loud and persistent, but does not actually signal that danger is present. Yet, the brain can respond to persistent tinnitus with anxiety, depression, sleep difficulty, and difficulty concentrating.

Overcoming False Alarms

Training the mPFC to intervene in these constant “false alarms” and overriding these first impressions with rational thoughts is part of an effective tinnitus treatment. We can use higher-level thinking abilities to unravel the web of stories that loop the mind in a constant state of distraction, worry, and struggle.

This all can seem so simple—we may have tried to tell ourselves to “just relax and take it easy” when, for example, we’re on an amusement park roller coaster. But blocking out perceived threat is far from easy. In order for the mPFC to communicate with the more primitive unconscious regions of the brain, we need to develop a system of neuronal connections to unlearn our old fears of tinnitus, and to build new communication wiring between our rational mPFC and our automatic reptilian brain and limbic system.

Like strengthening and maintaining the strength of a muscle at the gym, this growing of neuronal fibers take hard work, consistency, and commitment.

Strengthening the pre-frontal cortex

Compelling studies support the argument that mindfulness can lead to more adaptive changes in a patient's response to old and new stimuli. Research conducted by Sara Lazar and her colleagues³ at Harvard suggests that meditation (a well-known mindfulness practice) can lead to cortical growth and thickening in parts of the brain associated with focal attention, fear, and emotional regulation. The study revealed that experienced meditators versus non-meditators were more effective in sending information to unconscious areas of the brain, which can exert more influence on the ability to regulate emotional response, such as a fearful reaction to bothersome tinnitus. This study also determined that the size of the pre-frontal cortex is correlated to the number of years of experience with meditating.

These discoveries support the Hebbian theory: "Neurons that fire together wire together." When we practice thoughts and actions (ie, regular yoga and meditation), we can strengthen connections within the brain. These connections make for a better opportunity to inform our actions and reactions, as with how we choose to respond to incidents of tinnitus.

Such practice contributes to creating new neural networks, so that these pathways can help us correct a misappraisal of the amygdala, allowing us to keep our attention open for other, more important, stimuli.

The mind's reappraisal of tinnitus. It is believed that the amygdala in some individuals with tinnitus misappraises the "level of threat" that the tinnitus sound represents, and this may be the reason why some people experience bothersome tinnitus while others do not.

Most cases of tinnitus begin with some degree of hearing loss, but not all people with hearing loss have tinnitus. It stands to reason that the difference between those who experience bothersome tinnitus and those who don't is not hearing loss; rather, it is the appraisal of threat that the amygdala assigns to the tinnitus sensation. It may be that the people who experience bothersome tinnitus remain on chronic alert to the sensation, while those who interpret the tinnitus sensation for what it is—a meaningless, benign perception of a sensation—are able (automatically/sub-consciously) to allow the sensation to drop into the recesses of awareness.

We know through science and experience that tinnitus—in and of itself—is not a cause for alarm and can safely be sent to the recesses. How, then, might we reassure ourselves of this, and assist the amygdala in choosing the more benign response?

MBTSR and brain training. A central goal of mindfulness-based programs is to help participants train the brain to convince the fast-acting and mis-appraising amygdala that keeping tinnitus in our awareness is a waste of our energy and resources. Like the sound of a white noise machine or fan, tinnitus also can safely recede into the recesses of our mind.

Convincing the amygdala of this fact is the job of the higher developed areas of the brain. As mentioned earlier, the pre-frontal cortex conducts our executive functioning tasks, including judgment, reasoning, emotional regulation, bringing awareness to certain things, and fear modulation, to name a few. This conscious part of the brain can be enlisted to exert more control over bringing awareness to certain processes, such as fear modulation and response flexibility (ie, think before you act). The goal here is to “chill out” the amygdala, so that we can recruit and utilize a more accurate appraisal of the tinnitus sensation.

The pre-frontal cortex is slightly slower in processing than the amygdala. This partly explains why our brains tend to place sounds in the “better-safe-than-sorry” danger category. Research in brain anatomy and physiology shows that, when directed, the pre-frontal cortex sends fibers to the overactive amygdala. These fibers are the down-regulating neuropeptides, such as GABA, that serve to “calm down” this area so that we can use reasoning to put tinnitus in the benign category, where it belongs.

Mindfulness: The Personal Trainer of the Pre-Frontal Cortex

A Mindfulness-based approach, and the 8-week MBTSR course specifically, builds these new mental muscles. Because many people have lived with bothersome tinnitus for years or decades, there are a lot of familiar patterns that they feel are impossible to overcome. However, with diligent practice, MBTSR teaches step-by-step skills needed to help the thinking brain more accurately determine real threats, and to calm “knee-jerk” reactions to bothersome tinnitus. The activated reptilian brain and limbic system are like anxious children; you don’t want them in the driver’s seat, but you also don’t want to stuff them in the trunk. MBTSR can help place the mPFC in the driver’s seat, while acknowledging the importance of the brainstem and limbic system.

A mindfulness approach to tinnitus helps extinguish the automatic fear reaction and replaces it with a letting go of attention and perception of tinnitus. The MBTSR program focuses on helping people uncover their own internal resources toward a reinterpretation of tinnitus. With practice, people with tinnitus are capable of “More Firing, More Wiring”: strengthening connections in the pre-frontal cortex for a greater, more measured, balance in daily life. This is an important step towards unraveling the Gordian Knot of tinnitus.

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More information about the 8-week mBTsr course can be found at: mindfultinnitusrelief.com

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