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## Foreword



When we speak of being of “sound mind and body,” we seldom realize that sound itself is the root of being. That sound itself is the route to acquire those things we want so much, a sound mind and body. Most of us spend our lives largely unaware of the sounds that surround us. Sound acts on our psyche and we ignore its impact. This can make us constant victims of our sound environment as the blast of a horn, the screech of a tire, the relentless pounding of a jackhammer all carry us into distraction. Even when we do take note of the sound pollutants in our environment, we often feel powerless to do anything about them. We assume that they’re the price of progress.

That doesn’t need to be the case. We can consciously and creatively add sound nutrients to combat those ill effects.

Sound nutrition is the core value of the book you hold in your hand. Read it. Listen to it. View it. Think about it. There has never been a book on music and sound with so many multisensorial possibilities. These suggestions will revolutionize your life. Each individual can create his or her own “sound diet” to match personal needs and tastes, to get the sound mind and body he or she desires.

Don Campbell and Alex Doman offer guidelines that can literally

turn on our ears and eyes, that can teach us to compose a sonically nutritious day by raising our awareness of the sound effects that tune up our lives. Here, they teach us how to maximize our good moods by using music to stimulate our optimism and increase our day's creative output, as well as how to turn down the sounds that distract and deter us. As these two distinguished experts combine their up-to-the-minute knowledge, vision, and creativity, you are in capable hands as a reader and listener, creating a truly "sound day" from the waking moment through the working day and into the evening.

Designed to enhance creativity, this book coaxes us all to listen outside the box, to create a unique sound landscape suited to our lives and families. Written with simplicity, fine research, and clarity, this book is perfect for the neophyte, the expert, and all of us in between.

Maximize your creativity and productivity with this gold standard course in personal awareness.

Listen, listen, listen.

—Julia Cameron  
Author of *The Artist's Way*

## Introduction

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### *Hear Here!*

If you stop right now and close your eyes, the first thing you'll notice is that you suddenly hear more things. Where are you? In your office? At home in bed or on your couch? What soundscape surrounds you right now? In my office, with the window open on a summer day, I can hear traffic on the street, two different kinds of birds from the tree outside my window, a horn honking, conversation from neighbors, my fingers on the computer keyboard. I can hear myself taking a deep breath. A Haydn piano sonata plays quietly from my stereo.

Before I closed my eyes, I might have been aware of the sonata and the car horn honking, but not much else. What about you? How many of the sounds that you heard are there by choice (Haydn) or because of the environment you happen to be in (street traffic)? Do you actively provide yourself with nurturing sounds and block or filter noise—or do you just let the sounds of your world wash over you without paying much attention to what's there?

Sound is everywhere—it is as much a part of our lives as the air we breathe and the food we eat. But until now, we haven't properly considered the health values of sound. We may choose organic food at the supermarket and avoid inhaling others' cigarette smoke, yet we rarely pay

attention to the equally positive or negative health impacts of sound, the other thing we put in our bodies.

Think about this: How did each sound you heard make you feel? The answer is not always as self-evident as we might think. Each individual has his or her own taste in music, tolerance level for noise and for silence, and habits in terms of allowing sounds into the environment. Some people find absolute silence refreshing; others find it boring. Some work better with the “wallpaper” sound of a radio talk show in the background; others lose concentration with the intrusion of any conversation or noise. Some find meaning and a sense of fulfillment in the clatter of family life, or the sounds of a busy city outside the window, or the workaday noises of an open-plan office space; others long for the aural serenity of a private room or a home surrounded by the sounds of nature.

This book is not about encouraging everyone to live in the same aural world—to wake up to a Vivaldi concerto, for example, then work to a brisk pop background, and fall asleep to a soothing Diana Krall tune. It’s about helping you identify which kinds of sounds enhance your own life most effectively at different times of the day and in different circumstances—and which sounds negatively affect your own and others’ moods, mental activity, and health. Once you have really listened to, identified, and analyzed the sounds in your daily life, you can begin to reshape what you hear to correct your own and your loved ones’ problems of attention, perception, and concentration; decrease your stress level and improve your emotional state; communicate more effectively at home and in the workplace; and create a better sense of community in your neighborhood and in the world.

Why and how does sound have such a profound impact on our daily experience? Many people fail to consider the fact that sound is a physical force. Since the original big bang (which no one heard, but whose effects we all experience), it has existed as a powerful part of the universe, resonating through space, through physical matter, and through all living things. Its basic components—vibration, pitch, and rhythm—can form planets, destroy cities, shatter glass, and bring disparate entities into harmony. On a smaller scale, it interacts with and affects the physical, neurological, and spiritual state of each human being in much the same way that heat can alter the chemistry of physical objects. Think of how the

mere act of singing nearly always lifts your spirits, how listening to certain types of classical music clarifies your mind, how playing music with others creates a warm sense of community, and how music with a steady beat that you enjoy makes exercise more productive—and you will realize that sound shapes your life profoundly in myriad ways, whether or not you are aware of it. The trick lies in directing this powerful force—much as you might direct the flow of water from a garden hose—to heal, to enhance, and to engage your life in a wide variety of ways.

When my book *The Mozart Effect* was first published in 1997, much of our knowledge of sound's effects on the human mind, body, and spirit remained in the realm of the anecdotal and even the intuitive. We knew that college students who listened to Mozart's music did better on temporal/spatial tests taken shortly after the listening experience. We had heard from numerous health-care professionals that listening to music appeared to increase patients' tolerance for pain and sped up their surgical recovery times, and that it even seemed to enhance premature infants' growth rates in pediatric ICUs. We had seen how, in certain special programs in schools, drumming circles had a remarkable impact on troubled youth. Few thorough studies had been conducted to scientifically validate these reports or to explain how the results were achieved. Scientists had not yet traced the ways in which rhythm and sound have facilitated connection, communication, and community.

Now, in the twenty-first century, that situation has changed. As a recognized authority on the transformational power of music and the author of more than twenty books about music's benefits in health and education, I have been both privileged and enormously gratified to witness a wave of new research in the areas of music and the brain, and the effects of the sound environment on health. An explosion of new data produced by hundreds of new studies, surveys, and research programs conducted in the wake of *The Mozart Effect* have launched this area of knowledge from the Sputnik of intuition to the Hubble's clear definition of the nature of sound and its organizing energy in our universe. As a better understanding of sound's properties and potential spurred scientists to ask better questions, more sophisticated research methods and equipment have shown that sound does in fact affect our health and healing on a cellular level, and that music can reduce stress and stimulate cognitive processing

and memory in measurable, substantive, and lasting ways. Throughout this book, I will point to the recent research behind each of my recommendations for using sound's power to create positive change in your life.




In 2006, I had the pleasure of meeting Alex Doman, the founder and CEO of Advanced Brain Technologies, a brain health and education company whose therapeutic programs harness the properties of sound to improve individuals' listening, learning, and communication skills. Alex's fascination with neurological development is no surprise: His family has been developing methods to help improve brain function for more than seventy years. While serving as vice president of the National Association for Child Development, an international organization founded by his father, Robert J. Doman Jr., Alex began researching the ways in which sound affects brain performance. By the time we met, he had developed sound-based methods—most notably the Listening Program<sup>®</sup>, discussed later in this book—to address such conditions in children as autism, ADHD, Down syndrome, and brain damage, and to enhance learning and sharpen mental acuity in adults. These programs are most commonly delivered via headphones using sound methods such as a bone-conduction audio system, which carries sound's vibratory benefits throughout the body, and Spatial Surround<sup>®</sup> technology to stimulate the brain via a full 360-degree listening experience as it exists in the natural world.

Having trained thousands of health-care, education, and music professionals around the world in the application of music-based listening therapies, Alex brought with him hands-on experience using recent developments in music effects research and neuroscience to profoundly improve people's lives. Through subsequent conversations, we found that we share a passion to communicate to others our personal and professional knowledge of sound's benefits. This book, presented in my voice, nevertheless represents Alex's and my combined vision and draws on our experience and research—along with the distilled results of more than three thousand new scientific studies, surveys, and other investigations into the sound-mind-body connection—to show you, the reader, how an improved sound environment can lead to a healthier, happier, more fulfilling life.

To do this, we will take you through a typical day, demonstrating ways



to put sound and silence to work enhancing your waking routine, morning commute, work experience, family time, social activities, and sleep. Along the way, we'll demonstrate what types of music can improve your performance in exercise and physical activity; how sound can be used at home and in public to create a private space or to bring others in; how music can decrease stress, improve productivity, and create a collegial environment at the workplace; how sound-related therapies and practices can improve your child's social, physical, and academic functioning; how music is being used in medical settings to reduce pre-operative stress, speed up recovery times, and enhance many different forms of physical therapy; and how music can improve the lives of the elderly, including those with Alzheimer's disease or other forms of dementia. Throughout, you will find not just theoretical information or general advice, but concrete suggestions for altering your sound routine; specific exercises for more effectively accessing the power of pitch, rhythm, and vibration; playlists for use when exercising, working, meditating, and performing chores; and suggestions on how to create a sound environment best suited to your individual tastes and needs.

For those who are reading this book on an electronic reading device with active Internet browser capability, we are particularly excited to be able to add a wealth of audio, visual, and textual enhancements via a simple click on an icon. Throughout the following chapters, ear icons () will take e-readers to sound recordings and informative audio podcasts; eye icons () will link to video lectures, exercise demonstrations, and documentary excerpts; and "idea" icons () will connect you to organizational Web sites, newsletters, and other resources that will help you implement the suggestions we provide. In its print version, *Healing at the Speed of Sound* provides URLs for each of these sources, allowing you to access the same materials via your home computer. This multisensorial approach, using images and sound as well as text, makes especially good sense as we encourage you to open all of your senses to the rich potential for pleasure in your lives, workplaces, and homes.

So often in today's world, we are encouraged to buy our way out of life's inevitable periods of unhappiness or trouble. Sound's great advantage lies in its absolute pervasiveness, its free availability for use in improving and

enhancing all of our lives. With the suggestions provided in these pages, we hope to help you access the wealth of stimulation, regulation, and inspiration already present in the air around you, expanding your experience as you move through each precious day. Consider *Healing at the Speed of Sound* your guide to a more vibrant world—a world already surrounding you, if only you have the ears to hear.

—Don Campbell  
Boulder, Colorado



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Meet Don and Alex

Allow us to introduce ourselves, and to show  
you how to get the most from this book.

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## CHAPTER ONE

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# Awake and Energize

## Starting Your Day with Sound

*For a few moments music makes us larger than we really are, and the world more orderly than it really is. . . . That is cause enough for ecstasy.*

—Robert Jourdain, author and composer

“I had the most wonderful morning,” a friend wrote in an e-mail to me last spring. “I borrowed a friend’s cabin for a week’s vacation in the mountains, but I needed to wake up early to take a phone meeting. There’s no alarm clock here, so I decided to try the alarm function on my iPod. I set it to wake me up with a randomly selected tune, thinking I’d get going the next day with Joan Osborne or maybe Elvis Costello. Instead, the first song I heard was my own teenage daughter, Jocelyn, singing a bluesy version of ‘Summertime’ with her high school jazz combo—a recording we’d made at her recital the year before. I can’t tell you how happy it made me to wake up to her voice, now that she’s away at college. I lay there in bed for the entire three minutes, looking out the window at the beautiful view while listening to the way Jocelyn phrased each line, remembering how happy she was performing and how proud of her we were, and also letting the song’s lyrics take me back to memories of our summers together as a family. When it ended, I turned off the music and just listened for a minute to the birds singing and the wind rustling in the leaves. I can’t tell you what a good mood it put me in, Don. I may start doing this every day!”

I had to laugh, reading her words—knowing how much this type A

friend of mine, a big-city reporter, depends on her morning routine of competing high-volume radio and TV news and traffic reports, ringing telephones, multiple cups of coffee, a hasty conversation with her husband as he loads the dishwasher and switches it on, and five minutes' play with her yapping fox terrier before she even gets out the door and off to work. For the first time in years—perhaps for the first time since she had left college and started her first full-time job—she had experienced an entirely different kind of “sound overture,” and a floodgate of joyful emotions had briefly opened for her as a result. If only she would pause and consider how she might redesign her entire sound environment, I reflected, her fleeting good mood might deepen into a more lasting condition of decreased stress, increased optimism, and better overall health.

What are the first sounds you hear in the morning, before you open your eyes? The loud, insistent beep of an alarm clock? The voice of a news announcer or loud rock music on your radio? The “noise alarm” of a crying baby or honking horns and other traffic noise outside your window? Or are you one of the lucky ones who awakens to just the simple sounds of nature—wind rustling in the trees, a rushing brook, the singing of birds tuning up like an orchestra before the great symphony of your day?

The first moment of awakening is brief, but it's important. What you hear influences your mood, alertness, energy level, and thus your behavior more directly and more profoundly than you may realize. Not only does each particular sound element create an impact, but the ratio of noise to organized sound, the layering of multiple sound sources, and the combined decibel level of all the sounds that greet you can all have a dramatically positive or negative effect. This effect can linger. As with a bell struck by its clapper, the effects of these sounds can resonate throughout your day.

Sound is vibration. It has the power to affect us literally from the atoms up. Certain sounds, provided in the right context and combinations, can organize our neural activity, stimulate our bodies, retune our emotions, and thus allow us to begin our day in a calmer, more productive emotional state.



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For centuries, the organizing effects of sound and vibration on matter have fascinated scientists, from Galileo Galilei in the 1600s to the twentieth-century Swiss physician Hans Jenny, who dubbed the phenomenon “cymatics.” Here, you can see for yourself sound’s power to organize grains of sand scattered randomly across a flat surface. If sound has this effect on the material world around you, imagine how it can affect your body and brain.

Your brain responds to this vibration in extraordinarily rich, complex ways. Once the sound travels through your ear, where it is translated into nerve impulses that then pass to the hearing center of your brain, different neural regions respond to different properties of the sound, just as numerous instruments in an orchestra interpret different parts of a symphony.<sup>1</sup> The right side of your auditory cortex perceives the sound’s pitch and certain aspects of melody, harmony, timbre, and rhythm.<sup>2</sup> The left side responds to rapid changes in the frequency and intensity.<sup>3</sup> The surface of the cortex responds to low frequencies, while higher frequencies move deeper inside, close to the center of the brain.<sup>4</sup> The association cortex compares the sound with past memories, looking for a match, while your brain’s language centers—Broca’s and Wernicke’s areas—process any words the sound contains.

The brain then mirrors what it has perceived. Researchers at the Neurosciences Institute, in La Jolla, California, have observed in real time the way brain-wave patterns change to match changing pitches of tone sequences. When the tone sequence grows more coherent—sounding more like a real melody—different parts of the brain interact in a more intense and consistent, or coherent, manner.<sup>5</sup> Scientists at Stanford University have recorded a similar mirroring response to the moments of musical transition in symphonies as one melodic theme evolves into another.

This mirroring phenomenon may be the reason why you don’t just perceive, but actively *experience* sound in so many ways. As you listen to

music with a strong beat, the region in the brain that controls movement sends sympathetic impulses through your entire body—you want to move. The association cortex not only compares the sound with similar patterns, but actively sparks emotional associations and ideas. Confronted with disorganized sound—traffic noise, a baby crying—your brain creates a stress response that can include a rise in blood pressure and shallow breathing. Pleasant sounds, such as a favorite song or the voice of a loved one, lead to an increase in the level of dopamine in the brain—a response similar to that stimulated by food or sex. Sad songs, such as ABBA’s “The Winner Takes It All,” can make us feel good in a different way, as the brain responds with a dose of the comfort hormone prolactin—the same hormone that’s released when mothers nurse their babies.<sup>6</sup>

Your responses to certain sounds may well be visceral and profound, but they will not always be the same. The effects will depend on your level of attention, the sound’s volume, how many other sounds are competing with it within the environment, as well as a phenomenon called habituation—the tendency for a sound’s effects on an individual to decrease over time. Habituation can be a good thing, as when you cease to consciously hear the airplanes that fly over your office building many times per day. It can be a bad thing when you stop “hearing” the alternative rock music you were enjoying for the past hour and then can’t figure out why it’s so hard to understand someone who’s talking to you over the phone. Throughout this and later chapters, you will learn how to consider all of these variables when creating your own daily symphony of healthy sound.

### **Design Your Own “Sound Breakfast”**

Sound’s personal connection to each human being, as it occurs in particular environments and stimulates unique memories and mental, physiological, and emotional responses, means that no one-size-fits-all prescription exists for a healthy and effective wake-up call. The choice is as varied as the number of individuals on earth. Many people love to wake up to the real or recorded sounds of nature, for example—yet one well-known New York wit has been known to complain that he can’t

sleep when he's in the country because, to him, a babbling brook "sounds like a subway train entering the station."<sup>7</sup> A friend of mine in Colorado swears by her Zen alarm clock, which brings her into consciousness with a quiet, repeated *ping*; another friend from Texas rises each morning to the sonic challenge of the Aggie fight song that fills him with happy memories of his alma mater and the rush of adrenaline that goes with them.

Whatever works best for you is best. The important thing is to choose your sonic nutrition consciously, with your own and your family's best interests in mind. Earlier, I asked you to consider the first sounds you hear in the morning, before you open your eyes. Now ask yourself how well those sounds serve you as you begin your day. Do the clock-radio news reports of auto accidents and terrorist threats depress you even before you climb out of bed and fumble for your robe? If so, perhaps a morning dose of upbeat pop music would improve your mood. Does the loud buzz of an alarm clock frequently jolt you out of a deep, restful sleep, putting you on edge for the rest of the day? Perhaps you'd do better with a soft, gradually increasing chime alarm, or a clock radio with multiple snooze buttons. Are your infant's morning cries about to make you tear your hair out? Waking up to lullabies might soothe your own nerves and then lull your baby back to sleep as you start to comfort her. If you are a morning person or a light sleeper who wakens easily, recorded nature sounds—birdsong, rushing streams, thunderstorms, and so on—may be all you need to recharge you for the day ahead.

Those who need something a little more insistent to lure them out from under the covers might try some stronger, highly structured music, such as Rachmaninoff's lively "Rhapsody on a Theme of Paganini," the Andrews Sisters' "Boogie Woogie Bugle Boy," some lively Brazilian bossa nova, or even the lively beat of drum corps music. If it makes your feet want to move, you'll know you've found the right sound.



[www.HealingAtTheSpeedOfSound.com/Link3](http://www.HealingAtTheSpeedOfSound.com/Link3)

(Free Download No. 1)

For the reluctant riser, this bright, uplifting version of a Bach badinerie, performed by the Arcangelos Chamber Ensemble

under the music direction of Richard Lawrence, may provide the perfect dose of sonic caffeine.



**[www.HealingAtTheSpeedOfSound.com/Link4](http://www.HealingAtTheSpeedOfSound.com/Link4)**  
**(Free Download No. 2)**

If Bach provides too strong a charge for a weekend waking, let Christina Tourin's artistry bring you to awareness with this fine recording of "Morning Has Broken" on the Irish harp.

Classical or baroque music makes for a great start to the day for anyone in the creative, academic, or other intellectually oriented fields who likes the idea of supercharging his or her brain even while getting out of bed in the morning, as Johann Sebastian Bach demonstrated with his "Coffee Cantata" more than two centuries ago. Whatever your feelings about the music of Mozart, Bach, and Telemann in other contexts, the fact is that the brain loves its complex structure and symmetrical architecture, which have a demonstrable positive effect on brain activity, cognition, and behavior. In follow-up studies to the groundbreaking Mozart Effect work of Fran Rauscher and other neuroscientists at the University of Wisconsin, Oshkosh, and the University of California, Irvine, researchers at the Osaka University Graduate School of Medicine have found that exposure to Mozart's sonatas improves performance on intelligence tests via an apparent priming effect of the brain.<sup>8</sup> Rauscher herself, collaborating with Stanford University geneticist Hong Hua Li, has found what she believes is a molecular basis of this priming effect: the expression of higher levels of several genes involved in stimulating and changing the connections between brain cells, which in turn leads to improved performance on learning and memory tests.<sup>9</sup>

All music—rock, folk, country, hip-hop, heavy metal, and every other form—has its place in our lives and its appropriate function. But it's important to understand that one reason why classical music has survived through the ages is because, often, its structure helps prime our brains.



### Sound Break: Prescription for a Perfect Wake-Up

#### *If You Are*

A light sleeper  
A heavy sleeper

A new parent

A sleepy student

A city resident  
Looking forward to a relaxed  
morning

Looking forward to a busy day

An information lover

#### *Try Waking To*

Recorded nature sounds  
Marches, drum corps  
music, or Strauss waltzes

Lullabies to ease both you  
and baby into the day

Any selection from the  
Buena Vista Social Club

Bossa nova, Latin jazz  
American Indian flute  
music

Any selection from Harry  
Connick Jr.

National Public Radio

In the end, the choice of how to begin your day lies in thinking honestly about what makes you happier, more alert, and better prepared to meet the challenges ahead, and then making the simple changes in your soundscape necessary to achieve that goal. Starting your day consciously is a skill, an art. It's not something you do just once, but a habit that you must form for the rest of your life. By changing the way you start your day, you change all your days.

Once you have accomplished this change for yourself, consider how your other family members might do the same. Remember, each individual has his or her own sound requirements and preferences that may not resemble yours. Respect your spouse's or partner's need for a gentler entry into the day by resetting the alarm to a classical music station and leaving the door closed when you leave the bedroom. Keep in mind, however, that even if you use and love a quiet Zen alarm, and your toddler does well with a quiet early session with a children's book or music selection, your teenager may need a rock station broadcast loudly from across the room if he wants to get to school on time. Your and your family members' needs are likely to change

with the seasons, too. Darker mornings in the winter may require a higher-volume wake-up call, or more sessions with the snooze button.

## Move to the Beat

Now that you're up and out of bed, it's time to get the blood circulating through body and brain. A morning exercise routine is a great way to lift your mood and increase your productivity throughout the day—and as we've already seen, music makes the body want to move. Aside from songbirds, humans are the only creatures that automatically feel the beat of a song, according to Nina Kraus, a professor of neurobiology at Northwestern University.<sup>10</sup> Music entrains our bodies—physically by activating the muscle-control centers of our brains that get us moving to the rhythm, and emotionally by guiding our moods into synchronicity with its own tone.



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If you've ever doubted music's ability to entrain the body, bringing it into the beat, watch how Snowball the cockatoo responds to the music of the Backstreet Boys.

Music entrains not just the larger muscles in your body—studies have shown that it affects your heartbeat and breathing rate as well, resulting in lower blood pressure, more efficient oxygen consumption, and a healthier, more productive workout session at the gym. Researchers have demonstrated that the hearts of people exercising on a treadmill work less hard when music is played than when exercising in silence, and that cyclists riding stationary bicycles use seven percent less oxygen when pedaling to music than when not working out to the beat.<sup>11</sup> As a result of this greater efficiency, they are able to prolong their exercise sessions and improve endurance.


Besides setting the pace, your favorite workout tunes engage your attention, distracting you from the strenuous effort of the workout. Music occupies the mind, freeing the body to do its work, as was proven in a 2009 study in which basketball players prone to performing poorly under

pressure improved their free-throw scores significantly when they first redirected their attention to the upbeat music and amusing lyrics of Monty Python's "Always Look on the Bright Side of Life."<sup>12</sup> At the same time, music you love releases pleasure-giving endorphins, which, combined with other biochemical reactions caused by your increased heart rate and breathing, drive you to work harder and to prolong your routine.

Classical, rock, country—any style of music you enjoy is fine for a workout, as long as its underlying characteristics suit the form of exercise in which you are engaged. An aerobic workout functions best when accompanied by music with a stimulating tempo, such as techno, rap, hard rock, or even punk. (College students recommend, for example, the music of Disturbed, Limp Bizkit, Fort Minor and its deep bass beat, and Panic! at the Disco's first album *A Fever You Can't Sweat Out*.) A tempo of 120 to 140 beats per minute is ideal during the warm-up phase, as it will bring your heart rate up to that target pace and get you revved up for what's to come.<sup>13</sup>

In the workout phase, upbeat music to stimulate adrenaline flow and songs with lyrics to distract your mind from the effort of your muscles will lead to longer, more intense sessions. During the cooldown phase, switch to "mellow, chill music" to bring down your heart rate and calm you for the day ahead.<sup>14</sup> Many people choose a song or two whose mood or lyrics will set the tone, they hope, for the rest of the day.


### Sound Break: Pump Up Your Pulse, Not the Volume!

 It's a proven fact that you'll get better results from your aerobic routine if you listen to upbeat music with a strong, rhythmic beat. Keep in mind, though, that when you oxygenate the body your ears become more sensitive. It's fine to start your routine with the music turned up, but lower the volume after a few minutes and focus on the rhythm instead. Eventually, you may be able to put the power of habituation to use in protecting your hearing. After a month of exercising to the same music playlist, you may find that you have internalized the music and can exercise to silence, with the music running through your head.

Bicyclists and runners find music with a brisk tempo—whether it’s aggressive with strong lyrics or mellower in mood—ideal for their workouts as well. (Queen, Madonna, and the Red Hot Chili Peppers are popular among treadmill runners, while hard-core cyclists like to pedal double-time to Salt-n-Pepa and Run-DMC.<sup>15</sup>) The importance of a fast tempo was demonstrated in a 2009 British study in which college students were asked to ride stationary bicycles for three thirty-minute sessions while listening to popular music of their choosing. Although the college students were unaware that the researchers had slowed down the tempo of their recorded music by ten percent in one session, sped it up ten percent in another, and kept it at the normal tempo in the third, their performance decreased significantly when the music was slowed. When the tempo was increased their heart rates rose, they covered more miles, produced more power with each pedal stroke, increased their cycling pace, and reported enjoying the music much more. They knew the workout had been harder, they reported later—the music hadn’t masked the pain—but the increased pace had increased their motivation, making them more willing to push themselves.<sup>16</sup>

This effect is strongest during the first part of your routine, as you’re getting up to speed. According to a 2009 review of research conducted by music-and-exercise experts Costas Karageorghis and David-Lee Priest, once your run reaches an intense level—say, ninety percent of your maximal oxygen uptake—your fatigue and other physical perceptions start to override music’s ability to distract you, and your heart rate and pace level out.<sup>17</sup> Still, one recent study conducted by Karageorghis found that listening to music enhanced treadmill runners’ overall endurance by fifteen percent—results sufficiently persuasive to convince the directors of London’s 2008 Sony Ericsson Run to the Beat half marathon to allow the researcher to set up seventeen live bands, playing music he had selected, to push the runners to the limit all along the marathon’s route. Aside from the endurance issue, many runners tell researchers that they simply like listening to music because it “sounds nice.”<sup>18</sup>

### Sound Profile: Trevor Hoffman

 If I were to choose one man as a symbol of music's power to motivate the athlete, it would have to be Trevor Hoffman, former pitcher for the San Diego Padres and Major League Baseball's all-time leader in saves. Hoffman became so well known for psyching himself up for a game by listening to the AC/DC song "Hell's Bells" that the song became a kind of calling card for him, its "death-march bells" played over stadium loudspeakers "at about a gazillion decibels," according to a report in the *San Diego Union-Tribune*, as he walked out onto a field.<sup>19</sup> That kind of entrance may have seemed "more suited to the World Wrestling Federation than the national pastime," as a *San Diego Union-Tribune* reporter wrote in 1998.<sup>20</sup> Still, the pounding, heavy-metal melody, with lyrics screaming about sending victims down below, invariably brings the fans to their feet, convincing them along with Hoffman that they're there to bury the other side. As one observer put it recently, this kind of music-generated euphoria "is what Trevor Time is all about."<sup>21</sup> Thanks to Hoffman's example, other closers in baseball, including Mariano Rivera and Billy Wagner, have adopted their own rousing theme songs as well.

For strength-training routines at the gym or at home, hard rock or other upbeat music with a strong beat is best. Weight lifters are probably right to insist that hard-driving music such as heavy metal<sup>22</sup> works best for them as a motivator, particularly since slow, sedative tunes have been shown to actually decrease individuals' muscular fitness potential over time.<sup>23</sup> But caution—if it is too loud, it may also decrease the effectiveness of your workout, since prolonged exposure to loud sounds has also been shown to weaken the muscles.



**[www.HealingAtTheSpeedOfSound.com/Link6](http://www.HealingAtTheSpeedOfSound.com/Link6)  
(Free Download No. 3)**

With “Up to Stay,” from the album *One Heart Wild*, courtesy of Silver Wave Records, Danny Heines’s marvelous jazz guitar gets us up and moving for three and a half minutes, without overpowering us.

There is, of course, a place for gentler music in the realm of exercise. Stretching or yoga routines work best with soft, contemplative music (try your favorite New Age music or selections by Enya) or recorded nature sounds, which set the stage for the appropriate meditative mood and flow.



**[www.HealingAtTheSpeedOfSound.com/Link7](http://www.HealingAtTheSpeedOfSound.com/Link7)  
[www.HealingAtTheSpeedOfSound.com/Link8](http://www.HealingAtTheSpeedOfSound.com/Link8)  
[www.HealingAtTheSpeedOfSound.com/Link9](http://www.HealingAtTheSpeedOfSound.com/Link9)**

#### The Beat of Your Own Drummer

When choosing the best music for an exercise routine, the number of beats per minute in a song you select is more important than its genre or style, since your heart rate will speed up or slow down to match the music’s pulse. Some online music stores, such as Power Music (link 7, above) and Yes! Fitness Music (link 8), offer preassembled playlists of songs suitably paced for aerobics, step classes, cycling, yoga, and other types of fitness routines—or allow you to create your own custom mix of selections at the tempo you need. But you probably don’t need to buy new music to create an excellent playlist. Dj BPM Studio (link 9) provides an extensive list of popular songs organized by beats-per-minute, free of charge. By consulting the list, you can assemble your own exercise music from selections you already own, at precisely the pace you need.

If you are unaccustomed to or simply not interested at this time in initiating a full-out morning exercise routine, consider this enjoyable alternative for getting the pulse racing and the adrenaline flowing for the day: Put on some music by Beethoven or John Philip Sousa and actively “conduct” it, using your whole body to actively shape, sculpt, and blend the music. If you prefer rock ‘n’ roll, you can benefit from much the same body-mind aerobic action with thirty minutes of *Guitar Hero*, *Rock Band*, or air guitar played along with your favorite band.

### **Sound Mind, Sound Body, Sound Home**

Awake and fully energized, you can now begin your day with new awareness—hearing sounds, perhaps, that you haven’t been conscious of for years. As you shower and dress, prepare breakfast, feed the pets, and gather with your loved ones around the breakfast table, pay attention to the quality of sound vibrations reaching your ears in each room of your home. In the bathroom, does the faucet drip or do the pipes run, creating an annoying dissonance that interrupts your thoughts? Does an electric toothbrush or shaver send low-pitched sonic vibrations through your bones? Are your ears assaulted by the noise of a hair dryer? In the living room, is a radiator hissing or a humidifier emitting a low rumble or hum? Is the television on? In the laundry room, is the low thrum of the washer or dryer tugging your spirits down? What about the kitchen? Do you hear the high-pitched grinding of the dishwasher? The refrigerator condenser clicking on and off? Does the coffee grinder offend your ears as you make your morning beverage, and the coffeemaker grumble and moan?

As the household begins to stir, how often does the telephone ring? Is loud rap music emanating from your teenager’s room? Do the kids shout to each other from room to room, or do they make the effort to talk face-to-face? How much noise is coming in through the windows? Do you hear the neighbor’s lawnmower, or dogs barking, or a garbage truck, or airplanes passing overhead?

So many of these aural influences affect our mood without our realizing it. When sounds are layered one over the other, their decibels combining

and their sound waves colliding, we can start to grind our teeth, snap at our partners, and lose our tempers without even knowing why. I recall one friend's story of a week when his young child was ill and he had to stay home with him, trying to fit in some work on his laptop at the dining table whenever he had a chance. "I tried to concentrate on the proposal I was writing, but I kept getting more and more irritated, even angry, and unable to concentrate," he said. "At one point, just when I was trying to tune up a particularly troublesome paragraph, Davey called out from his room that he thought he was going to throw up. I slammed down the materials I was going through and ran into the bedroom, only to find him vomiting all over his blankets and pajamas. I'm ashamed to say it, but I completely lost control. I yelled at him for something he obviously couldn't help, and jerked the covers off his bed and pushed him into some clean clothes. Afterward, horrified and ashamed, I apologized to him and went back into the dining room. I stood there for a second and really listened. There was an incredible level of noise in that room: the banging of the dryer from down the hall, the screeching dishwasher in the kitchen, a motorcyclist revving his engine over and over, and a dog that had been barking down the street for what seemed like hours without my consciously noticing it. I'm not excusing my behavior, but the thought did cross my mind: No wonder I blew up! We already have a smoke alarm and a carbon-dioxide warning device in this house, but what I really think we need is a noise alarm."

My friend hit the nail on the head with that last remark. It is astonishing how much noise most of us tolerate in today's world, when the very definition of the word *noise*, according to K. D. Kryter, author of *The Handbook of Hearing and the Effects of Noise*, is "acoustic signals which can negatively affect the physiological or psychological well-being of an individual."<sup>24</sup> Described as the most pervasive pollutant in America, noise presents a significant threat to human health. Not only can it affect your hearing, but at certain levels it can increase blood pressure, change the way your heart beats, increase your breathing rate, disturb your digestion, contribute to the development of ulcers, interfere with sleep even after the noise stops, intensify the effects of drugs and alcohol, speed up the appearance of signs of aging, and affect the fetuses of pregnant women, possibly even contributing to premature birth.<sup>25</sup>



It is no wonder, as George Prochnik points out in his book *In Pursuit of Silence*, that police officers such as John Spencer, of Washington, D.C., claim that the majority of domestic disputes they encounter are actually noise complaints. “You go into these houses where the couple, or the roommate, or the whole family is fighting and yelling and you’ve got the television blaring so you can’t think, and a radio on top of that. . . . They’re fighting about the noise. They don’t know it, but that’s the problem.”<sup>26</sup>

In general, the louder and more prolonged the noise, the more harmful it is to your ears—the sound waves damage the tiny, delicate hair cells, or cilia, in the inner ear—not to mention your sense of well-being. Most people know that noise levels are measured in decibels (dB), and that the higher the decibel level, the louder the noise. What you may not know is that decibel numbers increase *logarithmically*—that is, a noise level of sixty decibels (the loudness level of laughter) is ten times as loud as fifty (the sound of rainfall or of normal conversation). As a result, decibel readings indicate an unsafe level of noise much more quickly than most people realize.

The cilia in the inner ear can be damaged by a brief, intense, very loud impulse, such as an explosion. Continuous and/or repeated exposure to noise above eighty-five decibels can also cause gradual hearing loss—and regular exposure of more than *one minute* of noise above 110 decibels risks permanent damage.<sup>27</sup> Some people assume that once they adapt or are habituated to dangerously loud noise it will no longer harm them. It’s easy to believe this, as noise-induced hearing loss is usually gradual and painless. But your assumption that you have adapted to the earsplitting noise of the coffee grinder in your kitchen is more likely an indication that your hearing has already diminished.

Below, I have provided a list of decibel levels for sounds to which we are often exposed in and around our homes. However, since we can’t all carry around decibel readers and unfortunately we don’t have those noise alarms wished for by my friend, keep in mind the general rule that a particular noise level is potentially hazardous if you must raise your voice to be heard, if you can’t hear someone two feet away from you, if the speech of people around you sounds muffled or dull, or if you have pain or ringing in your ears after you leave the noisy area.

## HOW LOUD IS IT?

This noise chart gives an idea of average decibel levels for everyday sounds in your home environment.<sup>28</sup>

<i>Decibel Level</i>	<i>What We Hear</i>
10 dB	Normal breathing
40 dB	Refrigerator humming
50–60 dB	Moderate rainfall
60–65 dB	Laughter
65–75 dB	Dishwasher
70 dB	Vacuum cleaner, hair dryer
78 dB	Washing machine
70–80 dB	Busy traffic
80 dB	Garbage disposal, alarm clock
85–90 dB	Lawnmower, motorcycle
98 dB	Farm tractor
100 dB	Train, garbage truck
103 dB	Jet flyover at 100 feet
110 dB	Jackhammer, power saw
120 dB	Jet plane take-off, band practice
145 dB	Boom cars

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I hope I have increased your awareness of the deleterious effects of unwanted noise. The next step is to use this information to consciously reshape your sound environment, beginning inside your home. I have asked that you listen to the many sounds within each room in your house or apartment. Now take a moment to rate the sound condition of each of your rooms in terms of how noisy it seems to you. Since noise is defined as any sound that negatively affects the physiological or psychological well-being of an individual, I want you to think a little less in terms of volume this time and more in terms of “annoyance factor.” The satellite radio jazz channel playing in the living room may be turned up too loud, for example, but it’s probably less irritating than the sound of your two kids arguing in the bathroom over who used all the hair gel.

There’s a reason why your ears perceive the sound of people arguing as “empty” and disruptive, while a classical sonata sounds clear and serene. Empty sound—the noise of a coffee grinder or of traffic outside—consists of a chaotic pattern of sound waves that, when interacting with your auditory system, cause your brain and body to respond in chaotic ways. Empty sounds are like empty calories: They just do not nourish. Uncluttered sound, on the other hand—such as slow classical music or a calm, quiet human voice—forms a regular and coherent sound-wave pattern, which your brain also reflects. Of course, no matter how coherent sound waves are when they are emitted, they can collide with others when combined in a contained space, creating a new, chaotic pattern that increases our stress level even when we are consciously unaware that it is there.

Decreasing empty sound, or noise, can often be a simple, commonsensical process once the sounds’ sources have been identified. Turn off the television. Wait to start the dishwasher until you are about to leave the house, or at least the kitchen. Fix the dripping faucet in the bathroom. When you are blow-drying your hair, hold the dryer farther away and aim at the back of your head, *not* toward your ear. Consider using earplugs to protect your hearing. When buying a new hair dryer or electric shaver, choose one with a low noise decibel level, or use it at a lower setting.

## FIRST STEP TO A SOUND LIFE

How noisy is your daily life? Moving through your home, estimate and circle the sound levels in each area: 1—very quiet; 2—aware of sounds; 3—filled with moderate sounds that include music you have chosen; 4—loud; 5—very loud and annoying. How many 4s and 5s did you discover? Once you know where your sound challenges lie, you can begin to work on getting the “noise numbers” in your life as low as possible.

<i>Area or Sound Source</i>	<i>Loudness Rating</i>				
Your bedroom	1	2	3	4	5
Other bedrooms	1	2	3	4	5
Bathroom	1	2	3	4	5
Kitchen	1	2	3	4	5
Living room	1	2	3	4	5
Dining room	1	2	3	4	5
Den or recreation room	1	2	3	4	5
Laundry room	1	2	3	4	5
Home office	1	2	3	4	5
Workshop	1	2	3	4	5
Garage	1	2	3	4	5
Plumbing	1	2	3	4	5
Heating/air conditioning	1	2	3	4	5
Outside	1	2	3	4	5
Other	1	2	3	4	5

Once you have decreased the aural chaos, you can begin to create a healthy sound environment by deliberately adding meaningful, coherent sounds throughout your home—sounds that nourish your mind and heart, regulate your body, and bring your family together—much as a composer might create a symphony or a designer might choose color accents for each room.

How can sound help you create a more serene, healthy ambience? Consider these four sonic tools for changing your environment in positive ways:

- **Entrainment:** The process of modifying brainwaves, breath, movement, emotions, or thoughts by matching the rhythm of an external stimulus, such as music. (Slow music entrains your pulse to a slower rate; chaotic sounds entrain your emotions to a higher state of tension.)
- **Iso-Principle:** The process of moving gradually from one tempo or level of intensity to another, either within a single musical selection in just a few minutes' time or over the course of an hour or so as one listens to a playlist. By matching a physical rhythm or emotional state and then slowing down or speeding up, music provides a comfortable bridge to a modified state. (The song "Happy Birthday to You" slows down at the end, broadening the sense of general goodwill. "Bolero" gradually intensifies over time, keying up the emotional state of the listener.)
- **Masking:** The process of using sound to cover up other sounds that are disturbing. (You may not be able to abolish the traffic noise outside your window, but you can mask it with a sprightly Bach concerto.)
- **Diversion:** Using music to get the mind onto a completely different track. (Instead of sulking because your partner went off to work and left you to do the dishes, put on some lively pop music and dance your way through that unpleasant chore.)

Consider the ways you can use each of these tools to improve your own and your loved ones' lives at home. In the living room, you might

*mask* the dispiriting clank of the radiator with some tinkling chimes positioned in the opposite corner of the room. In the bathroom, you could *divert* attention from the everyday sounds of splashing and brushing by opening the window to the breeze and the birds. As your overly energized partner bounds through the house, smartphone in hand, you could employ the *iso-principle* to calm him down a bit with a playlist beginning with Duke Ellington’s “Take the ‘A’ Train” and ending with Miles Davis’s “Kind of Blue.” And as the family gathers around the breakfast table, put the power of *entrainment* to use by playing some soft, energetic music—a little Herbie Hancock, perhaps, if you’re a jazz fan—to stimulate conversation, lift moods, and reinforce family connections before you all disperse for the day.

Even if you are the only human occupying your home, entrainment might come in handy for other living beings around you. It’s useful to know that according to some animal experts, pets’ moods lift just like humans’ when listening to happy, upbeat songs. (Just be sure the lyrics don’t include a clearly voiced “no,” one expert tells us, or your pet will just shut down!)<sup>29</sup>



[www.HealingAtTheSpeedOfSound.com/Link10](http://www.HealingAtTheSpeedOfSound.com/Link10)

In this TED talk, sound consultant Julian Treasure explores ways to turn down the volume and restore your relationship with sound.

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## The Harmony of the Hemispheres

It can be quite enjoyable to tweak the sound cues and rearrange the sonic cushions throughout your home, observing the impact of these changes on yourself and others. But it’s important to remember the need for sound privacy as well as conviviality within the domestic sphere. If you share your home with others—family members, roommates, or anyone else—try to make room for thirty minutes of quiet time before you leave the house for the day, and encourage others to do the same.

If you're lucky, you can retreat to a room of your own, shut the door, and put on some quietly invigorating instrumental music while you check your e-mail or read the paper. If that's not possible, you can still create your own private sound environment by investing in a pair of high-quality headphones for use at your computer or in a quiet corner armchair. Think about the activities ahead of you that day and choose a private playlist that will charge you up for whatever challenges you face. If you didn't sleep well but are facing an important meeting this morning, fast-tempo, high-frequency music (Chuck Berry or Aretha Franklin, anyone?) will provide you with a dose of sonic caffeine. If you need to draw on your creative skills today, spend this time with classical music, such as Handel's Oboe Concerto no. 3 in G Minor, and let its beautiful architecture "organize" your brain. Baroque music, such as the first movement of Bach's Brandenburg Concerto no. 3 in G Major, can energize you both physically and mentally, its faster tempo activating the most alert (beta wave) brain state, its bright tonal qualities enabling you to work, study, think, and maintain a positive, productive attitude. If you anticipate a stressful encounter today—with an angry boss, an ex-spouse, a financial auditor—put on the headphones, close your eyes, and listen to some soothing, reassuring folk music, Brahms, or a round of early Beatles tunes.

I find the music from Trent Reznor and Atticus Ross's 2011 Academy Award-winning soundtrack of *The Social Network* most interesting for this purpose. Each piece presents a different mood—great calm, peace of mind, frenetic, geeky, high energy, and so on. You can sample each of the tracks on the soundtrack album's page on Amazon.com. Sense the different moods and tension immediately through the dichotomy of electronic, yet organic, music.

Whatever your need, there is an appropriate sound to meet it. If you like, you can amplify and enhance its effects by listening on bone-conducting headphones. These headphones, designed for use with personal music devices and now easily available in electronics stores and via the Internet, deliver the sound's healing vibrations directly through the bones of the skull, adding subtle vibration to the skin and skeletal system and engaging the whole body with the sound. (The speed of sound varies with temperature, humidity, and altitude. The higher the temperature, the faster the sound waves propagate.)



[www.HealingAtTheSpeedOfSound.com/Link11](http://www.HealingAtTheSpeedOfSound.com/Link11)

### Hum Your Way to Harmony

Even without bone-conducting headphones, you can give yourself some bone-conduction stimulation by humming a little every day. As I demonstrate in this video, humming in the proper position causes your whole body to resonate, especially the bones of your skull and spine. As you hum, the vibration through your skeletal system combines with your slow, deep intake and out-flow of breath to revitalize you. By performing this exercise just five to ten minutes at the start of each day, you will not only find that you experience increased energy, but the quality of your voice will improve as well, becoming richer and more resonant as more of your body participates in vocal expression.

An advantage of headphones is that you are still available to your family or housemates, if necessary, while you are using them. You might take advantage of this situation to end your private time with a brief period of silence. With all the talk about the healing power of sound, it's important to remember that silent periods are equally necessary—that they fortify, soothe, and recharge the mind and body in their own way as well. A five-minute time-out allows you to organize your thoughts, review and process recent conversations and events, and meditate briefly on what's really important for you to pay attention to today, rather than focusing only on what others demand of you. Experiencing silence also reawakens your awareness of the noise around you at other times. This is why the Center for Hearing and Communication has instituted a minute of silence—a Quiet Diet—from 2:15 to 2:16 on the afternoon of their annual International Noise Awareness Day.<sup>30</sup>

## With a Song in Your Heart

Wake-up call, moving to music, a soundscaped home, a private moment with or without sound—by the time you go out the door, you will have



created a morning prelude to your day, perfectly suited to your own tastes and needs. Raising your awareness of the sound around you, and re-designing your sound experience as you begin your morning, will not just enhance those hours as you are experiencing them, but will extend through the day as you go off to work with a clear mind, tempered body, and a mood improved by more pleasant interactions with your loved ones.

As you continue your new sound routine each morning through the weeks to come—as the “habit of beauty” becomes a part of your routine—you are likely to find that your overall attitude and your life are improving as a whole. The British newspaper columnist Simon Jenkins put it best when he described the part of the brain that recognizes sound as a field of neurons arranged like rows of growing stalks of corn. “The music drifts across it in a breeze, leaving its indent on the corn,” he wrote. “The deeper the indent the easier it is for the same breeze to follow it a second time, while the deeper the indent, the closer it is to the soil where it agitates the pleasurable endorphins.”<sup>31</sup> With repetition, your morning ritual of sound and music, contemplation and exercise, song and conversation, will become an integral part of your sense of self, adding depth, meaning, and precious memories to your mornings, and bringing you to a healthier life.