

Learn About Hearing Series:

***Measuring Hearing Loss:
Is It Decibels or Percent?
and
Calculating Hearing Disability***

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Measuring Hearing Loss: Is It Decibels or Percent? and Calculating Hearing Disability

More articles in the series:

***Everything You Wanted to Know About Your Hearing Loss But Were Afraid to Ask
(Because You Knew You Wouldn't Hear the Answers Anyway!)***

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Measuring Hearing Loss: Is it Decibels or Percent?

Question: From time to time, I see people writing, “I have 78% hearing loss in my right ear and 95% in the left.” What does this percent mean? I thought sound was measured in decibels (dB), not percent? If this is the case what percent is 115 dB?

Answer: Excellent questions. You have good reason to be confused because you cannot equate decibels to percentages no matter what anyone tells you.

Decibels vs. Percent

Sound intensities are indeed measured in decibels (dB). There are two reasons why you can never equate decibels to percentages. First, the decibel scale is open-ended like that of the Richter scale used for measuring earthquake intensities. To calculate a percent you need to know the maximum value possible. In both of these scales there is no limiting maximum value. Therefore, you cannot calculate a percentage. Any attempt to do so is just a bunch of meaningless gibberish!

Second, the decibel scale is logarithmic, while the percent scale is linear. Numbers that appear to be similar have vastly differing meanings. They are as different as trying to compare apples to elephants!

When people (ignorantly) talk about having a 50 percent hearing loss they likely mean that they have a 50 dB loss. Where did the idea come from that we can measure

hearing loss in percentages? Here is how Brad Ingrao, an outstanding audiologist, explained it.

To measure sound intensity (the way audiologists measure it) you need to do a mathematical calculation that is so strange that $20 + 20 = 26$ dB (SPL).

To make a scale that makes sense to most people (including us knucklehead audiologists), a different equation is used to convert sound intensity using the Sound Pressure Level (SPL) scale to the Hearing Level (HL) scale that goes from 0 dB HL (normal threshold) to 120 dB HL (pain threshold).

If we forget about hearing losses greater than 100 dB (like most people tend to do), we get 0 dB to 100 dB as the usable (dynamic) range of hearing for the average “normal” ear.

Since doctors and audiologists tend to under-estimate their patient’s ability to understand such things (or they don’t understand it themselves), the erroneous concept of dB = % evolved.

There you have it folks. It seems health care professionals think we are too stupid to understand much, so they let us believe error rather than teach us the truth.

We can put a stop to this nonsense right now. Let’s understand how this decibel scale works and why using a percentage value to describe our hearing losses is so very wrong.

First we need to understand that a decibel is not a given intensity (loudness) of sound, but rather, it is a **ratio** of how many times louder (or softer) a sound is than a given reference sound level.

This means that 0 dB is not the absence of sound, but is an arbitrary zero. We define it as the faintest sound that a young sensitive human ear can hear. In actual fact, some people can hear down to -20 dB—a very faint sound indeed!

Furthermore, because the decibel scale is logarithmic, every 10 dB increase in sound intensity is actually a **ten-fold** increase. Therefore, a sound intensity of 20 dB is not twice as loud as a sound intensity of 10 dB as you might think, but is actually 10 times as loud, and a sound intensity of 30 dB is 100 times as loud as a sound intensity of 10 dB. Similarly, a sound intensity of 50 dB would be 100,000 times as loud ($10 \times 10 \times 10 \times 10 \times 10$). This is how the decibel scale works. It is totally unlike the linear percent scale.

Now lets see the fallacy of trying to compare this “funny” decibel scale to the percent scale. To illustrate this, let’s assume (remember this assumption we’re making

here is totally wrong) that 0 dB is equal to 0 percent hearing loss and that 100 dB equals a 100 percent loss. This would then mean that 50 percent would equal a 50 dB hearing loss, right? Wrong! Not by a long shot! A 50 percent hearing loss would equal, believe it or not, only a 3 dB loss! Looking at it the other way, a 50 decibel loss is not just half as loud, like it would be in a percentage scale, but would only be one thousandth of one percent as loud!

Here is another example. I have a 80 dB loss. This is not equal to a 80 percent loss by any means. In actual fact it means that the softest sound I can hear needs to be 100,000,000 times louder than the softest sound a person with normal hearing can hear. One out of 100 million is definitely not a 80 per cent loss but would be a loss of 99.99999999%! Quite a difference, isn't it? Now you can see why we must never use percentages when talking about our hearing losses. They just do not equate. They are absolutely meaningless!

Percent Used to Describe Discrimination

Although we cannot use percentages to describe our hearing losses, we correctly use percentages to describe our ability to discriminate sounds. To determine our ability to discriminate between words, our audiologist sets the volume of the audiometer at our most comfortable listening level (MCL). She then has us listen to a list of words and we repeat back what we think we heard. The number we get right, converted to a percentage, becomes our discrimination score. Therefore, if I understood 70 out of 100 words in my right ear, my discrimination is 70% for that ear. I may have an entirely different result for my other ear. Consequently, we can correctly describe our ability to **understand** what we hear as a percentage. A person could correctly say that his discrimination is 78% in his right ear and 95% in his left ear. But this has nothing to do with the **severity** of our hearing losses as such.

Percentage and Hearing Disability

If your hearing loss resulted from an accident on the job, there is a formula that is used to calculate the percent **disability** pension for which you may be eligible. Don't get mixed up. This is not your hearing loss expressed as a percentage. Rather, this formula calculates how much your degree of hearing loss supposedly impacts your ability to remain employed at full wages.

For example, plunking your hearing loss levels into the formula may yield a result of 75%. This means that with your particular hearing loss, you may be entitled to a 75%

disability pension. Again, this is not your average hearing loss expressed as a percentage. Chapter 2 explains how to calculate a percentage disability for any given hearing loss.

Classifying Our Hearing Losses

Hearing health care professionals classify hearing into several categories such as normal, slight, mild, moderate, moderately severe, severe, profound and deaf. Not all of them use all of these categories, nor do they all use the same hearing loss ranges in each one. In the past, most used this simple scale.

Simple Hearing Classification Hearing Threshold

Normal hearing	down to 20 dB
Mild hearing loss	21 to 40 dB
Moderate hearing loss	41 to 60 dB
Severe hearing loss	61 to 90 dB
Profound hearing loss	greater than 90 dB

Today, research has shown that even hearing losses of only a few decibels can cause significant hearing problems. As a result, many hearing health care professionals have fine-tuned this scale to better reflect this reality. (Note that these ranges are arbitrary and may vary slightly among authorities.)

Today's Hearing Classification Hearing Threshold

Normal hearing	-10 to 15 dB
Slight hearing loss	16 to 25 dB
Mild hearing loss	26 to 40 dB
Moderate hearing loss	41 to 55 dB
Moderately severe loss	56 to 70 dB
Severe hearing loss	71 to 90 dB
Profound hearing loss	91 to 120 dB
Deaf	greater than 120 dB

Describing Our Hearing Losses

Unless you have a “flat” curve on your audiogram, how can you accurately describe your hearing loss? Your hearing loss could be different at every frequency so one word could be meaningless.

The best way is to be specific. If I have the typical “ski slope” hearing loss, I could describe it as, “I have a 30 dB loss at 500 Hz, dropping to 100 dB at 4,000 Hz.” A more general way, but still accurate, would be to describe it as, “I have a mild loss in the low frequencies, dropping to profound in the higher frequencies.

The next best way to describe our hearing losses is to average the 4 frequencies that carry most of the speech information to arrive at a single figure. Use the following four frequencies—500 Hz, 1,000 Hz, 2,000 Hz and 3,000 Hz—and average the hearing loss at these frequencies to come up with one figure. However this method falls down if we only have a bit of hearing left in the very low frequencies. Incidentally, it is not right to take the average of our best and worst figures. That could give a very wrong impression of our hearing losses.

If you want a very simple way to describe your hearing loss, the most accurate (and simple) is to say you have either a mild, moderate, severe, or profound hearing loss. Your audiologist can tell you which category your hearing is generally in. (Remember, you could be mild in the low frequencies and profound in the highs—but to oversimplify, you can reasonably accurately reflect your practical hearing loss by using one of these categories.) It is much more meaningful, and far more accurate than trying to use a meaningless percentage. Let’s get back to using these standard audiological terms and stamp out this absurd percent business.

The original of this article is on the Center’s website at <https://hearinglosshelp.com/blog/hearing-lossdecibels-or-percent/>.

Measuring Hearing Loss:

Calculating Hearing Disability

Question: I hear the terms “hearing impairment,” “hearing handicap” and “hearing disability” used seemingly interchangeably. Why do we have these terms if they all mean the same thing? I’ve also heard that you can calculate the percentage of hearing loss for purposes of a disability pension. How do they do that?

Answer: These are more excellent questions! Actually, these terms don’t mean the same thing at all, hence the confusion. The American Academy of Otolaryngology (AAO) carefully defined each term. I think you’ll find these differences most interesting for they relate to how society values and views our worth as hard of hearing people.

Hearing Impairment

Hearing Impairment is any deviation from “normal” for the worse-whether in structure or in function. Therefore, any degree of hearing loss is a hearing impairment. So too are all the other strange conditions we have that are associated with “damaged ears” such as tinnitus, hyperacusis, recruitment, less than perfect discrimination, etc. It covers the whole range of hearing loss from mild to totally deaf. Therefore, all of us with any degree of hearing loss have a hearing impairment.

Hearing Handicap

Hearing Handicap is the disadvantage imposed on hard of hearing people by society such that it affects our efficiency in our daily lives.

Even though we may have hearing losses (hearing impairment), we do not have to be handicapped if we live in a society that is sensitive to our needs! For example, years ago on Martha's Vineyard there were many people who were deaf. These people would have been severely handicapped in a "normal" society. However, a wonderful thing happened. Everyone on the island learned to sign, so whether you were deaf or hearing you had no trouble communicating with any one. Thus, the deaf people there were not handicapped even though they couldn't hear.

Another example—if all television programs were captioned, then whether we hear well or not doesn't make any difference—we can all understand the programs. As a result, we would not be handicapped in this situation.

When society fails to meet our unique needs as hard of hearing people, we end up handicapped. This handicapping is not the fault of our hearing losses as such, but from society not "leveling the playing field" so we can live in society as equals.

Hearing Disability

This brings us to the third term, "Hearing disability." Hearing disability is "an actual or presumed inability to remain employed at full wages." Hearing disability only comes about when society fails to meet our needs and thus handicaps us so it is difficult for us to compete fairly in a hearing society. In a nutshell, hearing disability is how society views our "worth."

It is not that we, as hard of hearing people, are not worth as much as hearing people, but this is how society (falsely) views us. Not only that, they have come up with a formula to calculate how much they think any of us with hearing losses are "worth".

Calculating Hearing Disability

After telling you in Chapter 1 that you cannot calculate hearing loss in percentages, now we are going to do what appears to be just that. However, note this well—we are **not** calculating hearing **loss** as a percentage, but rather, we are calculating hearing **disability** as a percentage—two entirely different things.

In 1979, the AAO came up with a formula that defines their concept of the degree of disability we suffer as a result of a hearing loss. Thirty-two of the 50 states now use this formula as the basis for their compensation awards.

Here is how to determine the amount your hearing loss would likely affect your ability to earn a “normal” salary in today’s society according to the AAO formula. All you need to determine your worth is a copy of your audiogram and a calculator.

Step 1

Determine your average hearing loss in decibels for each ear using these four frequencies-500 Hz, 1,000 Hz, 2,000 Hz and 3,000 Hz. (Note: if your hearing at any of these frequencies is better than 0 dB, use 0 dB and if your hearing is worse than 100 dB, use 100 dB.) I’ll use my hearing loss as shown on one of my audiograms as an example so you can see how it is done. Follow along using your own figures.

You’ll find the hearing loss for your right ear marked on your audiogram with red circles and your left ear marked with blue Xs. (Ignore any other marks such as red triangles, blue squares or angle brackets like < or >.)

Frequency	Right ear	Left ear
500 Hz	65	65
1,000 Hz	75	75
2,000 Hz	65	70
3,000 Hz	60	65

Add the figures up for each ear and divide by 4 to get the average. (Round your answer to the nearest whole number.)

$$65 + 75 + 65 + 60 = 265/4 = 66 \text{ average dB loss in right ear.}$$

$$65 + 75 + 70 + 65 = 275/4 = 69 \text{ average dB loss in left ear.}$$

Step 2

Calculate the degree of impairment for each ear. The assumption is that a hearing handicap doesn’t begin until you have at least a 25 dB loss. The handicap then increases by 1.5% for each dB loss above 25 dB. To determine this, take the average you calculated in Step 1 and subtract 25 from it. If the answer is greater than zero, multiply the result by 1.5. Do this for each ear. (If your loss in both ears is less than or equal to 25 dB you don’t have any hearing handicap according to the AAO.)

Right ear: $66 - 25 = 41 \times 1.5 = 61.5\%$ handicap

Left ear: $69 - 25 = 44 \times 1.5 = 66\%$ handicap

Step 3

In this step, you apply a 5 to 1 weight favoring your better ear, then you combine the results to obtain the final figure. (If your better ear has a hearing loss of 25 dB loss or less, and your worse ear is greater than 25 dB, simply take the result of your worse ear and divide it by 6 to get the final answer [and skip the next paragraph].)

To calculate your hearing disability, take the smaller figure from Step 2 (your better ear) and multiply it by 5. Add this to the figure of your worse ear from Step 2. Add these two numbers together and divide the result by 6. That is your hearing handicap as a percentage.

Better ear $61.5 \times 5 = 307.5$

Add together $307.5 + 66 = 373.5$

Divide by 6 $373.5/6 = 62\%$

According to this formula, at the time of this audiogram I had a hearing handicap of 62%. This means that my expected earning capacity would be 62% below “normal” and this could be the basis for compensation if I were eligible.

In other words, my value to society is only 38% ($100 - 62 = 38\%$) when compared to a person with normal hearing. Therefore, I could expect to only earn (on the average) 38% as much as a person with normal hearing according to the AAO. Let’s say that the average salary today is \$40,000.00. Instead of bringing home that amount, I could expect to only take home 38% of that, or \$15,200.00.

All too often this is the reality. There are several studies that show that deaf and hard of hearing people are consistently underemployed and underpaid.

On top of all this, there are some serious flaws in this formula. Notice that it fails to take into consideration whether we can understand what we hear. This is called discrimination. (All of us with sensorineural hearing losses have discrimination problems to one degree or other.) We may be able to hear pure tones for the audiogram, but if we cannot understand speech well (or at all) because of poor discrimination we are essentially deaf-yet we could be compensated as though we could hear and understand at the level our audiograms indicate. Also, if we suffer from tinnitus or recruitment

or hyperacusis-we may not be able to function well in society-but supposedly we can “hear” so no allowance is made for these factors either.

If you ever find yourself in the situation where your hearing disability is being figured out, make sure they take into consideration not only your hearing handicap as calculated, but also all the other factors that make up your hearing picture. In the final analysis, determining your hearing disability is an “administrative decision” although it is greatly influenced by the results of this hearing handicap calculation. What this means in practice is that the person determining your hearing disability has the discretion to consider any other factors and either increase or decrease your hearing disability percentage.

So there you have it. Whether you like it or not, and whether you think it fairly reflects your status in the workplace or not, that is how “they” calculate your “worth” to society.

Reference

Rosen, Elizabeth, Jeffrey Vrabec & Francis Quinn. January 10, 2001. Noise Induced Hearing Loss. Grand Rounds Presentation, NTMB, Dept. of Otolaryngology. <http://www.utmb.edu/otoref/Grnds/Hear-Loss-Noise-000110/Hear-Loss-Noise.pdf>.

The original of this article is on the Center’s website at <https://hearinglosshelp.com/blog/hearing-loss-and-social-security-disability-ssd/>.

Good Books on Hearing Loss

Books in the series:

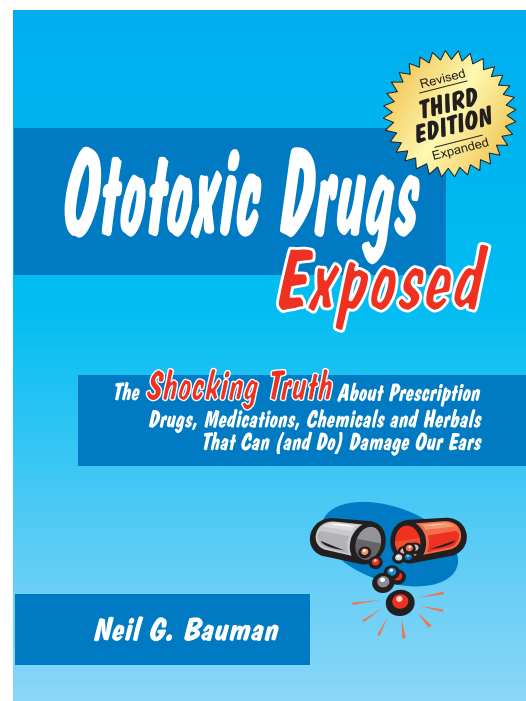
Everything You Wanted to Know About Your Hearing Loss But Were Afraid to Ask (Because You Knew You Wouldn't Hear the Answers Anyway!)

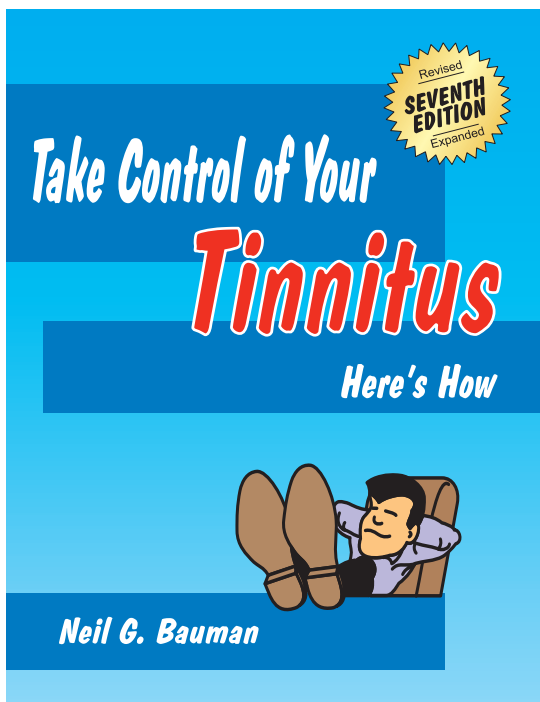
by Neil G. Bauman, Ph.D.

If you have enjoyed these articles and would like to learn more tinnitus or Musical Ear Syndrome, or about hearing loss and how you can successfully live with it, you may be interested in some helpful books by Dr. Neil. Each book is packed with the things you need to know in order to thrive in spite of your various hearing loss issues. To order any of these books, open your browser and go to <https://hearinglosshelp.com/shop/category/books/>.

Ototoxic Drugs Exposed—The Shocking Truth About Prescription Drugs, Medications, Chemicals and Herbals That Can (and Do) Damage Our Ears (\$52.45; eBook \$39.95)

This book, now in its third edition, reveals the shocking truth that many prescription drugs can damage your ears. Some drugs slowly and insidiously rob you of your hearing, cause your ears to ring or destroy your balance. Other drugs can smash your ears in one fell swoop, leaving you with profound, permanent hearing loss and bringing traumatic change into your life. Learn how to protect your ears from the ravages of ototoxic drugs and chemicals. Describes the specific ototoxic effects of 877 drugs, 35 herbals and 148 chemicals (798 pages).



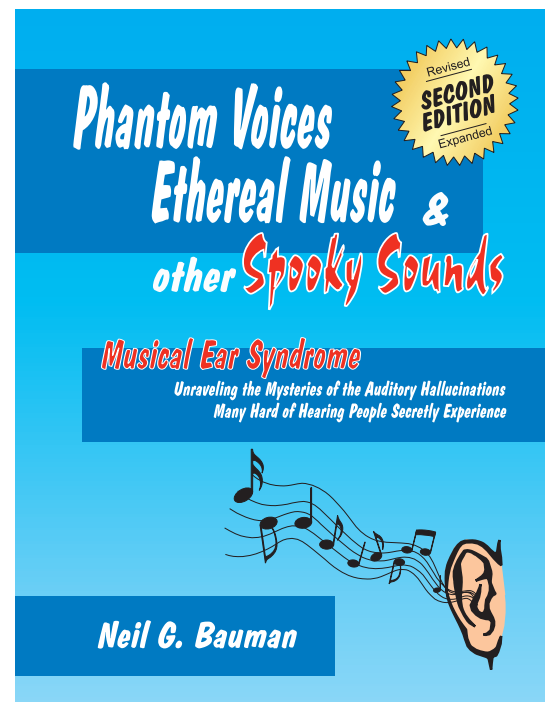


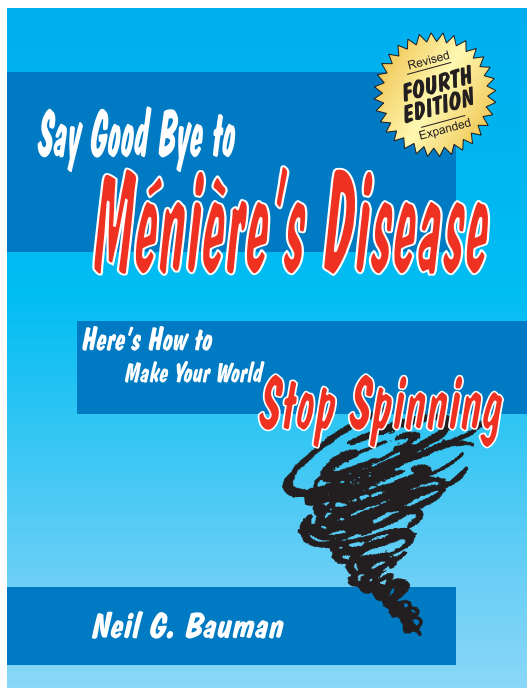
Take Control of Your Tinnitus—Here's How
(\$29.95; eBook \$22.99)

If your ears ring, buzz, chirp, hiss, click or roar, you know just how annoying tinnitus can be. The good news is that you do not have to put up with this racket for the rest of your life. You can take control of your tinnitus. Recent studies show that a lot of what we thought we knew about tinnitus is not true at all. Exciting new research reveals a number of things that you can do to eliminate or greatly reduce the severity of your tinnitus so that it no longer bothers you. This totally-revised, up-to-date and expanded 7th edition contains the very latest in tinnitus research and treatment. In this book you will learn what tinnitus is, what causes tinnitus and things you can do to take control of your tinnitus (356 pages).

Phantom Voices, Ethereal Music & Other Spooky Sounds (\$22.49; eBook \$16.99)

When you realize you are hearing phantom sounds, you immediately think that something has gone dreadfully wrong “upstairs”—that you are going crazy. Because of this, few people openly talk about the strange phantom voices, music, singing and other spooky sounds they hear. This book, the first of its kind in the world, lifts the veil on “Musical Ear syndrome” and reveals numerous first-hand accounts of the many strange phantom sounds people experience. Not only that, it explains what causes these phantom sounds, and more importantly, what you can do to eliminate them, or at least, bring them under control (178 pages).



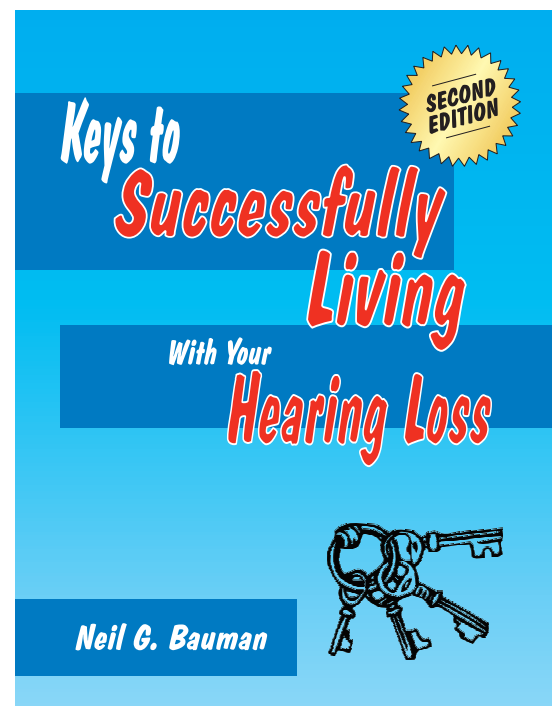


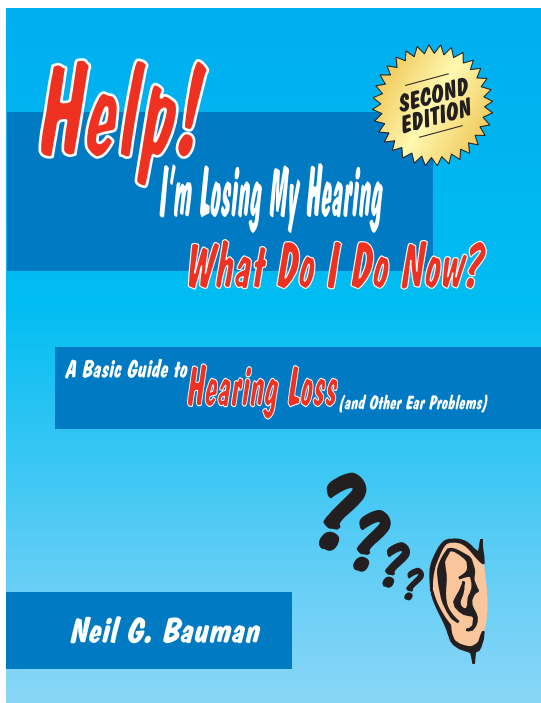
Say Good Bye to Ménière's Disease—Here's How to Make Your World Stop Spinning (\$21.95; eBook \$16.49)

Ménière's disease is one of the more baffling and incapacitating conditions a person can experience. If you suffer from your world spinning, have a fluctuating hearing loss, tinnitus and a feeling of fullness in your ears, this book is for you. It details what Ménière's disease is like; explains the recent breakthrough into the underlying cause of Ménière's; and shows you how, at last, you can be free from the ravages of this debilitating condition. Each page is packed with practical information to help you successfully conquer your Meniere's disease. Join the hundreds and hundreds of people whose worlds have now stopped spinning (128 pages).

Keys to Successfully Living with Your Hearing Loss (\$19.97; eBook \$15.49)

Do you know: a) the critical missing element to successfully living with your hearing loss? b) that the No. 1 coping strategy hard of hearing people instinctively use is wrong, wrong, wrong? c) what the single most effective hearing loss coping strategy is? d) how you can turn your hearing aids into awesome hearing devices? This book addresses the surprising answers to these and other critical questions. Applying them to your life will put you well on the road to successfully living with your hearing loss (84 pages).



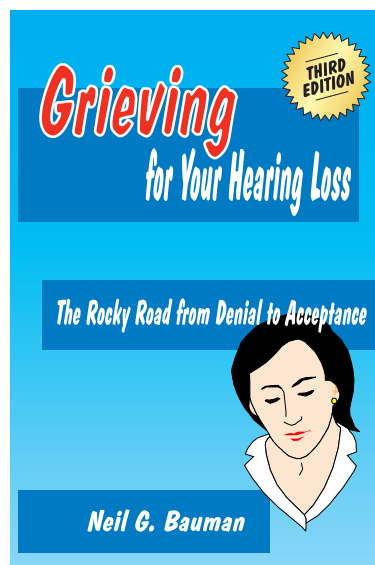


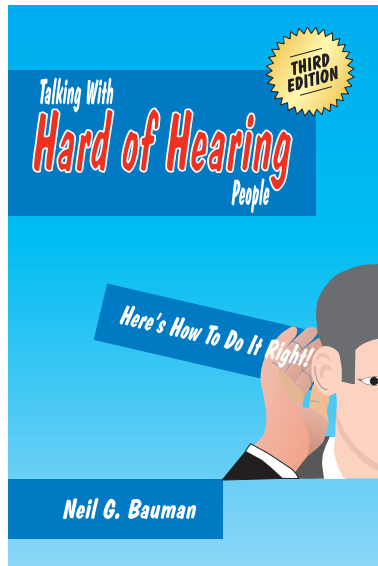
Help! I'm Losing My Hearing—What Do I Do Now? (\$18.95; eBook \$14.49)

Losing your hearing can flip your world upside down and leave your mind in a turmoil. You may be full of fears, wondering how you will be able to live the rest of your life as a hard of hearing person. You don't know where to turn. You lament, "What do I do now?" Set your mind at rest. This easy to read book, written by a fellow hard of hearing person, is packed with the information and resources you need to successfully deal with your hearing loss and other ear conditions (116 pages).

Grieving for Your Hearing Loss—The Rocky Road from Denial to Acceptance (\$12.95; eBook \$9.95)

When you lose your hearing you need to grieve. This is not optional—but critical to your continued mental and physical health. This book leads you through the process of dealing with the grief and pain you experience as a result of your hearing loss. It explains what you are going through each step of the way. It gives you hope when you are in the depths of despair and depression. It shows you how you can lead a happy vibrant life again in spite of your hearing loss. This book has helped many (56 pages).



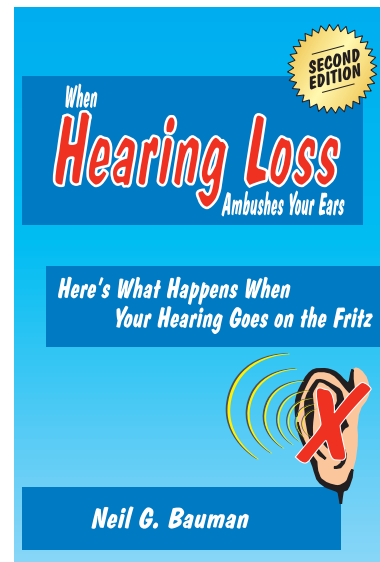


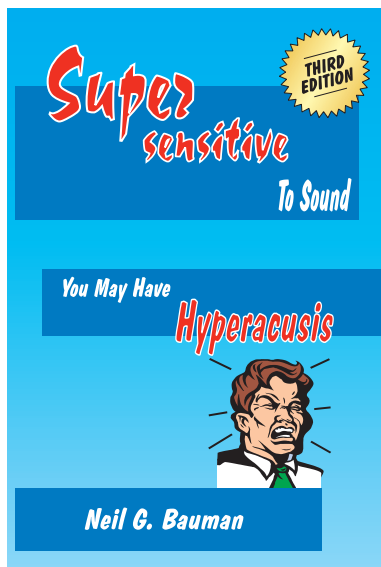
Talking with Hard of Hearing People—Here's How to Do It Right! (\$9.95; eBook \$7.95)

Talking is important to all of us. When communication breaks down, we all suffer. For hard of hearing people this happens all the time. This book is for you—whether you are hearing or hard of hearing! It explains how to communicate with hard of hearing people in one-to-one situations, in groups and meetings, in emergency situations, and in hospitals and nursing homes. When you use the principles given in this book, good things will happen and you will finally be able to have a comfortable chat with a hard of hearing person (38 pages).

When Hearing Loss Ambushes Your Ears—Here's What Happens When Your Hearing Goes on the Fritz (\$14.95; eBook \$11.95)

Hearing loss often blind-sides you. As a result, your first step should be to learn as much as you can about your hearing loss; then you will be able to cope better. This most interesting book explains how your ears work, the causes of hearing loss, what you can expect to hear with different levels of hearing loss and why you often can't understand what you hear. Lots of audiograms and charts help make things clear. You will also discover a lot of fascinating things about how loud noises damage your ears (88 pages).



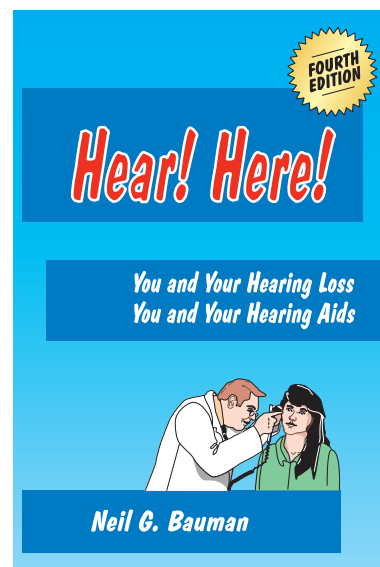


Supersensitive to Sound? You May Have Hyperacusis (\$9.95; eBook \$7.95)

If some (or all) normal sounds seem so loud they blow your socks off, this is the book you want to read! You don't have to avoid noise or lock yourself away in a soundproof room. Exciting new research on this previously baffling problem reveals what you can do to help bring your hyperacusis under control (42 pages).

Here! Here! You and Your Hearing Loss/You and Your Hearing Aids (\$12.95; eBook \$10.95)

Part I of this book contains a series of my newspaper articles on hearing loss such as, "Hear Today. Gone Tomorrow?" "Hearing Loss Is Sneaky!" "The Wages of Din Is Deaf!" "When Your Ears Ring..." "Get In My Face Before You Speak!" "How's That Again?" "Being Hard of Hearing Is Hard" "I'm Deaf, Not Daft!" Part II contains articles on hearing aids such as, "You Better Watch Out..." "Before Buying Your First Hearing Aid..." "Please Don't Lock Me Away in Your Drawer" "Good-bye World of Silence!" "Becoming Friends with Your Hearing Aids" "Two's Better Than One!" (56 pages).



You can order any of the foregoing books/eBooks (plus you can read more than 1,000 other helpful articles about hearing loss and related issues) from the

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