

Allied Health Media

AudiologyOnline

## Tinnitus Care: What Should I Know When Starting to Provide Tinnitus Care?

Presenter: William H. Martin, PhD  
Professor of Otolaryngology at the  
National University of Singapore

Moderator: Carolyn Smaka, AuD, Editor in Chief, AudiologyOnline

Allied Health Media

AudiologyOnline

- Technical Assistance: 800-753-2160
- CEU Total Access members can earn credit for this course
  - Must complete outcome measure with passing score (within 7 days for live webinar; within 30 days of registration for recorded/text/podcast formats)
- Questions? Call 800-753-2160 or use Contact link on AudiologyOnline.com

## Tinnitus Care: What Should I Know When Starting to Provide Tinnitus Care?

William Hal Martin, PhD  
National University of Singapore  
Center for Hearing, Speech & Balance

### Tinnitus

- What is it?
- What causes it?
- How does it impact patients?
- Tinnitus treatment vs. management?
- Where do I start?

## Tinnitus

from the Latin *tinnire*, meaning to ring

Ringling, hissing, humming, buzzing, roaring,  
crackling, sizzling, wooshing, howling, grinding

...

No one else hears it but you.

## What is tinnitus?

- The perception of sound, typically in the absence of an external acoustic signal.
- Objective - mechanical source
- Subjective - physiological but non-mechanical source
- Neural signals interpreted by the brain as sound

## Epidemiology

- 1999-2004 National Health and Nutrition Examination Surveys (NHANES)
  - Any tinnitus: 25.3% >80 million
    - 26.1% of men
    - 24.9% of women
  - Frequent tinnitus: 7.9% >25 million
    - 9.4% of men
    - 6.5% of women

Shargorodsky 2010

## Increased odds of frequent tinnitus:

- White, non-Hispanic
- > 40 years old
- Smoker
- Hypertensive
- Diabetic
- Overweight
- High cholesterol
- Noise exposure
- Major depressive disorder
- Generalized anxiety disorder
- Have hearing loss

Shargorodsky 2010

## Tinnitus

- In adults, exposure to sudden or prolonged sounds is the most commonly reported factor related to the onset of tinnitus  
Meikle, Creedon, Griest 2007
- Present after 90% of acoustic trauma events  
Mrena et al 2004
- Tinnitus may be an early indicator of impending NIHL  
Griest & Bishop 1998

One way to prevent tinnitus  
is to reduce lifetime sound exposure

## Tinnitus in kids

- Tinnitus in 7 year olds  
12% experience tinnitus  
2.5% say onset after loud sound  
Holgers, K-M, 2003
- Tinnitus in 5-12 year olds  
37.5% experience tinnitus “sensation”  
19.6% experience tinnitus “suffering”  
Noise exposure significant risk factor  
Coelho et al, 2007

## Tinnitus in kids

9 - 11 year old students were asked:

“Do you ever experience ringing or other noises in your ear(s) or head?”

never	24%	
rarely	28%	
sometimes	30%	} 47%
often	11%	
always	6%	

n = 1949

Martin et al. 2011

What causes tinnitus?

## Mechanisms of Tinnitus

- **INDUCTION** of tinnitus usually involves peripheral pathologies that result in imbalances of activity in the CNS. Abnormal spontaneous neural activity produces tinnitus perception.
- **MAINTENANCE** of tinnitus involves central auditory structures that are not necessarily impaired.

## Peripheral triggers

- Cochlear damage
- Head & neck injury
- TMJ
- Other?

## Central triggers

- Metabolic
- Neurologic disease
- Stress
- Brain injury
- Other?

## Long term effects

- Deafferentation
- Cytotoxicity
- Excitatory/inhibitor imbalance
- Cortical reorganization
- Thalamocortical dysrhythmias
- Other?



In what ways does tinnitus  
impact a patient's life?

Difficult to concentrate	85 %
Difficult to relax	85 %
Irritable or nervous	83 %
Uncomfortable in quiet	83 %
Tired or stressed	81 %
Interfere with social activities	74 %
Hard to interact pleasantly	73 %
Problems with sleep	73 %
Cause you to feel depressed	70 %
Interfere with work activities	66 %

OHSU Tinnitus Clinic - Martin et al., 2002

Why does tinnitus become a problem?

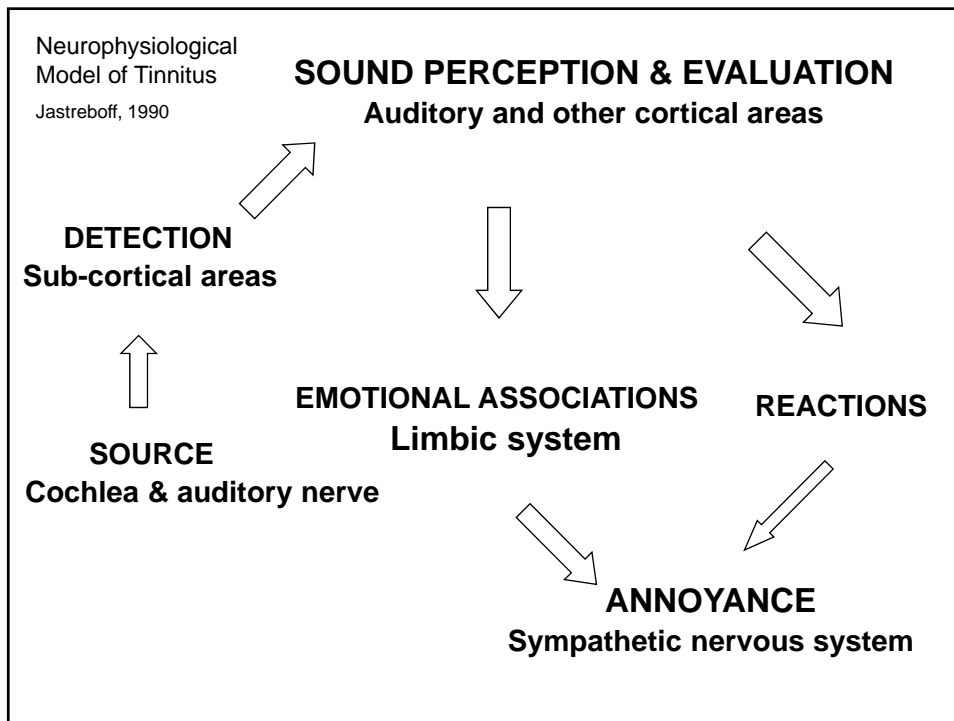
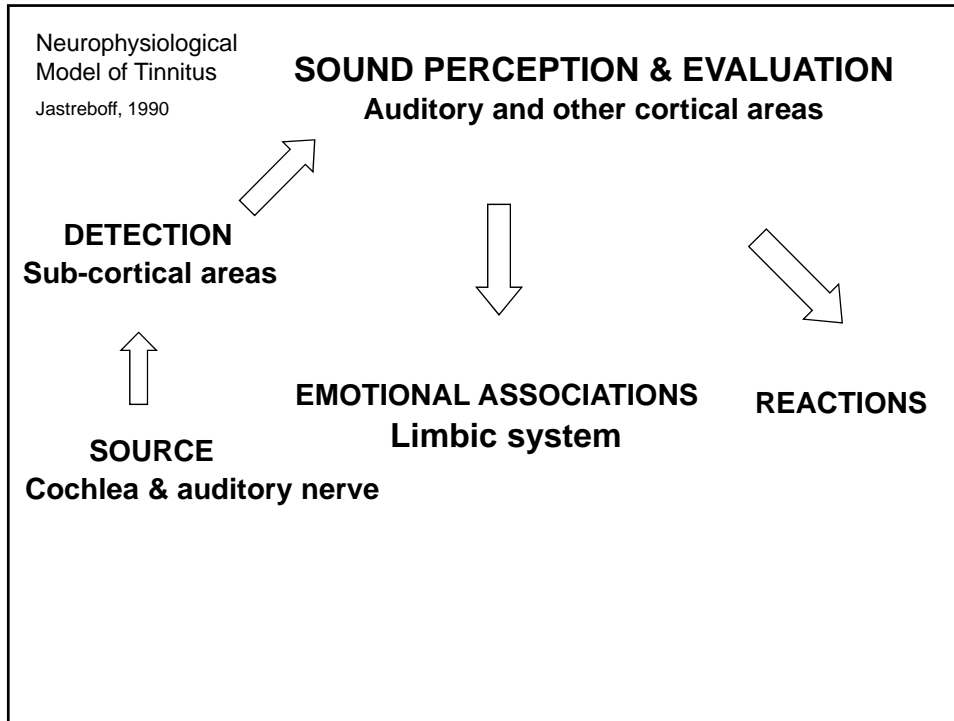
Neurophysiological  
Model of Tinnitus  
Jastreboff, 1990

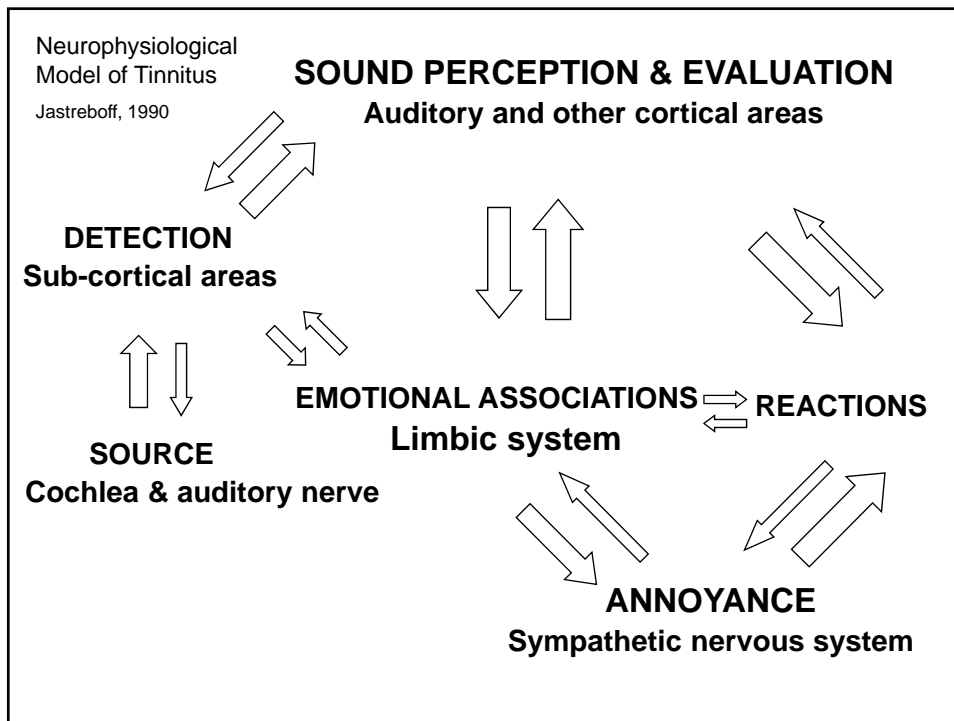
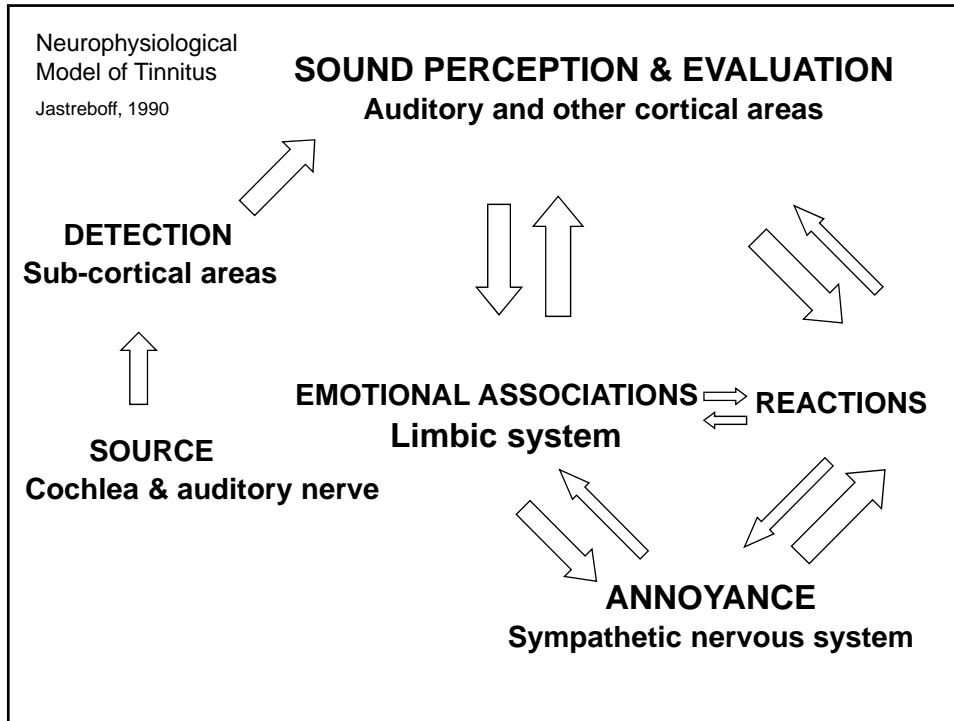
**SOUND PERCEPTION & EVALUATION**  
Auditory and other cortical areas

**DETECTION**  
Sub-cortical areas

**SOURCE**  
Cochlea & auditory nerve







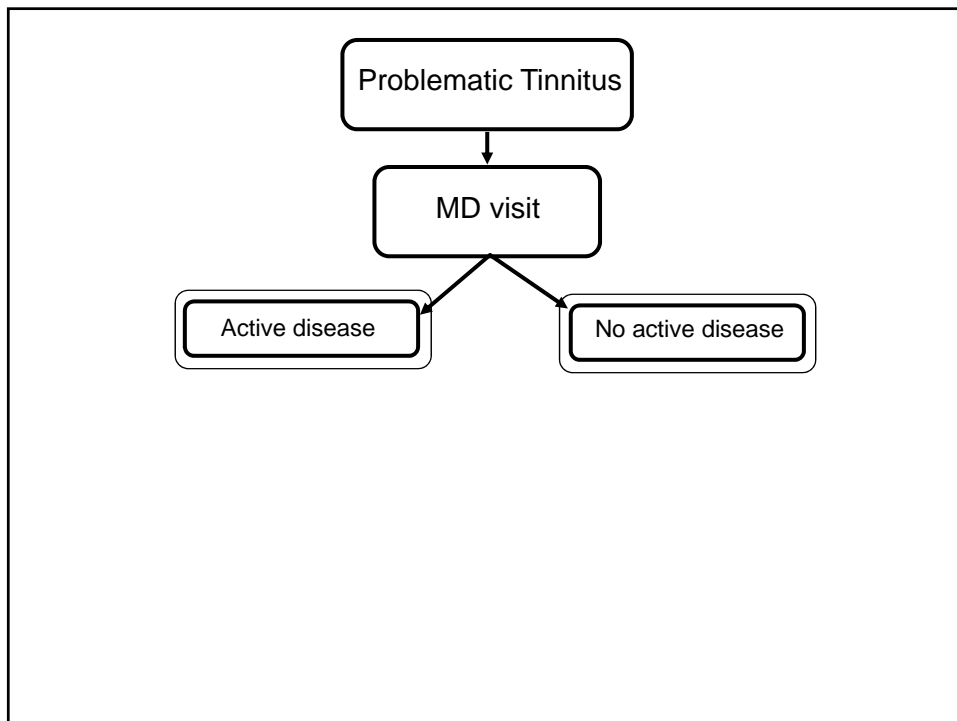
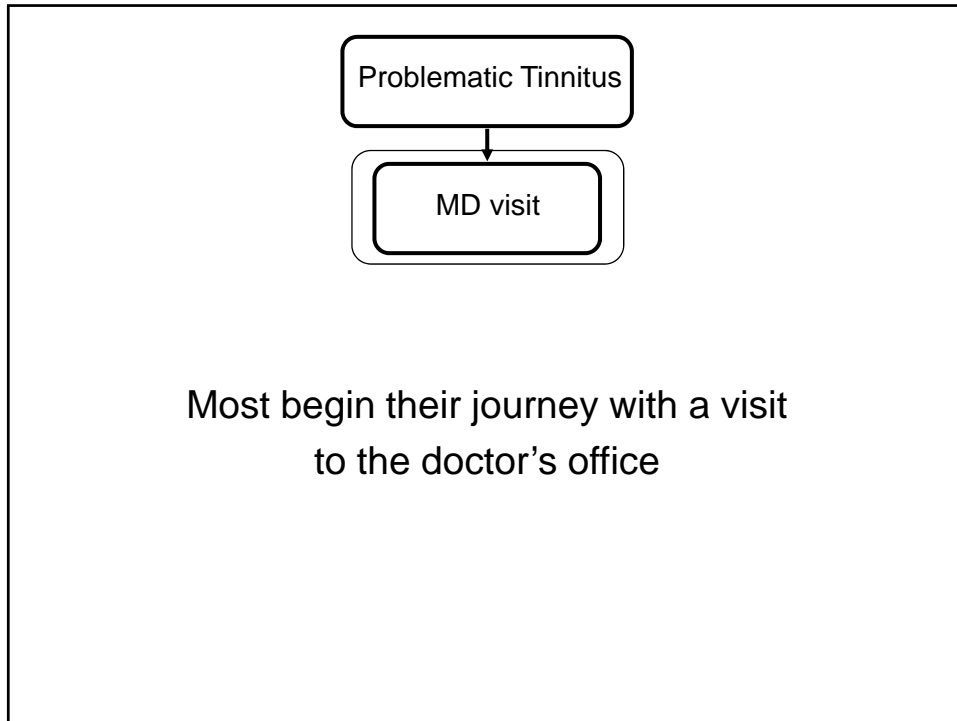
## Problematic Tinnitus

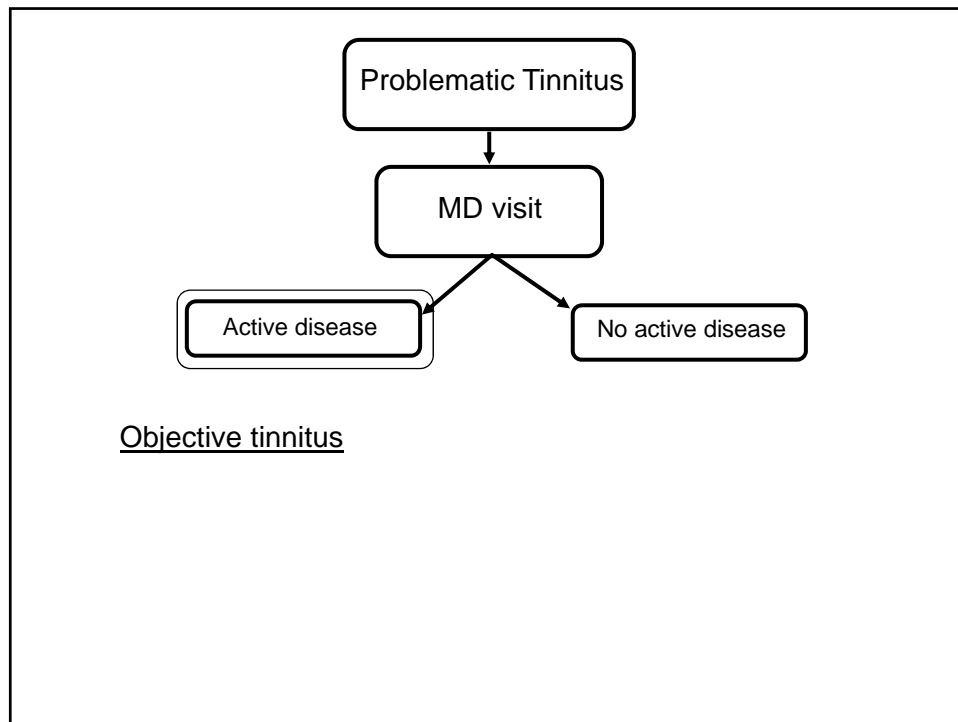
- Novelty
  - Fear
  - Selective attention
  - Reinforcement
  - Negative counseling
- “There’s nothing that can be done about it”
- “You may have a brain tumor”

## Goal of Treatment Program

- To medically or surgically resolve active disease processes causing tinnitus
- To eliminate the presence of tinnitus

Whenever possible, active disease processes should be identified and treated prior to tinnitus management





- 
- Active disease
- Objective tinnitus
- Vascular abnormalities
- Congenital arteriovenous fistula
  - Acquired arteriovenous shunt
  - Glomus juglare
  - High-riding carotid artery
  - Carotid stenosis
  - Persistent stapedial artery
  - Dehiscent juglar bulb
  - Vascular loop (e.g. AICA or PICA)
- The diagram shows a rounded rectangle labeled 'Active disease' at the top center. Below it, the text 'Objective tinnitus' is written. Underneath that is the heading 'Vascular abnormalities' followed by a bulleted list of nine items, each preceded by a right-pointing arrowhead (➤).

Active disease

Objective tinnitus

Mechanical disorders

- Patent Eustachian tube
- Palatal myoclonus
- Temporomandibular joint disorder
- Stapedial muscle spasticity

Problematic Tinnitus

MD visit

Active disease

No active disease

Subjective tinnitus



Active disease

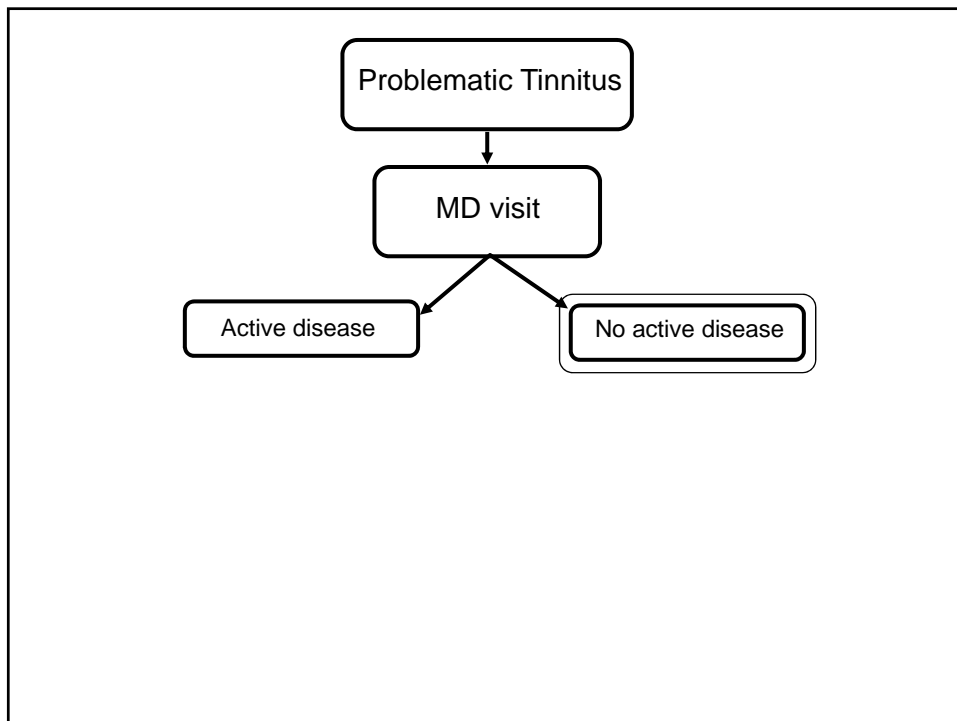
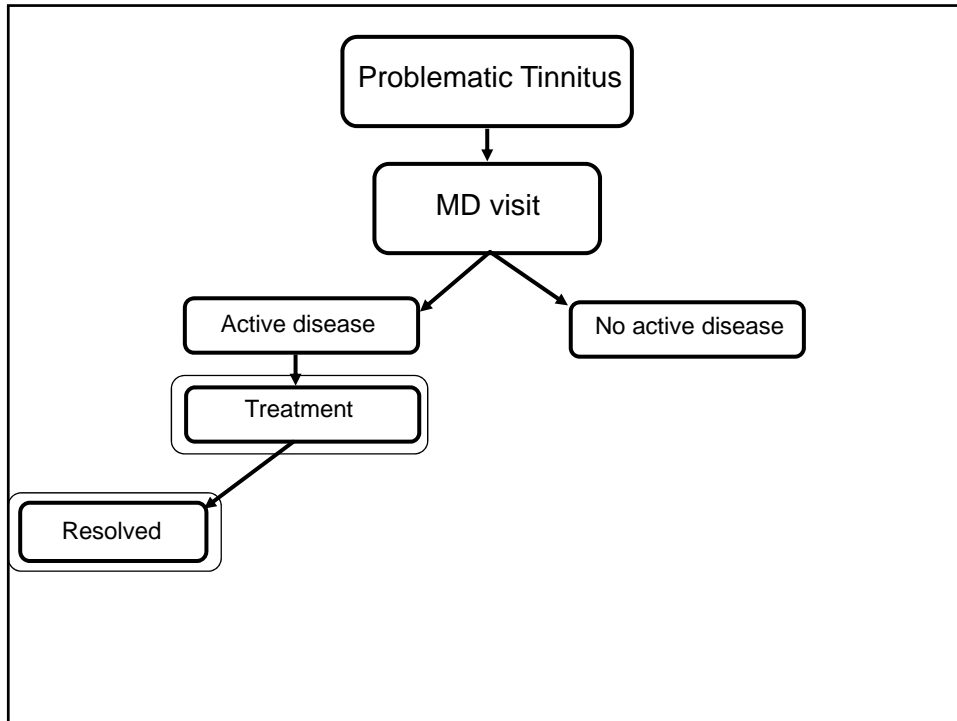
Subjective tinnitus

- Otosclerosis
- Infections – bacterial, viral, fungal
- Autoimmune hearing loss
- Endolymphatic hydrops / Meniere's
- Neoplasms
- Otitis media
- Benign intracranial hypertension

Active disease

Subjective tinnitus

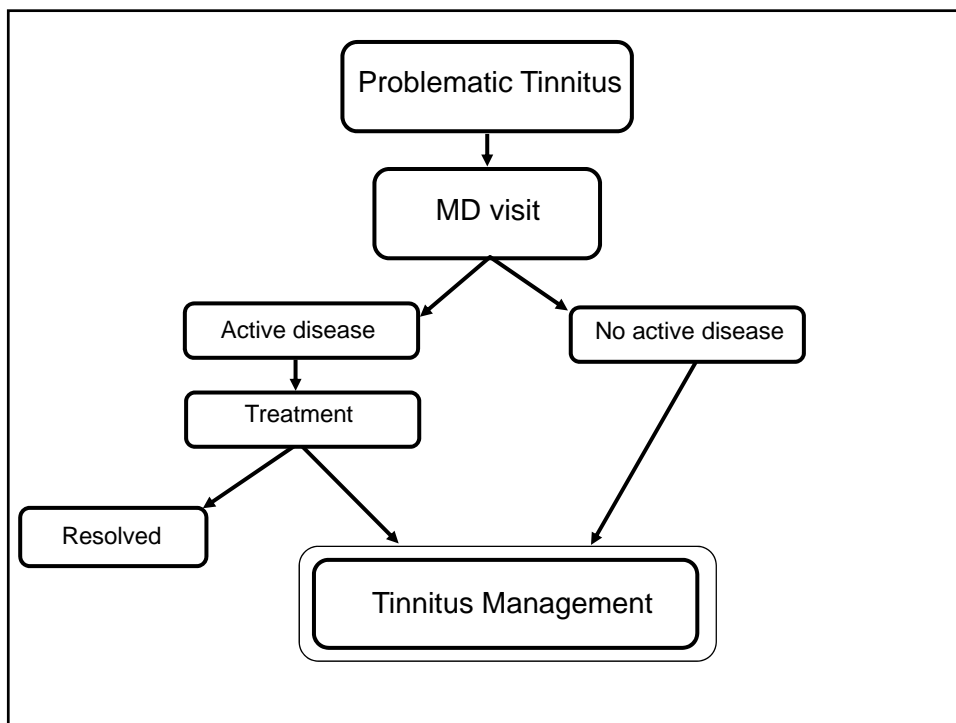
- Genetic predisposition
- Ototoxicity
- Vascular – hypertension, CVA, cerebral aneurysm, arteriosclerosis
- Metabolic – anemia, hypothyroidism, diabetes mellitus
- Head or neck injury



No active disease

Subjective tinnitus

- Presbycusis
- Noise induced hearing loss - chronic
- Noise induced hearing loss – acute
- Genetic predisposition
- Ototoxicity
- Otosclerosis
- Post-operative hearing loss
- Endolymphatic hydrops / Meniere's
- Idiopathic tinnitus



THE JOURNAL OF  
**FAMILY  
PRACTICE**

Tinnitus: Questions to reveal the cause, answers to  
provide relief

RL Folmer, WH Martin, YB Shi

*Journal of Family Practice 53(7): 532-540, 2004*

“As with chronic pain, the treatment of  
chronic tinnitus is more accurately described  
in terms of management rather than cure.”

Duckro et al. *Biofeedback and Self-Regulation*

1984;9(4):459-469

## Goal of Management Program

- Reduce **perception** of and **reaction** to tinnitus until it is no longer a controlling factor in the person's life
- Provide long-term relief and control

Where do I start?

## Exploring new realms

- Captain
- Ship
- Map
- Sextant
- Supplies
- Crew
- Funding

Exploring new realms: The Captain  
The Tinnitus Specialist

## Tinnitus Specialist

The role of the tinnitus specialist often exceeds the realm of traditional audiology in order to produce effective tinnitus management

## Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed

### Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed

### Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed



### Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed

### Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed

### Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed

### Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed

## Tinnitus Specialist

- **Identify** - all factors that impact tinnitus severity
- **Educate** – the patient regarding the impact on tinnitus
- **Persuade** – the patient to pursue parallel interventions
- **Facilitate** – assist patient in identifying needed care
- **Coordinate** – serve as intermediary between clinicians
- **Follow** – monitor progress, assist with obstacles
- **Modify** – management plan as needed

## The Ship – Setting up your tinnitus clinic

## Exploring new realms: The Ship

### Facility:

Test booth

Room for counseling and education

Medical exam room (later)

### Equipment:

Audiometric test equipment

Hearing aid fitting and testing equipment

Specialized tinnitus matching system (later)

## The Map – Choosing a course of tinnitus management

## Exploring new realms: The Map

Progressive Tinnitus Management  
Clinical Handbook for Audiologists

James A. Henry

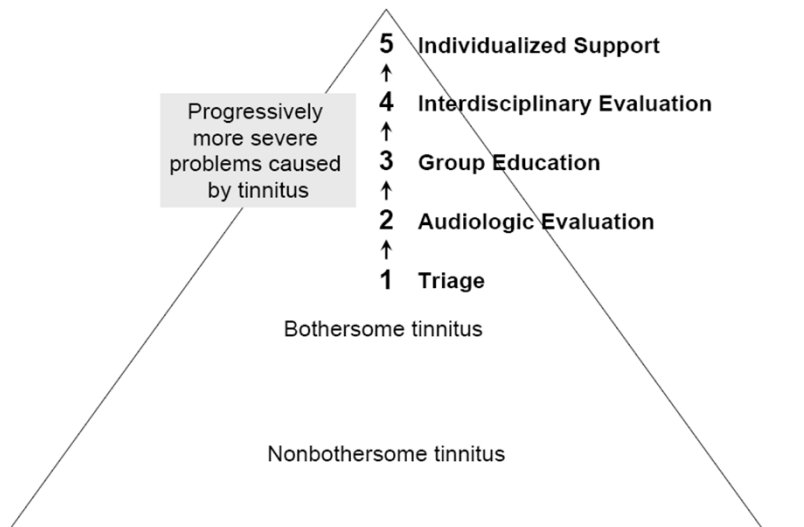
Tara L. Zaugg

Paula J. Myers

Caroline J. Kendall

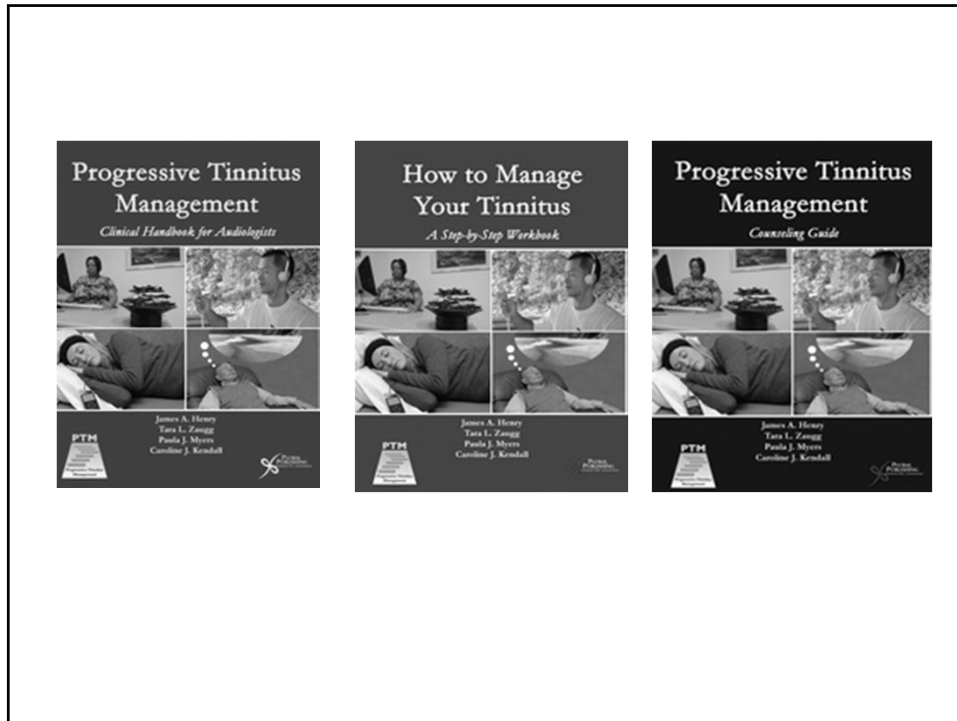


VA National Center for Rehabilitative Auditory Research



Five hierarchical levels of tinnitus management

Google: Progressive Tinnitus Management



The Sextant –  
How do I know the patient is on course?

## Exploring new realms: The Sextant

### Questionnaires

### The Questionnaires

- Tinnitus, hearing and medical histories
- Modified Beck Depression Inventory
- Anxiety index
- Tinnitus severity index

Depression inventory

Beck, A T. Beck, R W.

Screening depressed patients in family practice. A rapid technique

Postgraduate Medicine. 52(6):81-5, 1972 Dec..

Anxiety inventory

**State-Trait Anxiety Inventory for Adults**

**Self-Evaluation Questionnaire**

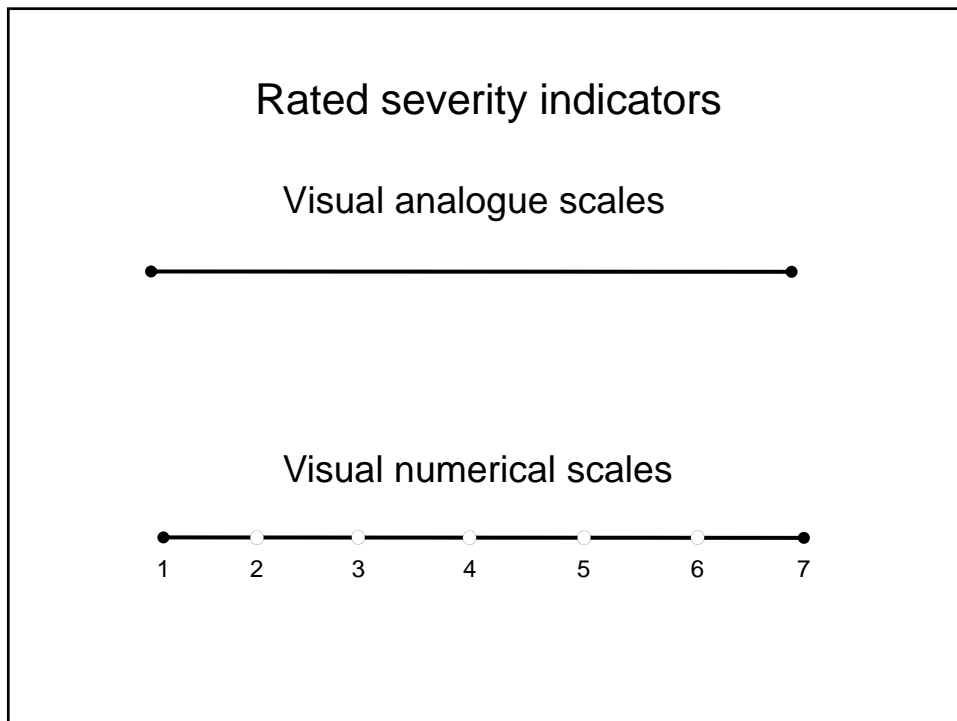
STAI Form Y-1 and Form Y-2

**Developed by Charles D. Spielberger**

in collaboration with R.L. Gorsuch, R. Lushene, P.R. Vagg, and G.A. Jacobs



Name:	Google:
Tinnitus Functional Index	TFI OHSU
Tinnitus Handicap Index	THI tinnitus
Tinnitus Handicap Questionnaire	THQ Iowa
Tinnitus Reaction Questionnaire	TRQ tinnitus



Exploring new realms: Supplies  
Gathering tinnitus management tools

Acoustical therapy: Devices

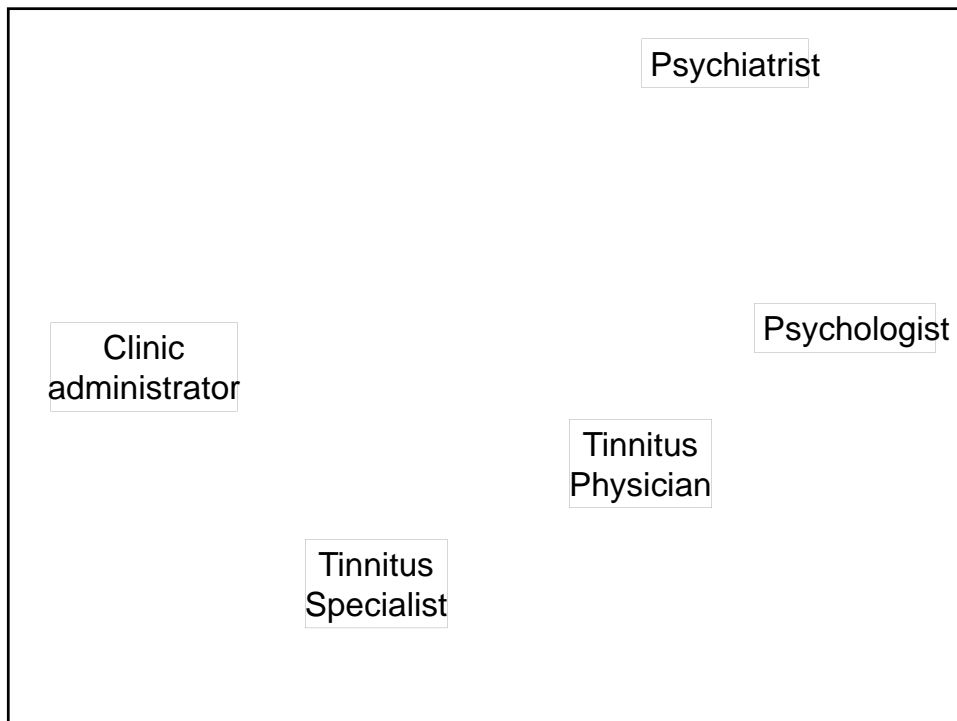
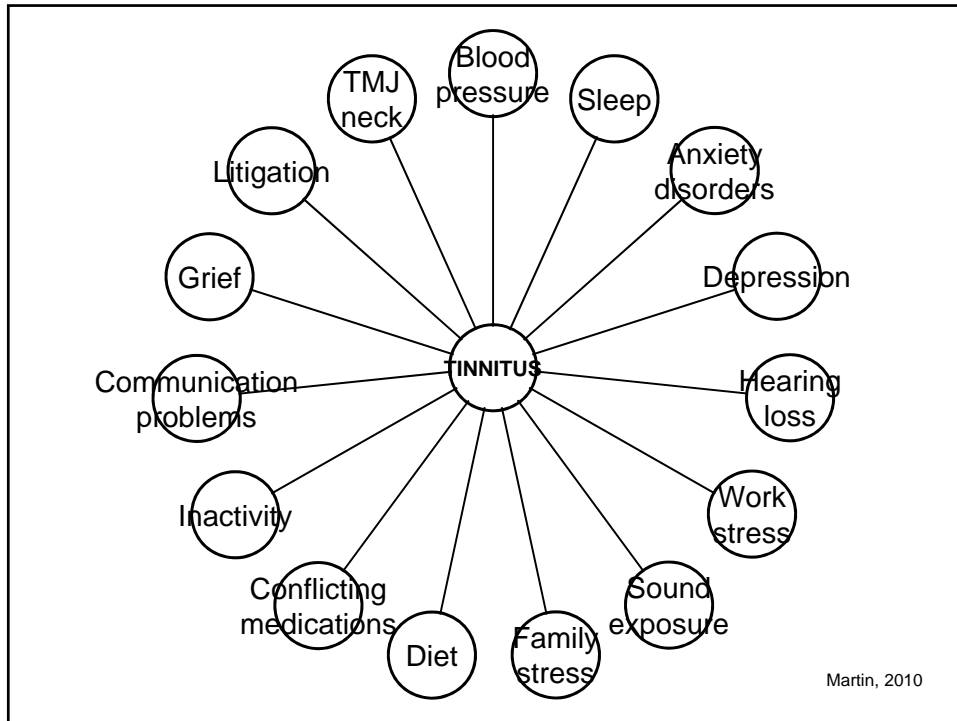
- Amplification (hearing aids)
- Ear-level sound generators
- Combination units
- Bluetooth streamers
- Table-top sound generators
- Sound pillows

Acoustical therapy: Phone apps



Best Relaxation & Meditation Apps

Exploring new realms: The Crew  
Assembling your tinnitus team



Exploring new realms: Funding  
How do you get paid for your work?

Exploring new realms: Funding

- Insurance coverage?
- Devices?
- Fee for service?
  - By procedure
  - Bundled services
  - Hourly

Help! Rescue us!