



July 16, 2024

**Mastering the Basics  
of Speech Masking:  
Fundamentals and  
Applications**

# 1. *Speech Testing With Masking, Fundamentals:*



How would you define Masking??

Again, How would you define Masking??

Masking is when you play a sound to the non-test ear to prevent it from influencing the patient's response to a stimulus in the test ear.





# What Test Require Masking??



There are 3 diagnostic test  
that require Masking...

## What are they???

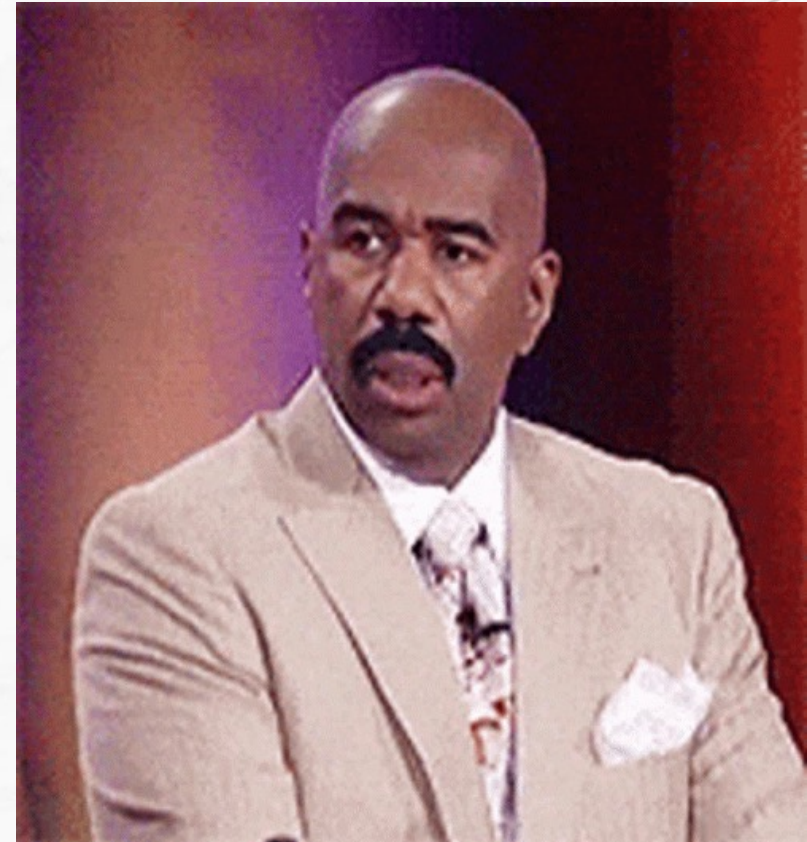
1. Air Conduction Testing



2. Bone Conduction Testing



3. Speech Testing



# What is Masking All About??



## What Equipment is Required for Masking??

### Two types of Transducers

Supra-Aural /Headphones



Insert Headphones





# Which two Speech Test Require Masking?



1. Speech Recognition Test (SRT)

4. Word Recognition Test (WR)

WHY?

These Two Test  
are Cognitive test

Side Note: Which Speech Test Do Not Require Masking? Why??

2. Most Comfortable Level (MCL)

3. Loudness Discomfort Level (LDL)

They are sensation level test and not cognitive test

## What are the Ground Rules for Speech Testing?



Speech Recognition Test (SRT) is the first test in the battery of speech testing. (it all begins with this test).

With SRT (Speech Recognition Test) testing, we want to establish the softest level that the person can Recognize 2 syllable words 50% of the time. **Spondee Words**

Note: Monitored live voice and recorded speech can both be used in ALL of the Speech Testing. However, RECORDED presentation is recommended because recorded materials standardizes the test procedure. With live voice presentation, the monitoring of each syllable of each word, so that it peaks at 0 on the VU meter can be very difficult. Thus, the consistency of the presentation is then lost. Using recorded materials is primarily recommended. Also, using MALE or FEMALE voice can alter the results.

# Speech Testing With Masking



## 3 Ground Rules for Speech Masking:

### 1. Understanding Cross-Hearing?

During Speech Testing, sound can travel from one ear to the other through bone conduction. If the test signal presented to one ear is loud enough, it can be heard by the non-test ear. This phenomenon is called cross-hearing.

### 2. Understanding Inter-Aural Attenuation?

This refers to the reduction of sound energy as it travels from the test ear to the non-test ear. The level of interaural attenuation varies depending on the type of headphones or earphones used (supra-aural headphones, or insert earphones, etc.).

### 3. Understanding How Much Masking is Needed?

The amount of masking needed is guided by the concepts of interaural attenuation, the hearing threshold of the non-test ear, and the patient's individual hearing profile.

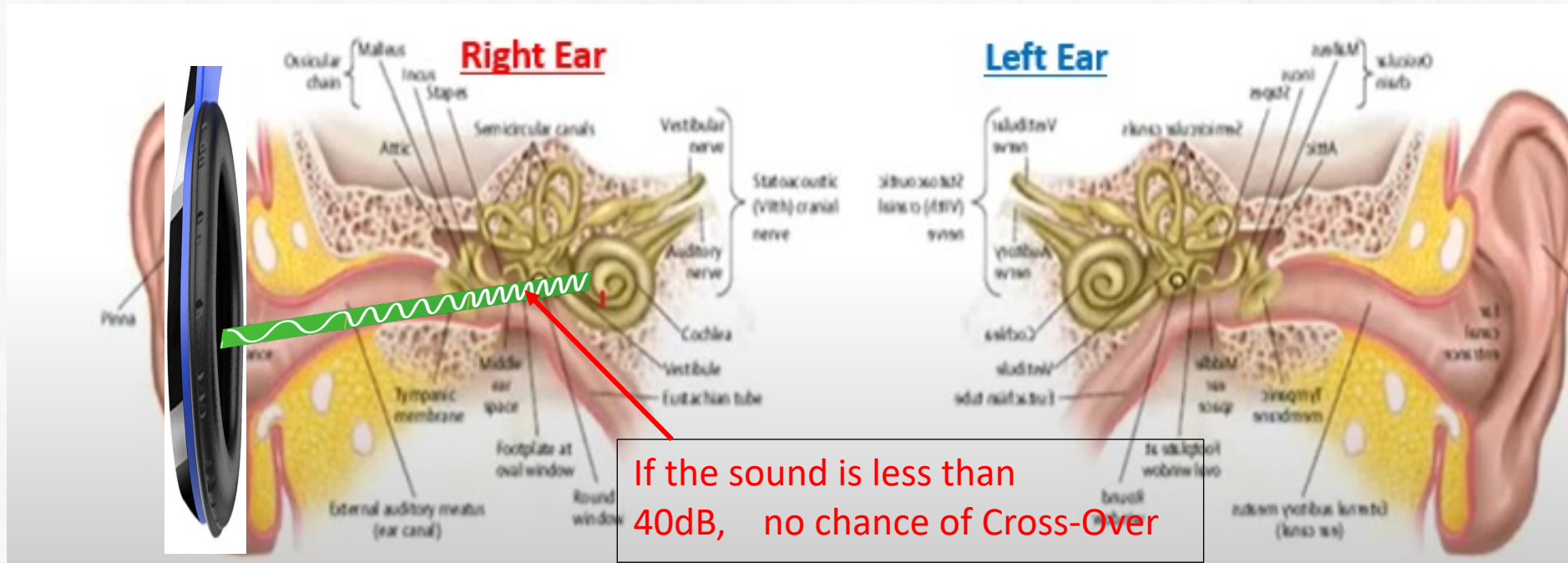


# 1<sup>st</sup> Ground Rule:



## What is Cross-Hearing?

Hearing a sound in one ear, when it was trying to be played to the other ear is called **cross-hearing** or **crossover**. Crossover is difficult for hearing testing. However, we can make sure that crossover hearing doesn't interfere with our testing procedure by covering up (or masking) any sound that crosses over.

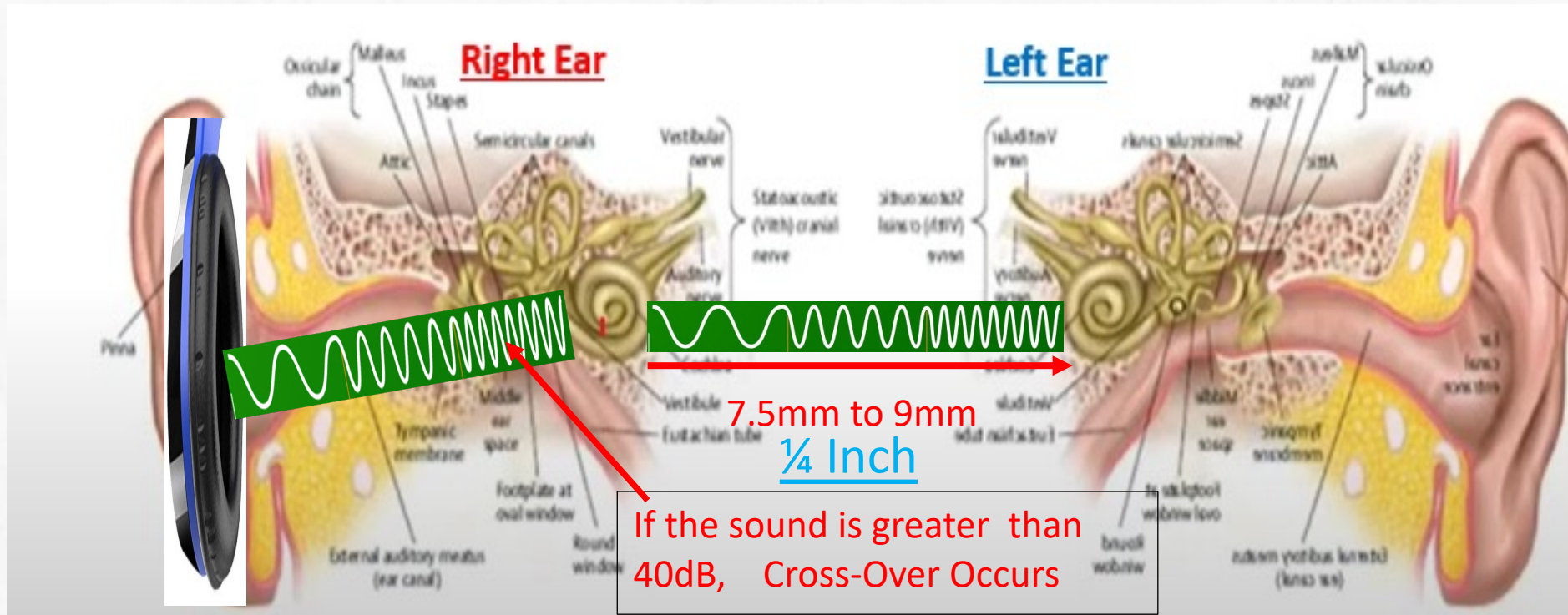




# Cross-Hearing With Supra Aural Headphones



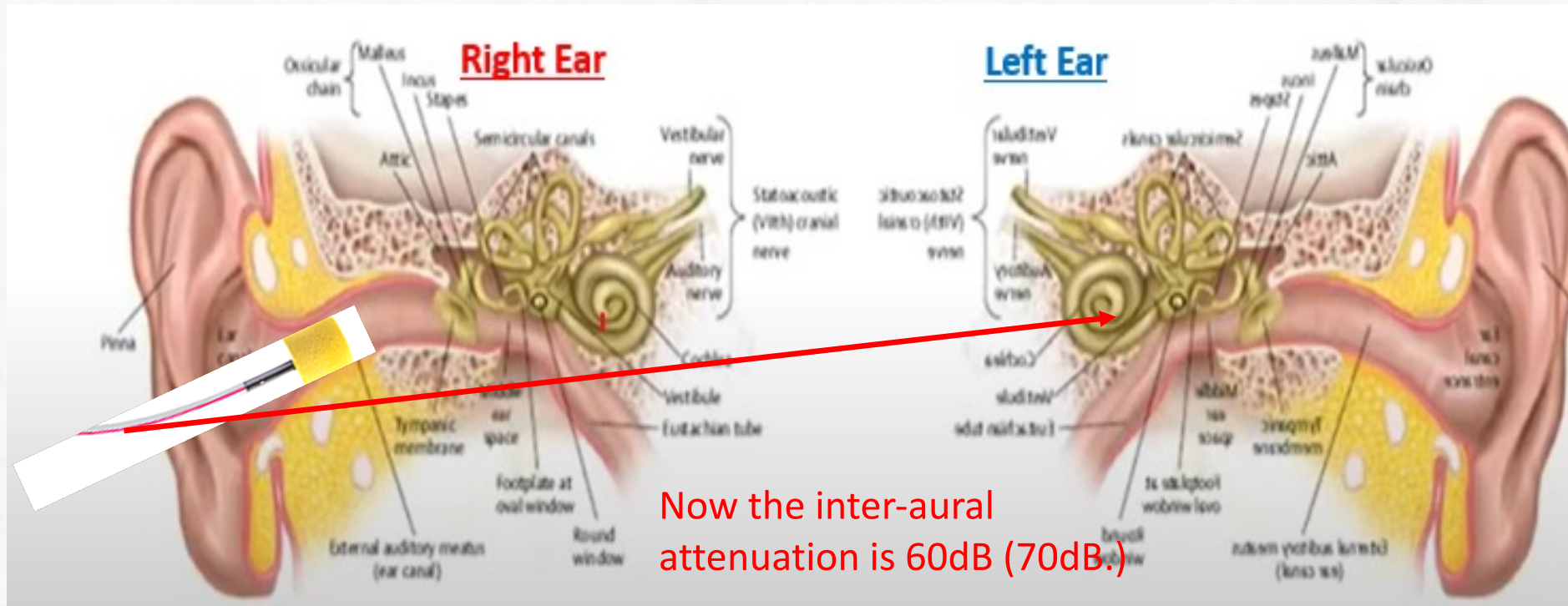
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# Cross-Hearing With Insert Headphones



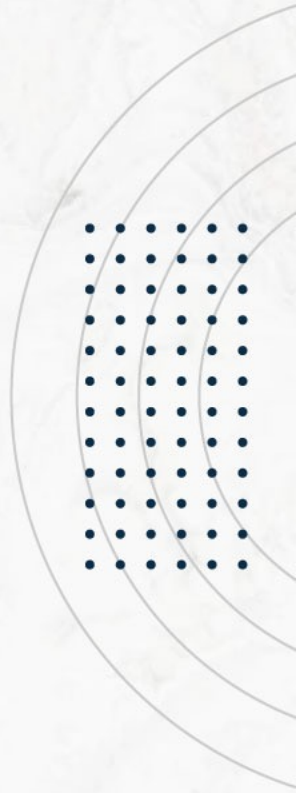
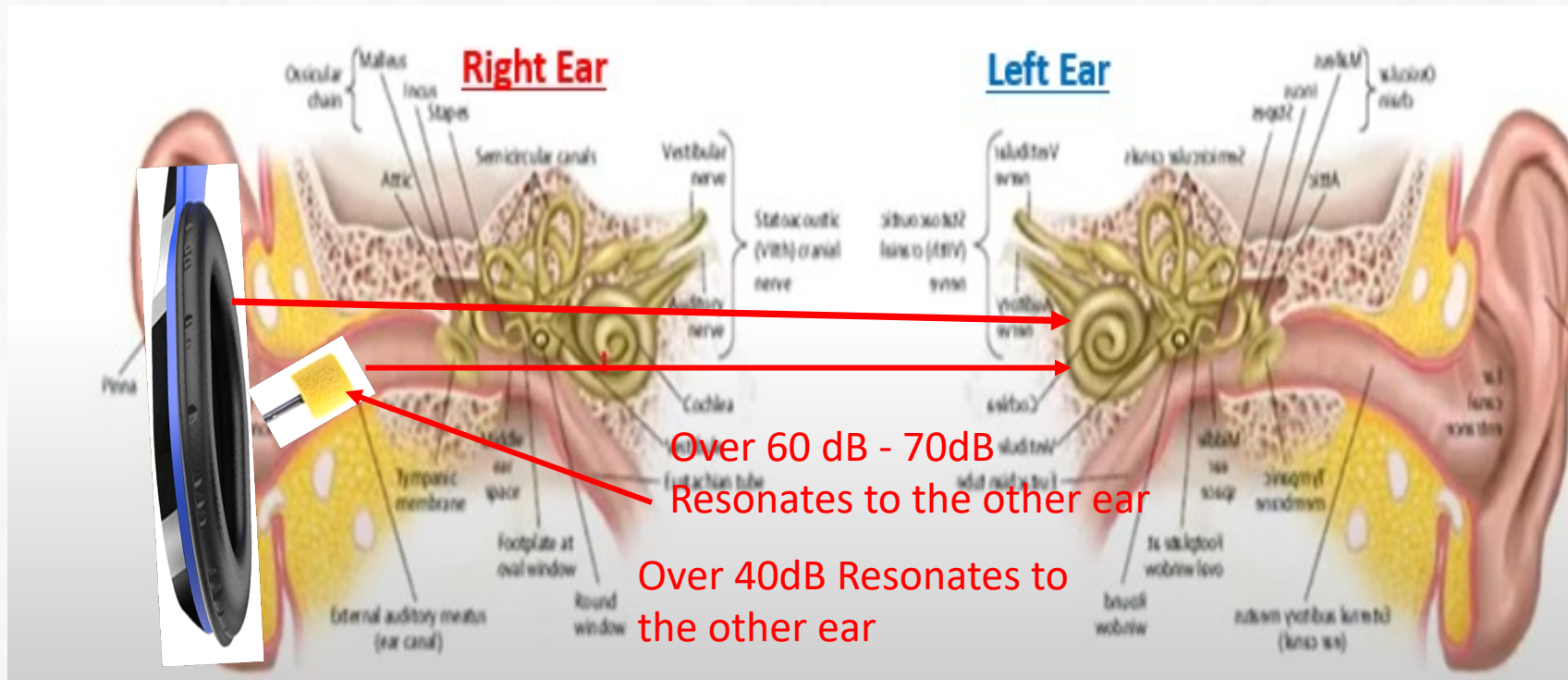
Unlike standard Headphones where the vibration comes from the headset itself, with **inserts**, the sound source now comes from a component that is NOT attached to the head. Hence, no chance of vibration, so the inter-aural attenuation level changes.



Now the inter-aural  
attenuation is 60dB (70dB.)



# Let's Review Cross-Hearing? Supra Aural Headphones VS. Insert Headphones



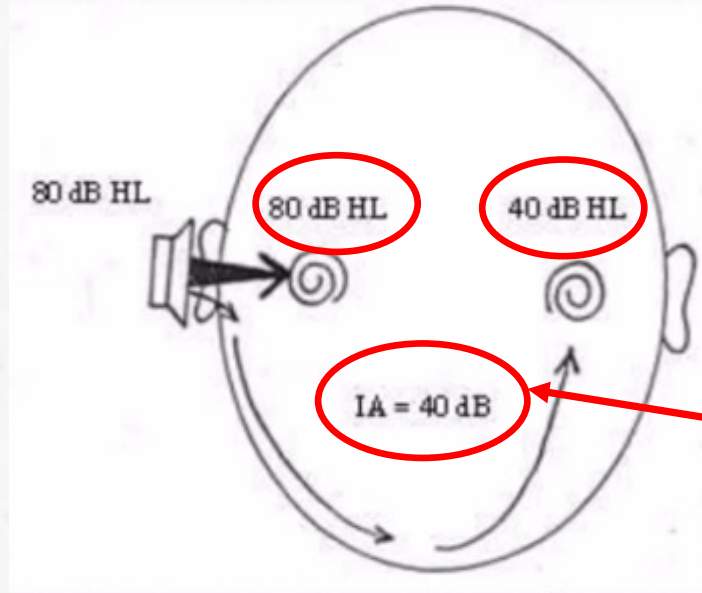
## 2<sup>nd</sup> Ground Rule:



### 2. Interaural Attenuation With Headphones

IA is the amount of acoustic energy (sound waves) that is lost as it travels transcranially to the contralateral ear (opposite ear).

That means that the tone presented can be perceived by the cochlea of the non-test ear and give rise to a false response.



What is the minimum interaural attenuation for headphones?

What if the generated sound is 60 dB...

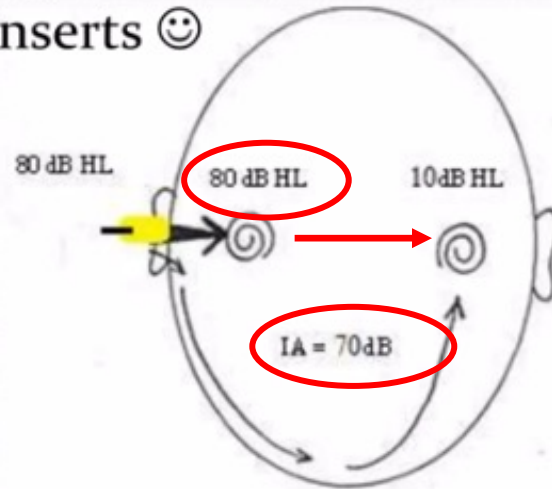
What is the amount of sound that is heard in the opposite ear. 20dB

What is the common dominator?



# Interaural Attenuation With Inserts

- The minimum IA of inserts is 60-70 dB
- If we present 80 dB to the test ear, 10 dB of that sound is reaching the cochlea of the non-test ear
  - You are less likely to mask for air-conduction testing when you use inserts 😊



What is the common Denominator for using inserts headphones?

# 3. How Much Masking is Needed?



Determining the appropriate amount of masking for speech testing involves specific calculations to ensure effective and accurate masking without overmasking. The amount of masking needed is guided by the concepts of interaural attenuation, the hearing threshold of the non-test ear, and the patient's individual hearing profile. Here is a step-by-step approach to calculating the required masking level:

## Steps to Calculate Masking Level:

### 1. Determine Interaural Attenuation (IA):

- **Supra-aural headphones:** Typically, IA is assumed to be 40 dB.
- **Insert earphones:** Typically, IA is assumed to be 60 (70) dB.
- These values can vary slightly based on the specific equipment and individual patient characteristics.

### 2. Calculate the Initial Masking Level:

- Formula: Initial Masking Level (IML) = SRT of the non-test ear (SRT\_NTE) + 10dB.
- This 10 dB safety factor ensures that the masking noise is sufficiently above the threshold of the non-test ear to prevent it from detecting the test stimulus.



## The first of the 4 Speech test is Speech Recognition Test

### How is Speech Recognition Test Performed?

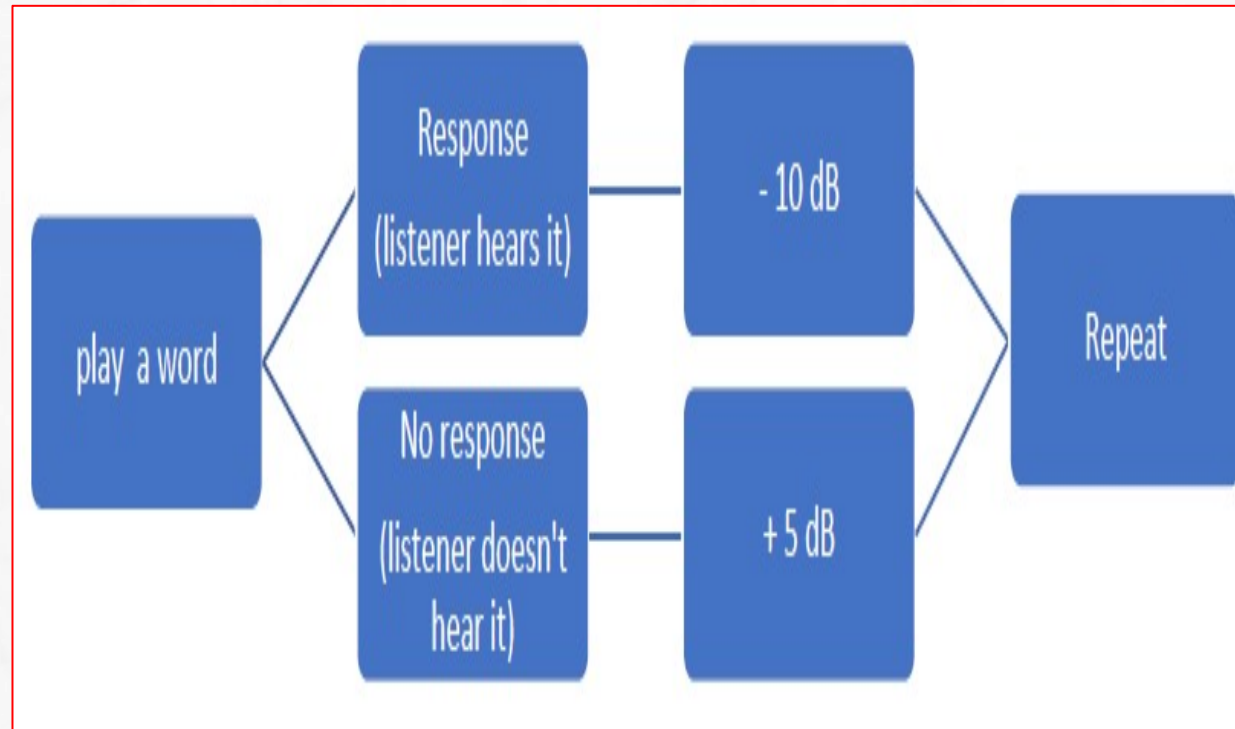
Starting @ the PTA level plus 20db...

- Play the first, second, third word. If they get them correct, lower the volume by 10dB.
- If they get the next three words correct, again, lower the volume by 10db.
- If they get the next three words correct, lower the volume by 10dB.
- If they get the next word incorrect, raise the volume by 5dB.
- Continue this procedure until they can get 50% of the words correct at the softest volume using a bracket of 6 words.

We will be using the ascending / descending method for this test.

*Note: Generally, the SRT and the PTA are well-aligned, within 10dB of each other.*

## How to perform SRT / Recap



Just like with A/C & B/C you have to establish the Unmasked score first.



# When to Mask for Speech Testing?



Anytime you think the non-test ear could be influencing the results measured in your test ear, you should mask. Speech contains many frequencies, so determining when to mask is a bit more involved than just looking at air conduction thresholds for one frequency.

Masking for any speech test is required whenever the presentation level of the speech (whether that's the unmasked SRT or the WRS presentation level) could be audible by the non-test ear. Remember that speech can crossover to the non-test ear just like tones, and that cross-hearing occurs by bone conduction. To determine when to mask, we can use the following formulas:

1. When the difference between the Unmasked SRT of the test ear minus IA > Best Bone threshold of the non-test ear is 40dB or Greater.
2. Additionally, masking is required when the SRT of the test ear is 40dB or greater of the SRT of the non-test ear.

# Procedure for Speech Masking?



## How to set the masking level for SRT testing:

Set the masking level at the SRT threshold of the non-test ear plus 10dB.

Make sure the person can hear the masking sound in the non-test ear. Use Speech weighted noise.

## How to Perform SRT Testing with Masking:

Present Spondee Words in TE (test ear) at the previously established unmasked threshold. If the person responds correctly, raise the masking by 5db. Present the next word. If the person does not respond correctly, raise the presentation by 5dB. Repeat this procedure until you get three responses in a row while raising the masking each time, without changing the presentation level. Record the Masking Levels in the appropriate location. This procedure is called the plateau method.



# How to perform MCL and LDL Speech Testing.



What Stimulus should be used for MCL and LDL Speech Testing?

Rainbow Passage... Male or Female Voice

What is your starting presentation Level for

MCL Speech Testing? **SRT + 20dB**

LDL Speech Testing?? **MCL + 20dB**

Note: Monitored live voice and recorded speech can both be used in ALL of the Speech Testing. However, RECORDED presentation is recommended because recorded materials standardize the test procedure. With live voice presentation, the monitoring of each syllable of each word, so that it peaks at 0 on the VU meter can be very difficult. Thus, the consistency of the presentation is then lost. Using recorded materials is primarily recommended. Also, using MALE or FEMALE voice can alter the results.

# Procedure for Word Recognition Test?



## How to set the level for Word Recognition Testing:

The unmasked level is derived from the Most Comfortable Level Test (MCL)

Using this formula:

@ (2000Hz)- Threshold <50dB + 25dB

@ (2000Hz) – Threshold 50-55dB +20dB

@ (2000Hz) – 60-65dB + 15dB

@ (2000Hz) – 70-75dB +10dB

## How to Perform Word Recognition Test:

Using Phonetically Balanced Words (PB), present these words at the appropriate level. Present 50 words for a more accurate score.

**Remember that the Unmasked Word Recognition threshold has to be established before the masked threshold can be established.**



# Procedure for Word Recognition Test With Masking?



For Word Recognition, Masking is required whenever the presentation level in the test ear minus IA exceeds the best bone conduction threshold by 35dB or more.

**Set the presentation level at the Unmasked WR Test Score.  
Level of masking will be that score minus (-) 20dB.**

**Present the words again, but do not adjust the masking nor the presentation level.**

**Present the next 50 Phonetically Balanced Words (PB)**

**Record score appropriately**

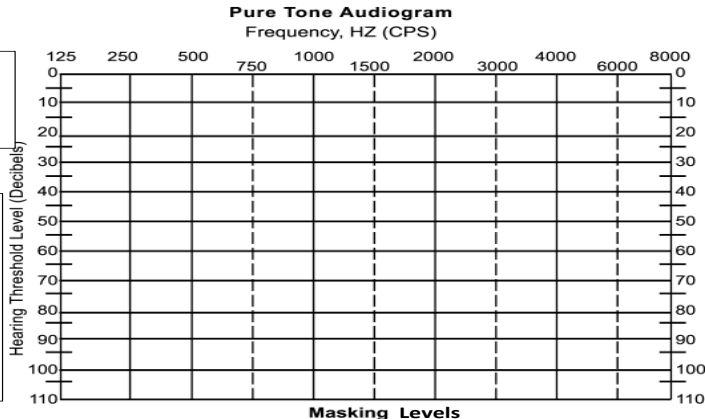
# Recording Your Results:



Name: \_\_\_\_\_ Examiner: \_\_\_\_\_ Date: \_\_\_\_\_

**A/C Masking:**  
Threshold of NTE + 10dB

**B/C Masking:**  
A/C Threshold of NTE + 10dB  
+ 15dB @ 250  
+ 15dB @ 500  
+ 10dB @ 1K  
for the Occlusion Effect



Audiogram Key	
Left	Right
AC Unmasked	○
AC Masked	○
BC Mastoid Unmasked	▽
BC Mastoid Masked	▽
BC Forehead Unmasked	□
MCL	—
LDL	—
Both	
BC Forehead Unmasked	↑
Sound Field	S
Examples of No Response Symbols	
✕	✕
⊕	⊕

Masking Levels	
A/C	B/C
LR	LR
LR	LR
LR	LR
LR	LR
LR	LR
LR	LR
LR	LR
LR	LR
LR	LR
LR	LR

**SRT Masking:**  
@ SRT of NTE Threshold + 10dB

**W/R Masking:**  
@ TE Threshold - 20dB

Speech Audiometry					
	SAT	PTA + 20 SRT	SRT + 20 MCL	MCL + 20 LDL	Word Recognition in % Correct @ MCL
<b>RIGHT</b>	dB	Unmasked Mask	dB	dB	Unmasked Mask
	Level				Level
	List				List
	Masking level in Left				dB
<b>LEFT</b>	dB	dB	dB	dB	dB
	Level				Level
	List				List
	Masking level in Right				dB
<b>SOUND FIELD</b>	dB	dB	dB	dB	dB
	Level				Level
	List				List

Type of Masking: \_\_\_\_\_

Type of Masking

Pure Tone Average		
	Left	Right
Air Conduction		
Bone Conduction		

Sum of the Thresholds @ 500 + 1K + 2K / 3

Test performed in stationary acoustical enclosure:  
 Yes  No  
 If no: \_\_\_\_\_  
 Room ambient noise level \_\_\_\_\_ dBA  
 Sound Level Meter: \_\_\_\_\_  
 Model & Serial Number: \_\_\_\_\_  
 Calibration Date: \_\_\_\_\_

**MCL Test:** @ (2000Hz)- Threshold <50 dB HL + 25 dB SL / Threshold—50-55 dB HL + 20 dB HL  
 Threshold 60-65 dB HL + 15 dB SL / Threshold—70-75 dB HL + 10dB SL

**Bone Conduction:**  
 Initial masking level is the: non-test ear's air conduction threshold +10dB + 10/15dB for the occlusion effect for that frequency safety pad





## TEST QUESTION:



Of the 4 Speech Test Required, Which 2 Require Masking?

Of the 2 Speech Stimuli's, Which one is more reliable?

Of the 2 Speech test that require masking, What test should be performed first?

What is the starting masking level for SRT Testing?

What is the masking presentation level for Word Recognition?

What stimulus is used for MCL and UCL Speech Test?

THANK YOU  
ANY QUESTIONS?

