By:
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Sensitivity and Specificity of the Pure Tone Screening Component of the NUS Adult Hearing Screening Protocol

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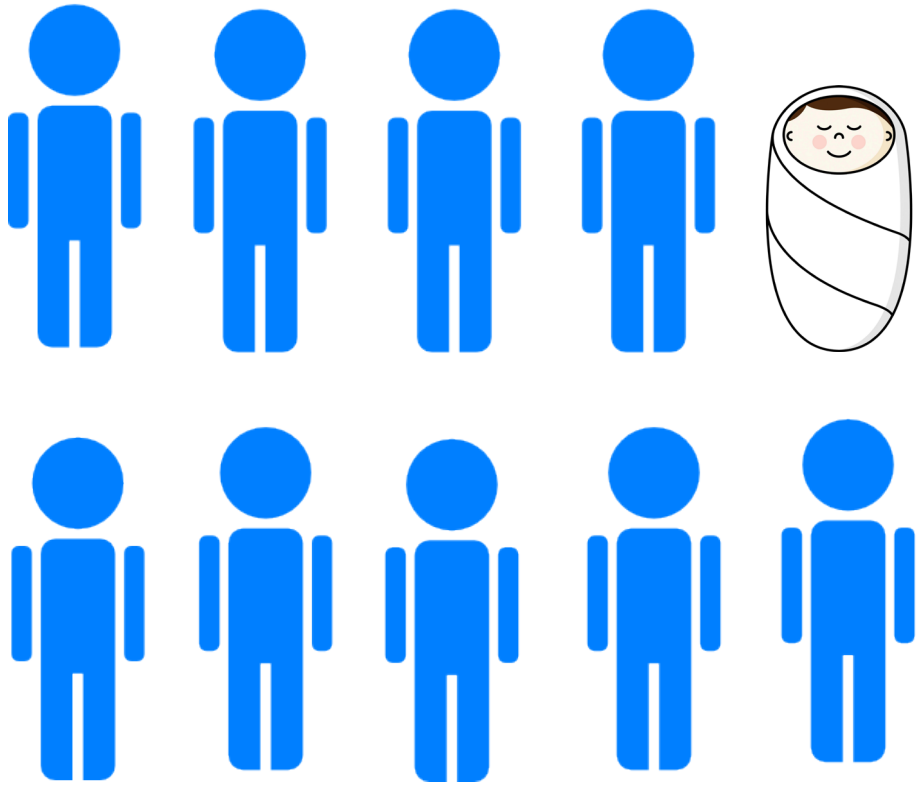
466 million individuals have disabling hearing impairment

93% are adults



Early identification and treatment

Community Hearing Screening

Background | Aim | Methods | Results | Discussion

Determine the validity of the pure tone hearing screening in reference to the pure tone threshold results for an elderly population in a community setting.

Participant Characteristics

- Convenience sample of 21 Elderly (42 Ears)
- 62 to 88 years old

Pure Tone Screening

Pure Tone Threshold

Grason-Stadler GSI-18 Audiometer

RadioEar IP-30 insert earphones covered by Peltor X2A earmuffs

Procedures

Pure Tone Screening

- Trained Hearing Screeners
- Screened at 0.5, 1, 2 and 4 kHz
- 25 dB HL and 40 dB HL
- MPANLs was 75 dBA

Pure Tone Threshold

- Threshold seek down to 0 dB HL
- Modified Hughson-Westlake
- 1, 2, 4 and 0.5 kHz
- MPANLs in octave band in dB SPL

Frequency (Hz)			
500	1000	2000	4000
52.6	43.1	42.8	47.0

Data Analysis

Sensitivity = TP/(TP+FN)
Specificity = TN/(TN+FP)
PPV = TP/(TP+FP)
NPV = TN/(FN+TN)

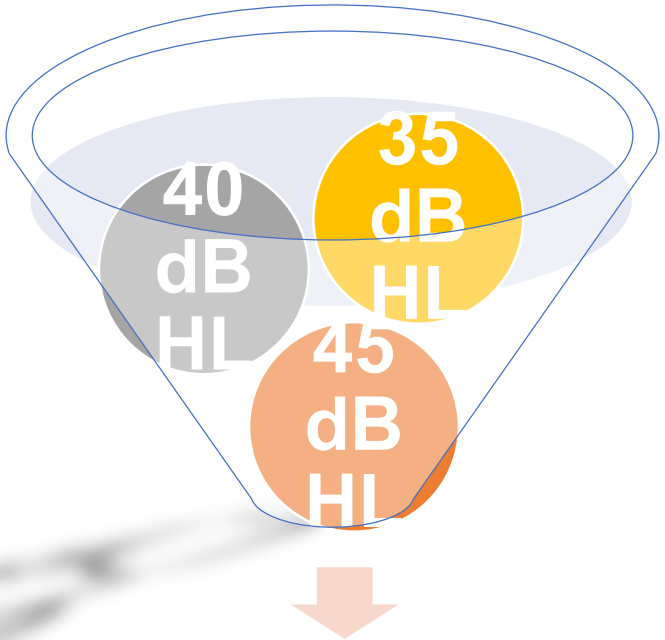
	Disorder	No Disorder
Positive Test Result	True Positive (TP)	False Positive (FP)
Negative Test Result	False Negative (FN)	True Negative (TN)

- 40 dB HL screening at 500 Hz= Responded (screened negative)
- 500 Hz Threshold= 45 dB HL

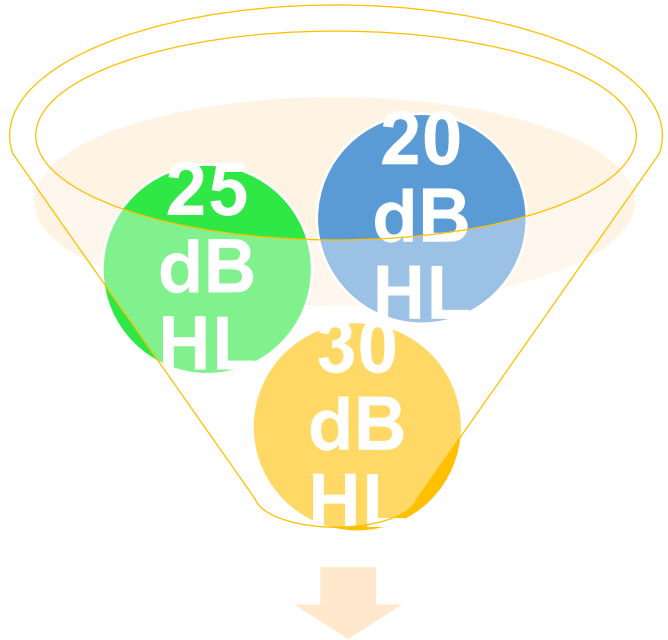
Disorder= Threshold is greater than screening level

	Disorder	No Disorder
Positive Test Result	True Positive (TP)	False Positive (FP)
Negative Test Result	False Negative (FN)	True Negative (TN)

± 5-dB Test-retest Reliability



40 dB HL Threshold



25 dB HL Threshold

- 40 dB HL screening at 500 Hz= Responded (negative results)
- 500 Hz Threshold= 45 dB HL **(40 dB HL?)**

Disorder= Threshold is greater than screening level

	Disorder	No Disorder
Positive Test Result	True Positive (TP)	False Positive (FP)
Negative Test Result	False Negative (FN)	True Negative (TN)

40 dB HL Screening

Screening at 40 dB HL	Sensitivity	Specificity	Predictive Values	
			Negative	Positive
Fail at any frequency	86.2	100.0	76.5	100.0
Failure by specific frequency				
500 Hz	85.7	91.4	97.0	66.7
1000 Hz	100.0	97.1	100.0	88.9
2000 Hz	93.8	100.0	96.3	100.0
4000 Hz	84.6	87.5	77.8	91.7

25 dB HL Screening

			Predictive Values	
Screening at 25 dB HL	**Sensitivity**	**Specificity**	**Negative**	**Positive**
Fail at any frequency	100.0	-	-	100.0
Failure by specific frequency				
500 Hz	100.0	87.5	100.0	97.1
1000 Hz	97.1	100.0	88.9	100.0
2000 Hz	100.0	100.0	100.0	100.0
4000 Hz	100.0	-	-	100.0

CONSEQUENCES

Negative

- Undetected Hearing Loss
- Late Diagnosis
- Delayed Intervention

False

Positive

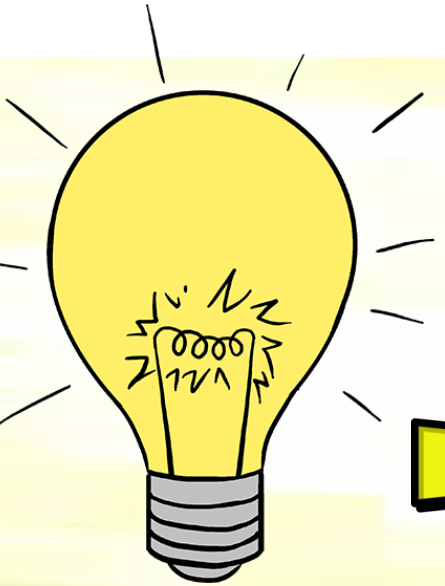
- Resource Wastage
- Unnecessary Emotional Anxiety
- ↓ Confidence in Screening Credibility

FALSE NEGATIVE

CHANCE EVENT?

- Only one reliable response is required to be screened negative.
- The same order of testing → learning effect for listening.
- Tone presentation: Duration → Too long? Rate → Rhythmic?

False Negative

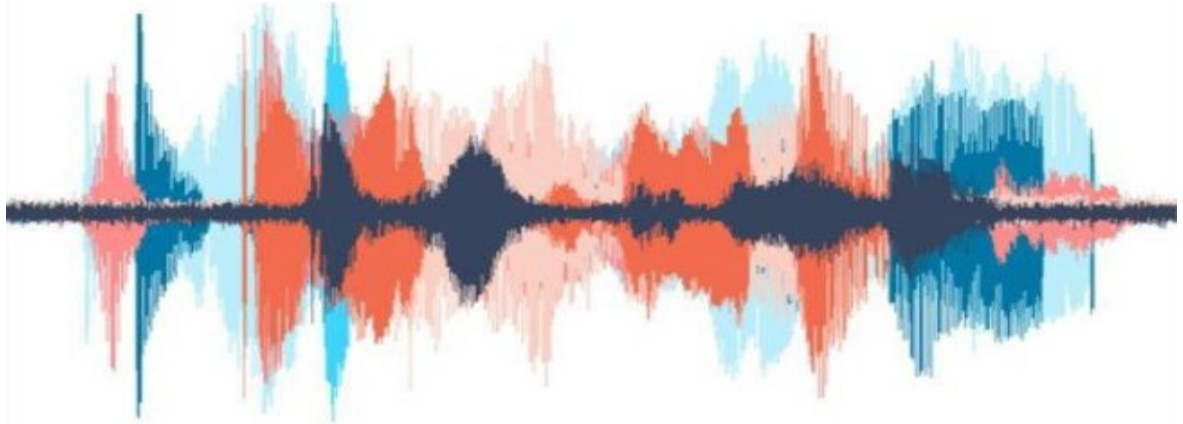


RECOMMENDATION

At least two reliable responses out of three trials.

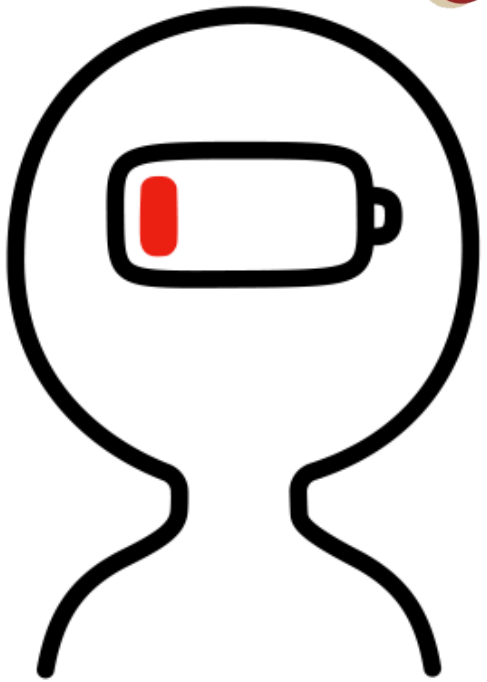
False Positive

- Masking of stimulus by ambient noise. Using an A-weighted level could potentially underestimates the effects of low frequency noise.
- Inadequate ear tip insertion.



False Positive

- Response state, fatigue, attention or understanding of test instructions.
- Reverse earphones placement.
- Visual distractions.



False Positive

RECOMMENDATION

Initiate an immediate rescreen after a referred result has been obtained with the participant re-instructed and the insert earphones repositioned.


Q & A

Pure Tone Screening

Study Number: _____

NUS Adult Hearing Screening Form:

Pure Tone Screening @ 25 dB HL (✓ = RESPONSE, NR = NO RESPONSE)							
Right				Left			
500 Hz	1000 Hz	2000 Hz	4000 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Pure Tone Screening @ 40 dB HL (✓ = RESPONSE, NR = NO RESPONSE)							
Right				Left			
500 Hz	1000 Hz	2000 Hz	4000 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz

Comments:

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Pure Tone Threshold Testing

Study Number: _____

Age: _____ Gender (please circle): Female/Male

Date and Time of Testing: _____ Study Site: _____

Tester: _____

Pure Tone Audiometric Result:

Right Ear	Frequency (Hz)			
	500	1000	2000	4000
Threshold (dB HL)				
Left Ear	**Frequency (Hz)**			
	500	1000	2000	4000
Threshold (dB HL)				

Comments/otoscopy:

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