

# DOES SIZE MATTER?

## WIDEBAND ABSORBANCE NORMS FOR SINGAPOREAN ADULTS



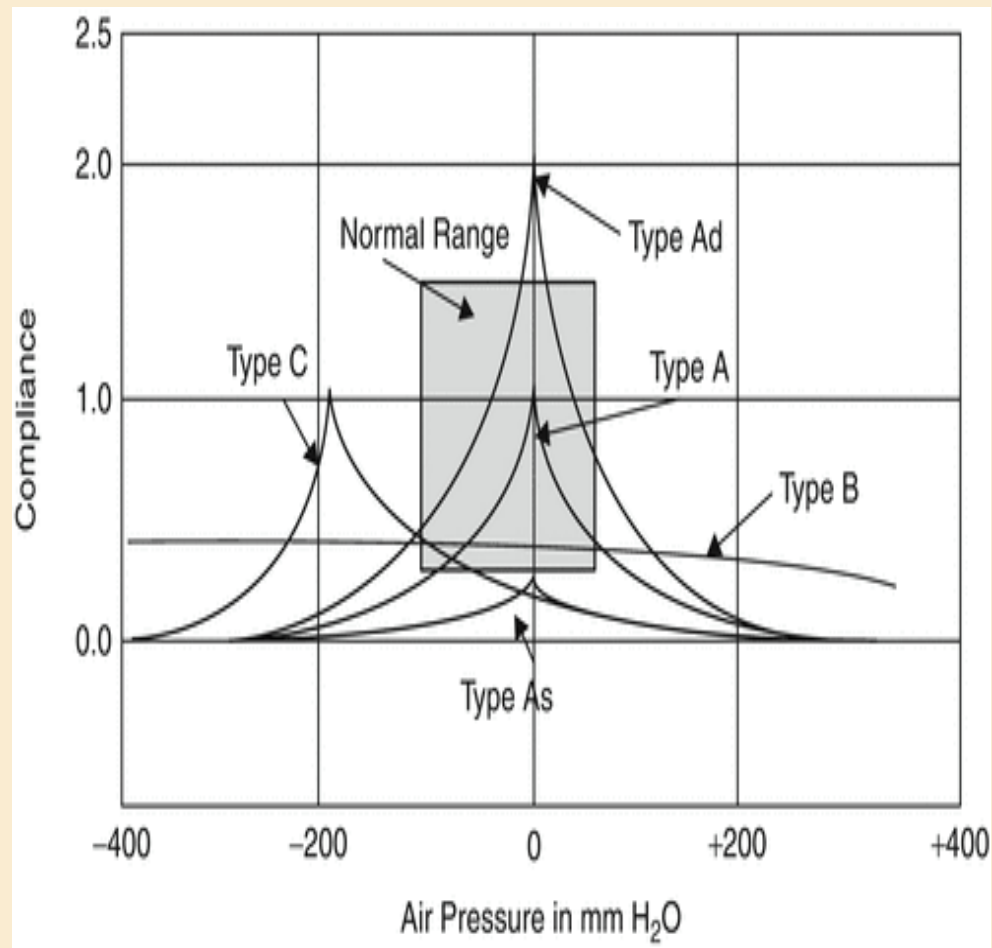
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# 01 INTRODUCTION



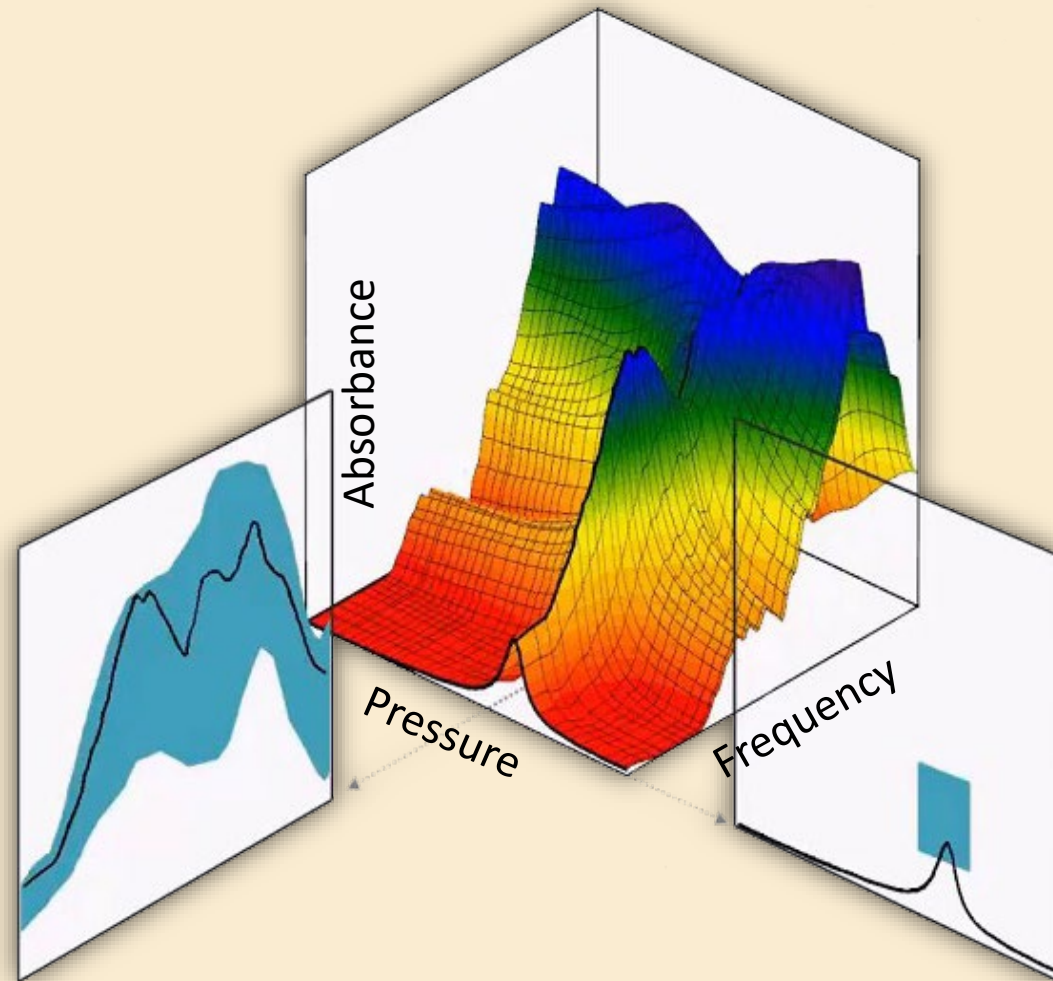
## 226 Hz Tympanometry

- ▶ Current clinical standard for middle ear (ME) testing
- ✓ Objective & easy to interpret
- ✗ Limited differential diagnosis
- ✗ Poor sensitivity to certain ME pathologies, like otosclerosis
- ✗ Inapplicable to neonates

# 01 INTRODUCTION

## Wideband Tympanometry

- ▶ Additional frequency parameter
- ✓ More power-response parameters
- ✓ Can use ambient pressure
- ✓ More sensitive and specific
- ✓ Single protocol for all ages
- ✗ Lack population-specific norms



# 01 INTRODUCTION

## AIMS

1. Establish normative wideband absorbance response for a healthy adult Singaporean population.
2. Identify any significant interactions between eight potential co-variates, such as age, ethnicity, and various body size indices, with the adult Singaporean wideband absorbance response.
3. Evaluate test-retest reliability of wideband absorbance measurements by Interacoustics' Titan system in an adult Singaporean population.

# 02 MATERIALS AND METHODS

## Participants (N=50)

- ▶ Mean Age:  $27.3 \pm 7$  years
- ▶ Males (N=25), Females (N=25)
- ▶ Chinese (N=47), Non-Chinese (N=3)
- ▶ 91 out of 100 ears included in analysis

## Instruments

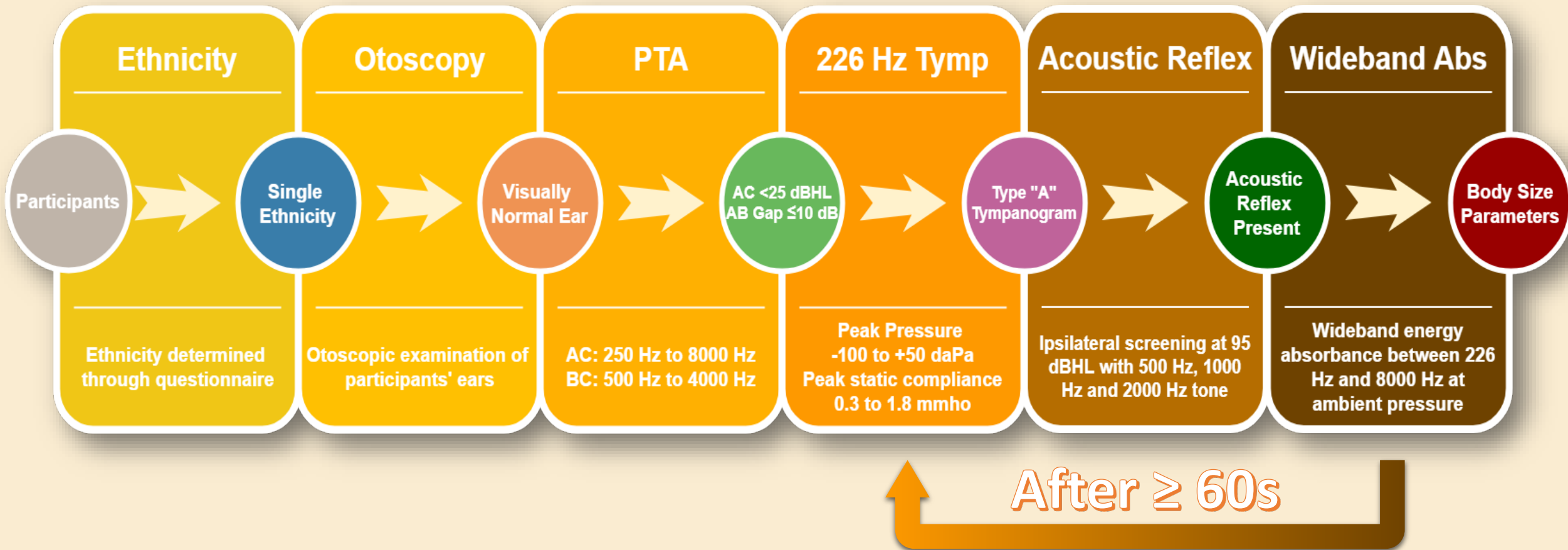
- ▶ NUS Audiology SmartClassroom (<30dBA)
- ▶ Siemen's Unity 2 Audiometer
- ▶ Interacoustics' Titan IMP440

## Statistics

- ▶ Mixed-model ANOVA (R Studio)
- ▶ Mean response, t-test, Pearson Correlation (Microsoft Excel)

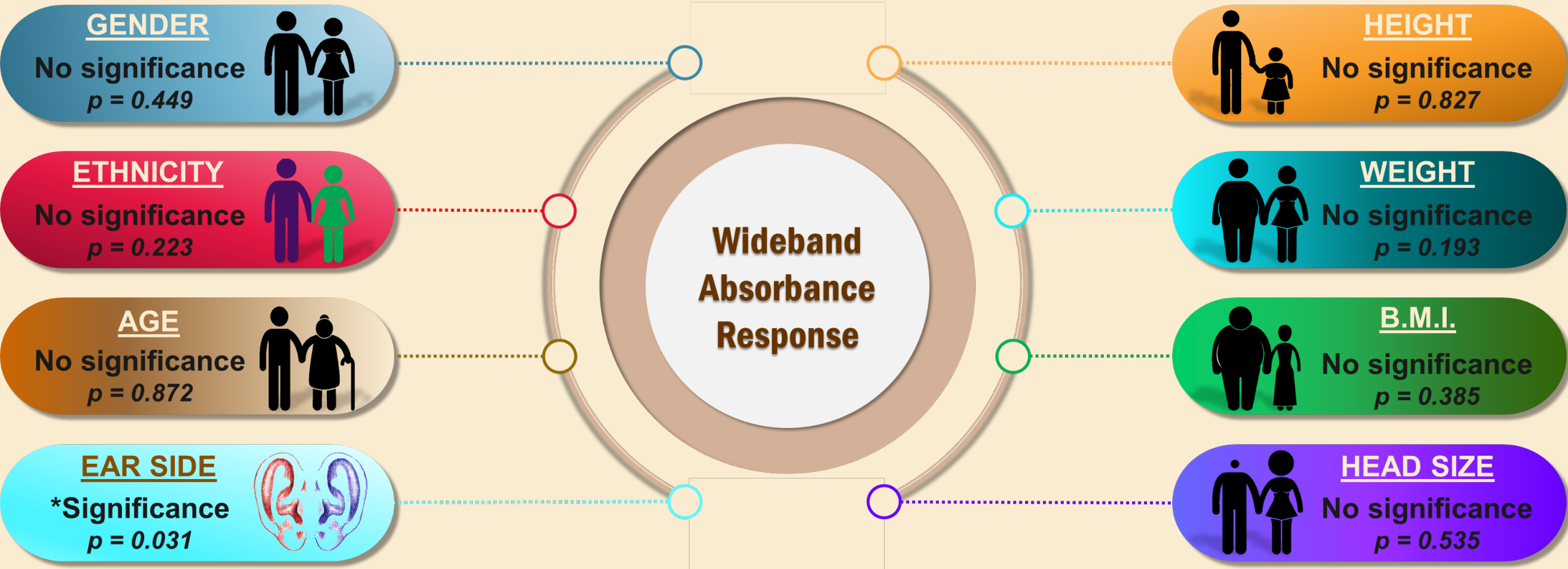
# 02 MATERIALS AND METHODS

## Data Collection Procedure



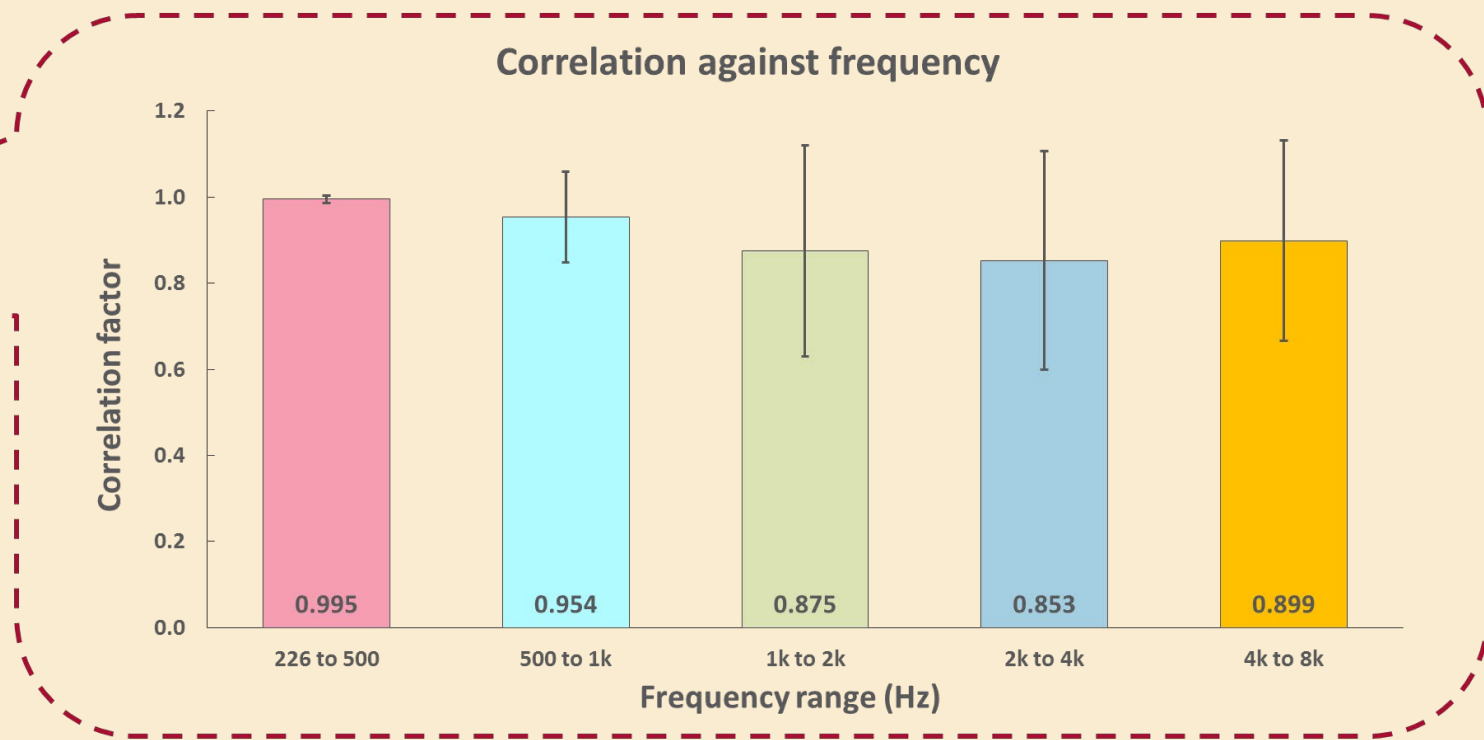
# 03 RESULTS

## POTENTIAL COVARIATES OF WIDEBAND ENERGY ABSORBANCE (EA) RESPONSE



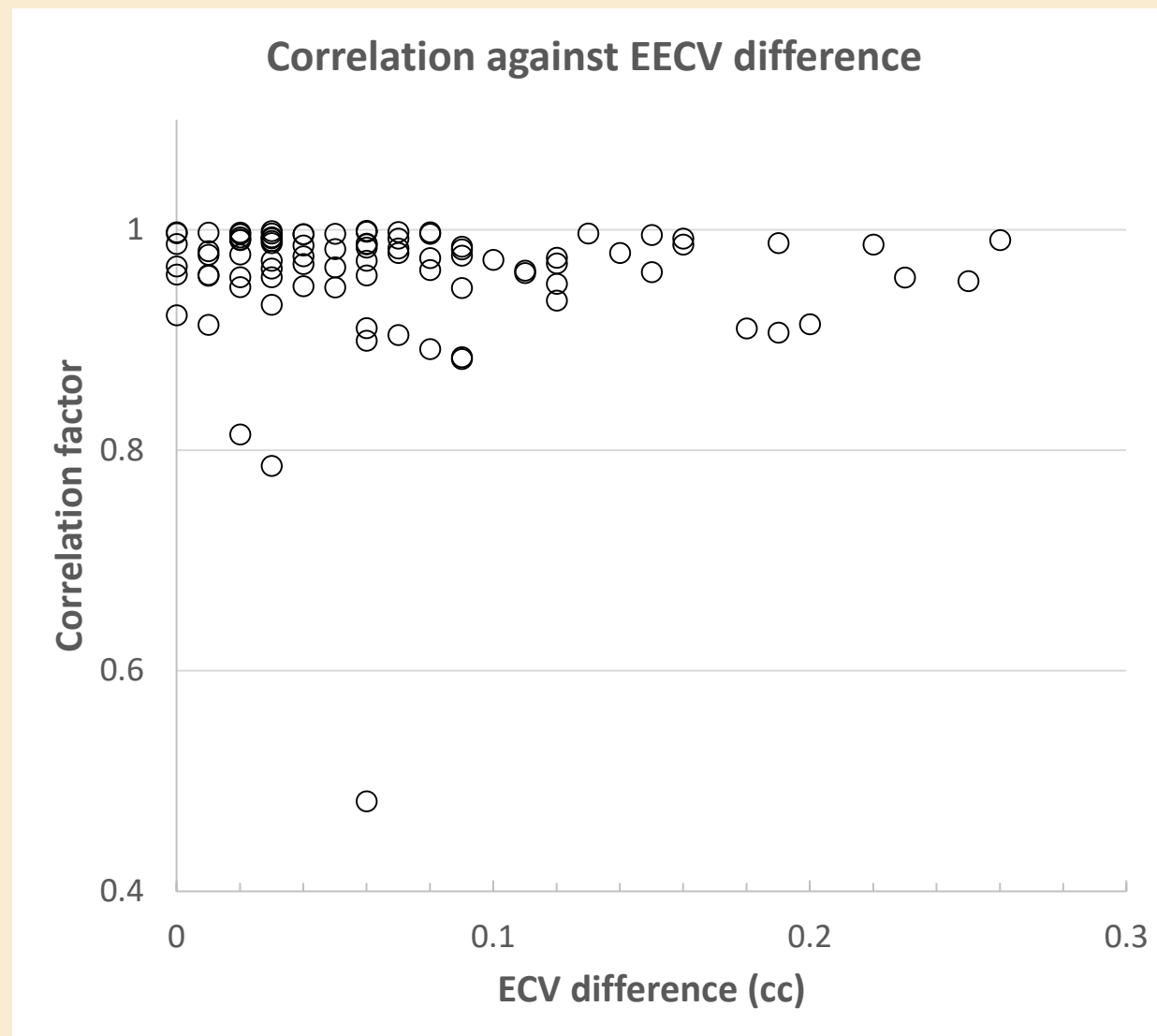
# 03 RESULTS

## TEST-RETEST RELIABILITY WITH PROBE REINSERTION

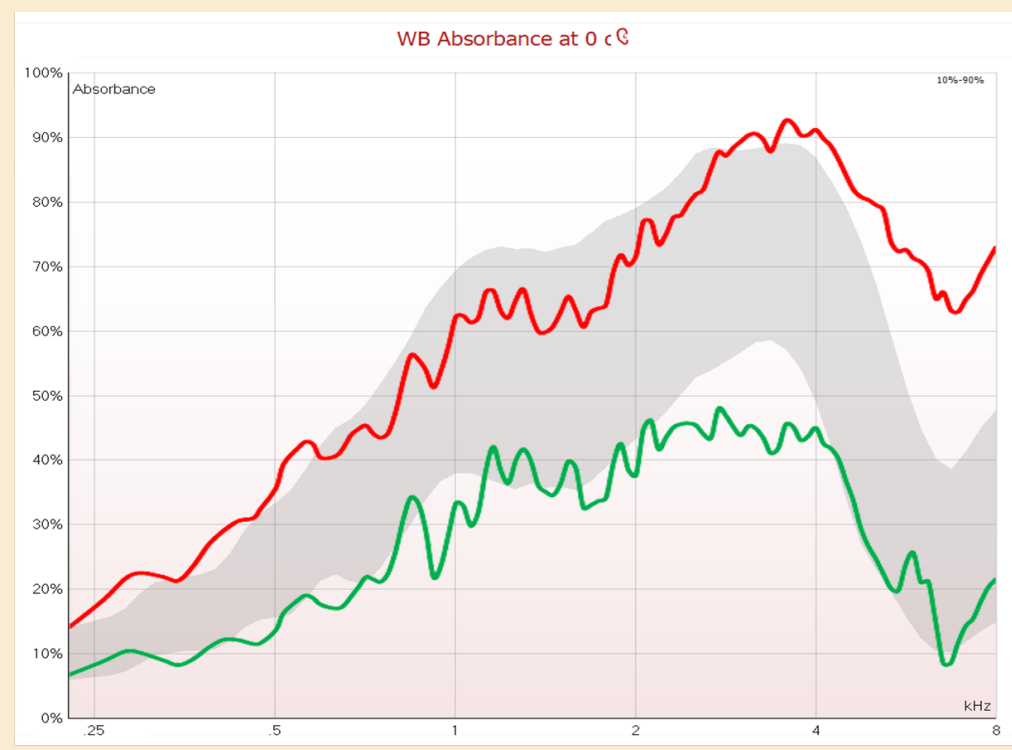
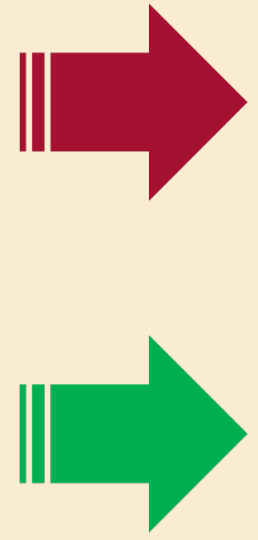
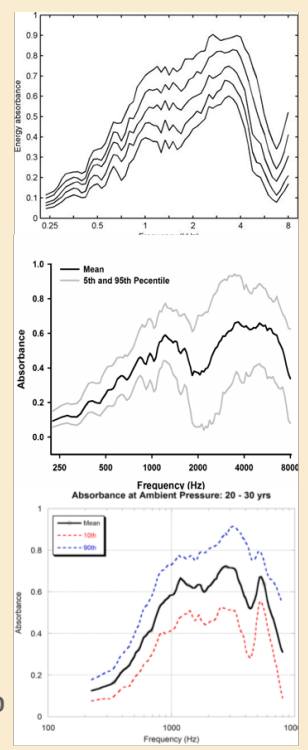
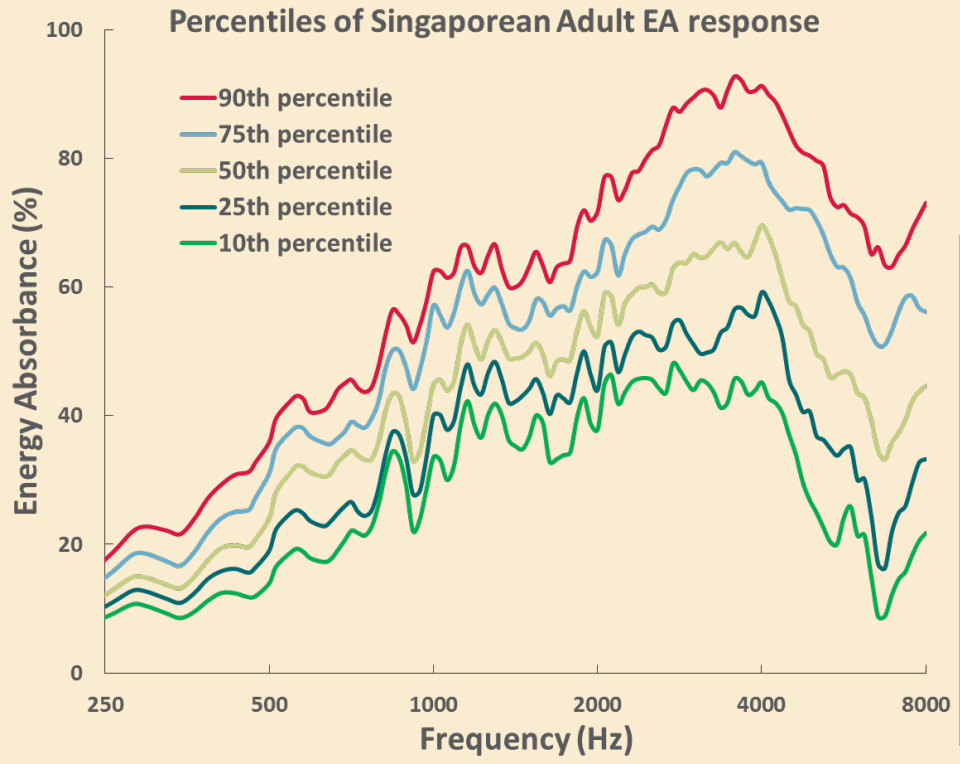




# 03 RESULTS



## PERCENTILES OF SINGAPOREAN ADULTS' WIDEBAND EA RESPONSE



# 04 DISCUSSION

## Effect of Potential Covariates on EA for Singaporeans

### ▶ *No significant interactions in seven covariates*

1. Mostly homogenous Asian population
2. Participants too young for significant ME ageing (>42 years old)
3. Samples for body size indices largely reflected gender patterns, i.e. Males were generally taller and heavier

### ▶ *Significant, but small, effect of ear laterality*

1. No test sequence randomization; possible procedural effect
2. Small differences (1.58% to 4.95%); unlikely to cause misdiagnosis

❖ Single baseline EA norm for adult Singaporeans

# 04 DISCUSSION

## Good Test-Retest Correlation Between Trials

### ▶ ***96% correlation between trials with probe reinsertion***

1. Depth of insertion not a factor
2. Angle of insertion is very important

### ▶ ***Correlation weakens at mid and high frequencies***

1. Possible instrumentation effects
2. Fixed-size rubber tips (low fq) vs insert foam tips (high fq)
3. Overall correlation still high (>85%) at all frequencies

❖ **Wideband EA is reliable and robust with good probe insertion protocol and technique**

# 04 DISCUSSION

## Singaporean EA response similar to other groups

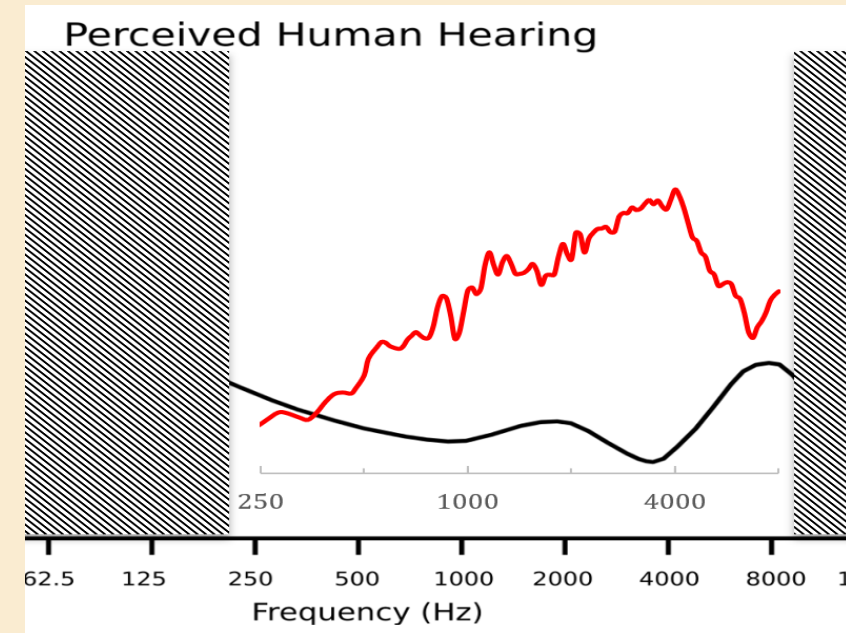
### ▶ *Two maxima near 1.2 kHz and 4 kHz*

1. Corresponds to ME and EAC resonant frequencies, respectively
2. Reflection of equal-loudness contour

### ▶ 10<sup>th</sup> and 90<sup>th</sup> percentiles for diagnostic purposes

1. Similar to Caucasian norms used in Titan system

❖ Good potential for clinical use in Singapore



# 05 CONCLUSION

**This project has**

- **established a normative range of wideband absorbance responses for normal Singaporean adult subjects and;**
- **shown that wideband energy absorbance can be a reliable diagnostic test.**

**However, additional normative data, including neonatal and pathological data, must be established on a Singaporean population prior to its inclusion in the standard test battery in Singapore.**