

*THESIS
PRESENTATION*

**The Reference Equivalent Threshold Sound
Pressure Level (RETSPL) values of the Creare
headphones**

by

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Purpose

Background

Methods

- *Subjects*

- *Protocol*

Results

Discussion

Conclusion

- *Suggestions*

Purpose

Determine the RETSPL values of the Creare headphones across audiometric test frequencies – 125Hz, 250Hz, 500Hz, 750Hz, 1kHz, 1.5kHz, 2kHz, 3kHz, 4kHz, 6kHz, 8kHz, 9kHz, 10kHz, 11.2kHz, 12.5kHz, 14kHz, 16kHz, 18kHz and 20kHz.



Background

The Hearing Evaluation System

- ❖ Create => engineering company => hearing evaluation system
- ❖ Comprises of tablet and headphones
 - Hearing tests run on a proprietary application
 - Protocols for different purposes are uploaded and installed
 - Headphones are designed to provide significant noise attenuation
- ❖ Potential test tool in under-equipped clinics and outside of sound booths

- ❖ However, little RETSPL data available

	125	250	500	1k	2k	4k	8k
APV80	27.7	29.1	35.1	36.7	31.9	33.5	34.7
Average	30.6	31.6	37.5	39.5	34.5	36.0	36.9
Standard Deviation	3.4	3.0	2.9	3.3	3.1	3.0	2.6

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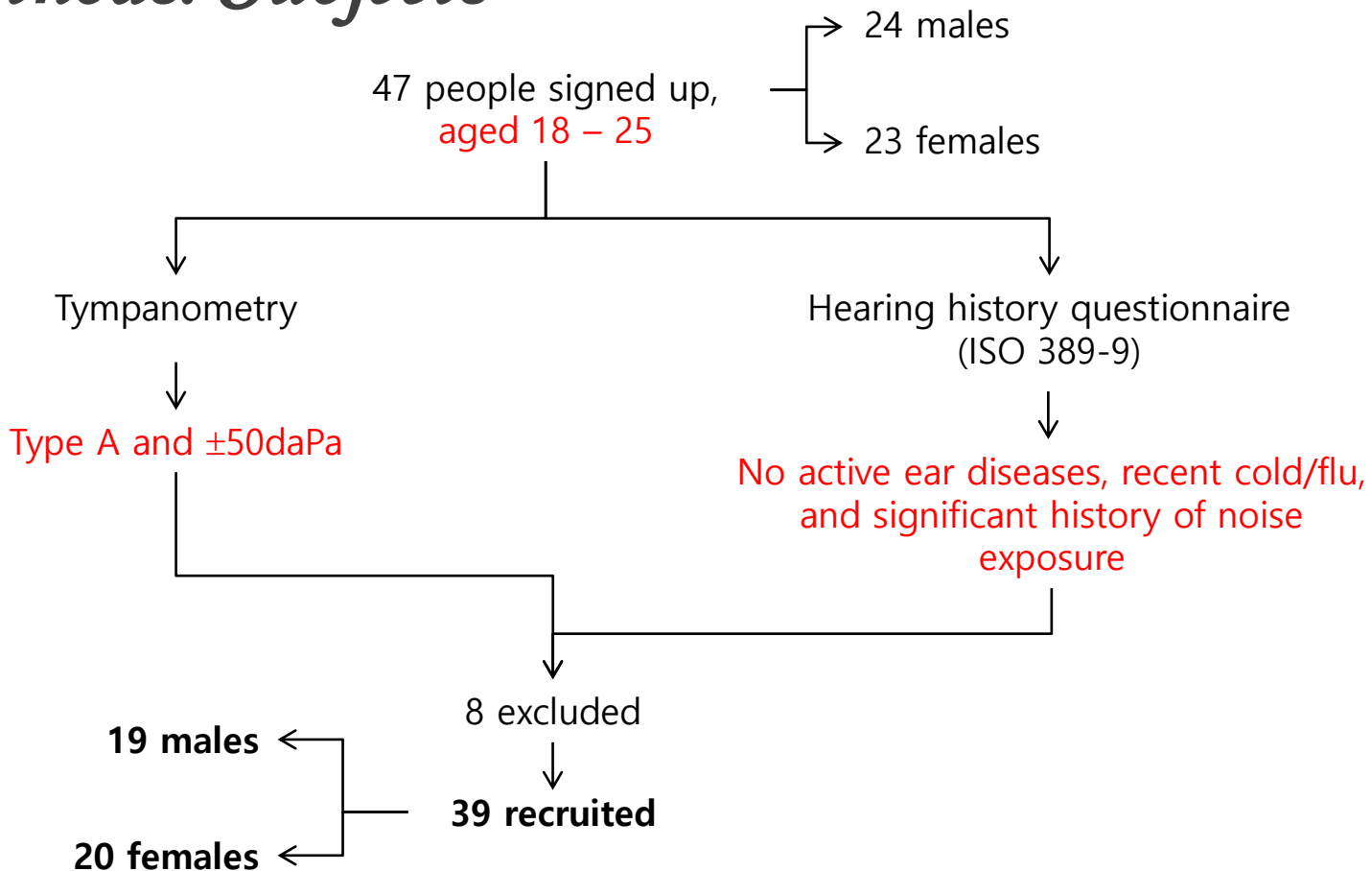
Conclusion

- *Suggestions*

- ❖ Varying hearing abilities at different frequencies
 - Normal hearing individuals hear each frequency at different SPLs
 - Recall: audibility curve
- ❖ Physical properties of different transducers
 - Different output SPLs with a fixed input SPL
- ❖ The BIG question is: What is the input SPL that a normal hearing individual can hear...
 - without the participation of any audiometers' settings
 - for this particular transducer
 - at each audiometric frequency

*RETSPL is essential for the calibration of audiometers

Methods: Subjects



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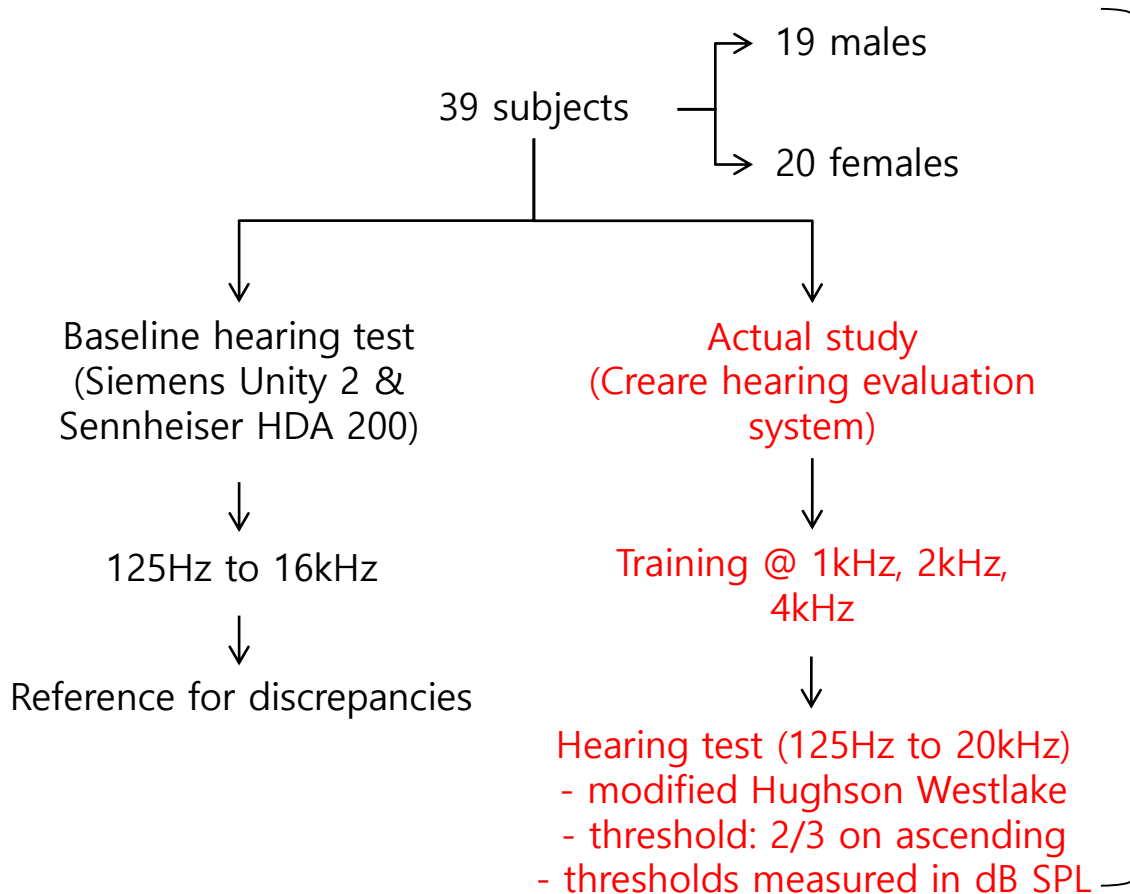
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Conducted in a room that meets ANSI standards for ambient noise levels (measured prior to study)



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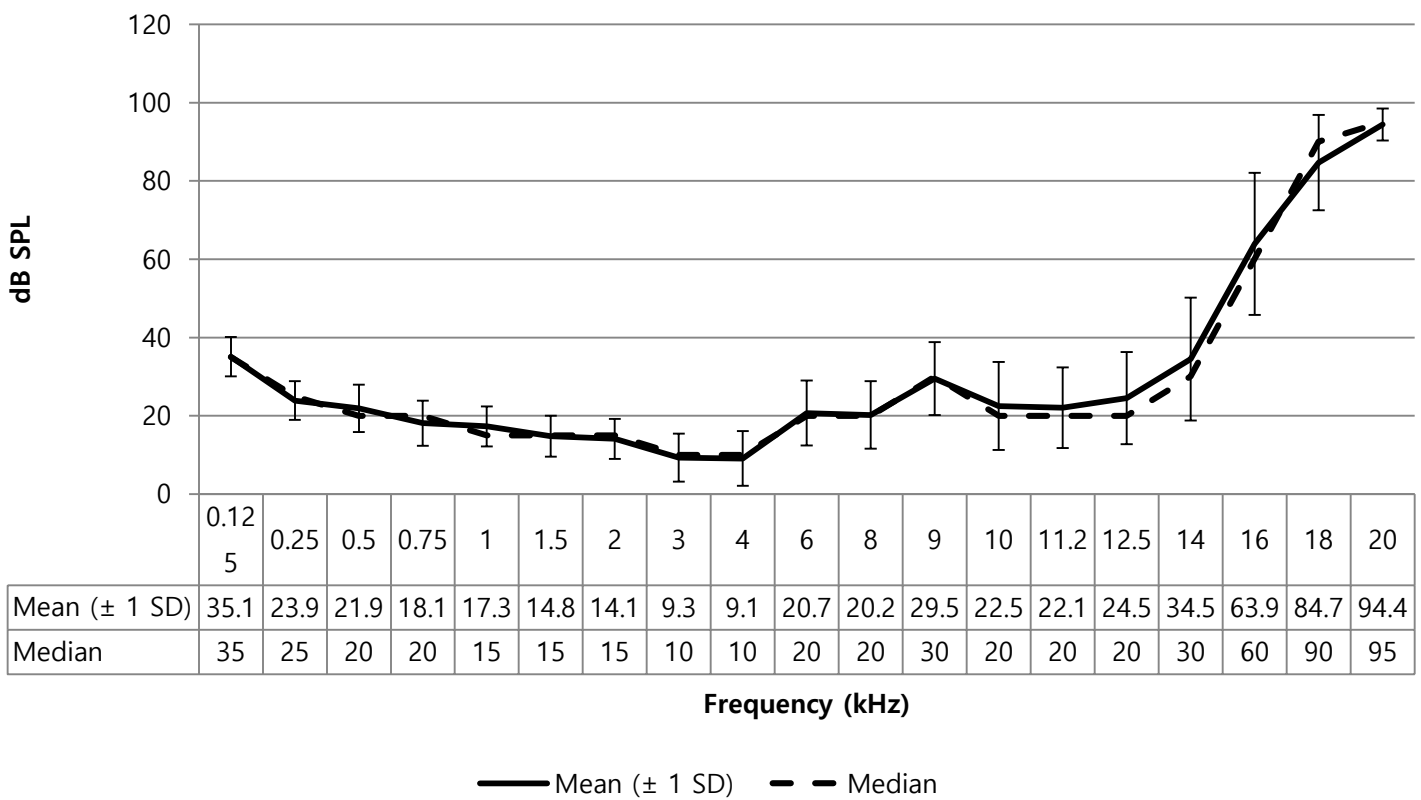
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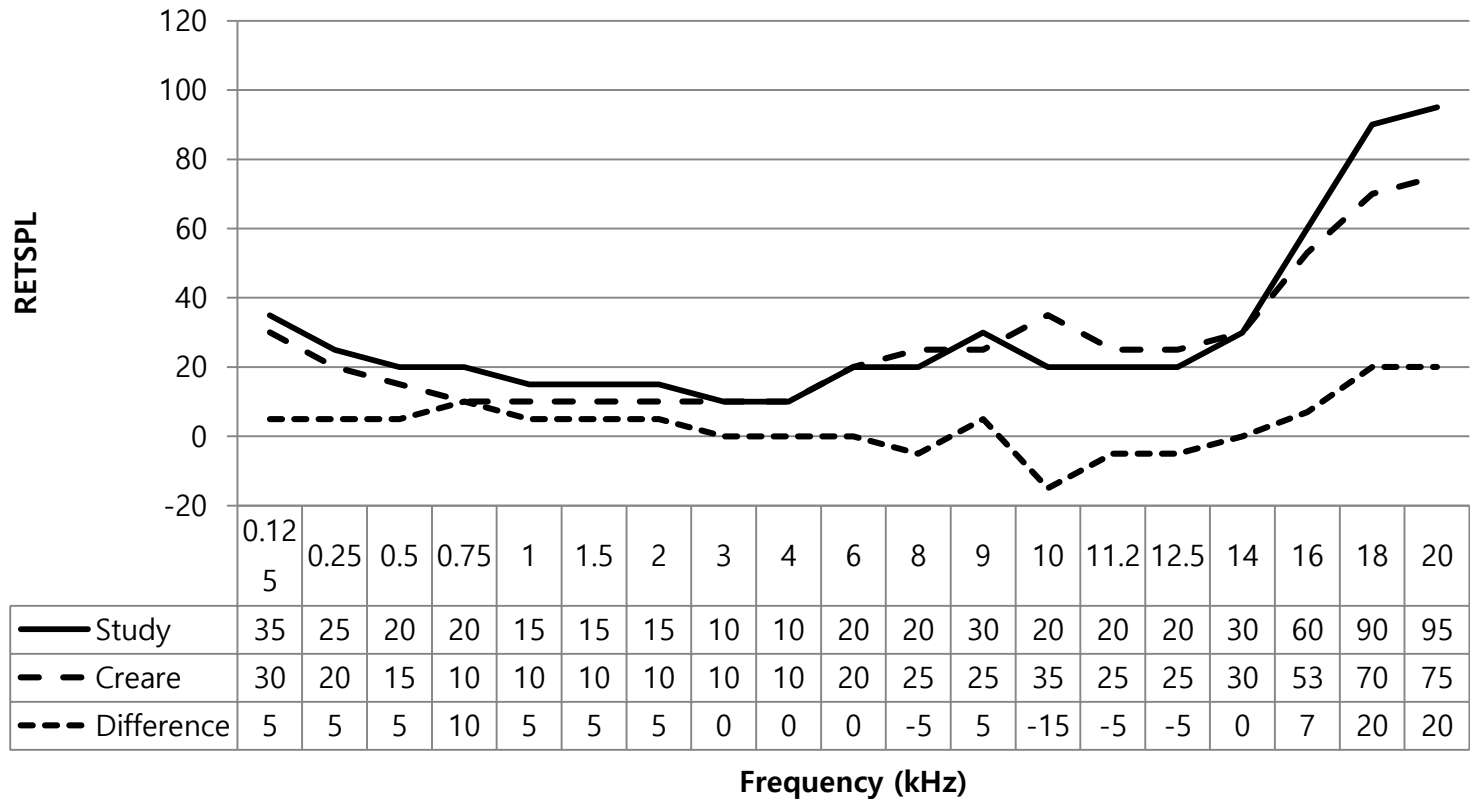
Results

RETSPL is determined as the median of the data because median is less affected by outliers as compared to mean.

The effects of gender and laterality had p-values that were generally below 0.05, showing that differences in results due to laterality and gender are insignificant.

Deviation is seen only at 6kHz with gender, possibly a result of noise exposure during the two years of military training in males.

Results



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Subjectivity of the hearing history questionnaire

- ❖ Open ended questions => no guided definitions
- ❖ Subjected to tester bias
 - Decide, at his/her discretion, whether to accept the participant
 - Draw the line between "at risk" and "not at risk" for hearing loss
- ❖ Criteria decided may differ in other studies => not published
- ❖ Difficult to decide which set of criteria is relevant and ideal to follow

- ❖ Defined the exclusion criteria and justified for questions that may be controversial. Mainly investigated the participants' frequency, duration and intensity of noise exposure to determine if the participants are eligible for the study.

Discussion

Limitations

❖ Calibration

- Ideal: calibrate before and many times during the study
- Susceptible to temperature, pressure and equipment handling
- Lack of equipment and budget

❖ Software inflexibility

- Unable to retest at a particular frequency
 - Valuable for unattainable or outlying results
- Repeating: time consuming and exhausting

❖ Maximum output levels

- Reduced from the previous study
 - Due to distortions caused by physical limitations of transducer
 - Prevent false positives
- Less data attainable at 18kHz and 20kHz

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- ❖ Gender and laterality did not have significant effects on the thresholds obtained.
- ❖ RETSPL values obtained were generally elevated as compared to Creare's values. Greatest deviations were seen at 18kHz and 20kHz.
- ❖ Although limited by the lack of recalibration and elevated results, data from this study are still valuable as this is only the second study of its kind.

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Conclusion: Suggestions

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- ❖ More RETSPL studies
- ❖ Ensure that repeated calibration is feasible
 - Improve the credibility and reliability of the results obtained.
- ❖ Research using different populations
 - Differing cultures, practices, genetic disposition => differing standards of "normal" hearing
 - Correlation between different populations and RETSPL values
- ❖ Research on effectiveness of the ISO 389-9 standard and suggest recommendations to reduce the subjectivity of the participant selection process.



THANK YOU

References

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