



# AZBIO Sentence Accuracy For English as a Second Language Adults in Quiet and Background Noise

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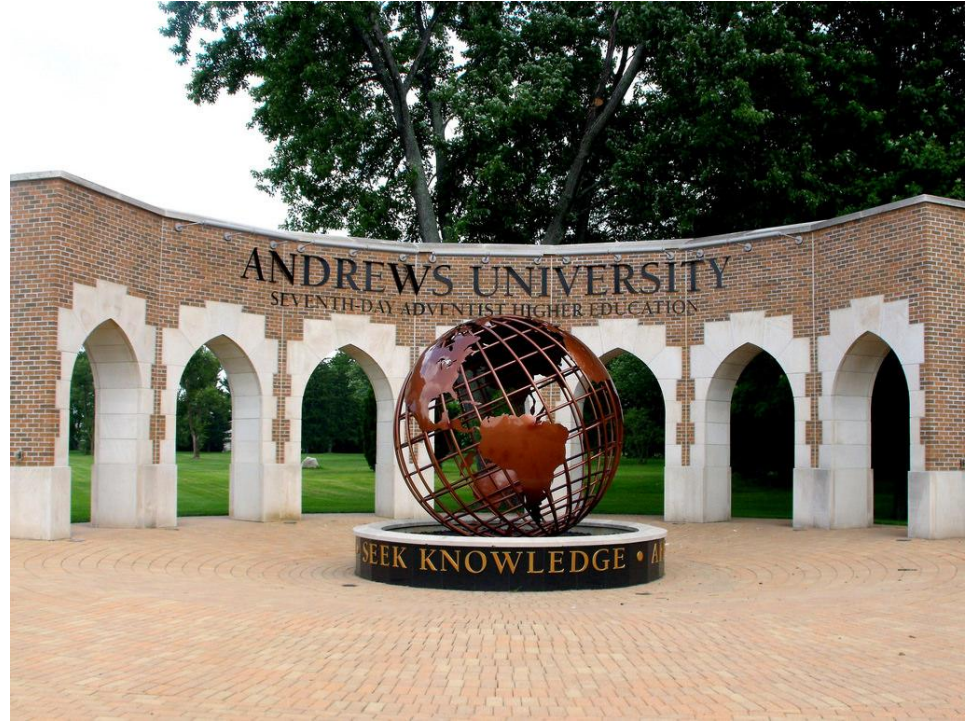
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# Introduction

How I got involved

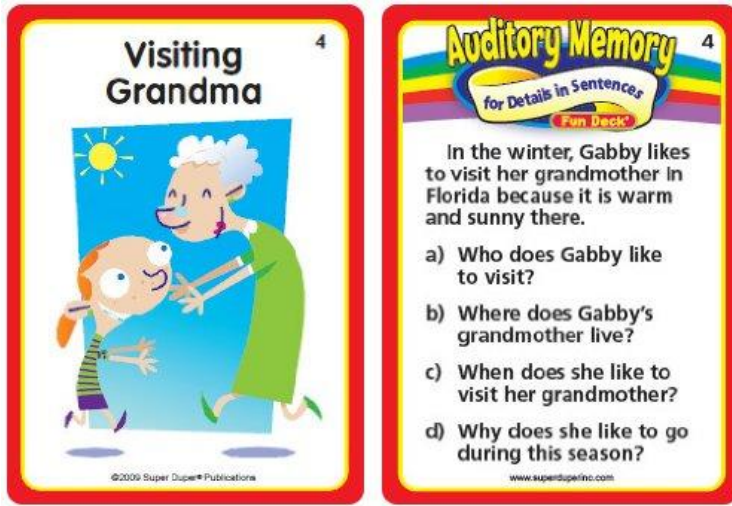
- Diversity at Andrews
- Personal background
- Curiosity



*Auditory figure ground:* the ability to isolate one meaningful auditory signal from other signals



*Auditory memory:* ability to process auditory information and recall what was heard



*AZBIO sentences - high context and low context*  
Sentence lists developed to isolate hearing ability by removing language as a factor.

- Please pass the salt
- Have a nice lunch
  
- Nothing tastes sweeter than self discipline
- The camel is not the most comfortable animal on which to ride



### *Age of acquisition*

- Age at which a language is learned

### *Background noise*

- +10 signal to noise ratio
  - Speech at 50 dB HL, noise at 40 dB HL

#### Decibel (dB) Range Chart

0dB	Threshold of human hearing
10dB	Breathing
20dB	Whisper, Light snoring
30dB	Quiet room
40dB	Moderate snoring
50dB	Conversation
60dB	Busy street, Alarm clock
70dB	Hairdryer, Noisy restaurant
80dB	Loud radio
90dB	Bass drum
100dB	Subway train
110dB	Industrial noise
120dB	Jet Plane take off
130dB	Gunshot, Metal concert



## Background research

- Regal, D., Kim, B., & Neufville C. (2015)
  - Determination of auditory processing ability of ESL students
- Carlo, M. (2009)
  - A review of the effects of bilingualism on speech recognition performance
- Stuart, A., Zhang, J., & Swink, S. (2010)
  - Reception thresholds for sentences in quiet and noise for monolingual English and bilingual Mandarin-English listeners
- Von Hapsburg, D., & Pena, E. D. (2002)
  - Understanding Bilingualism and Its Impact on Speech Audiometry.



# Research Questions

1. Is there a significant difference between the ESL participants' scores in quiet and background noise?
2. Is there a significant difference between the overall scores of the language groups?
3. Does age of acquisition of English impact overall score?



# Methods

## Participant selection

- Korean, Portuguese, and Spanish speaking undergraduate and graduate students

## Data collection

- All participants received a hearing screening and completed speech discrimination testing
- AZBIO sentence tests were conducted at a normal conversation level, were pre-recorded, and used male and female voices





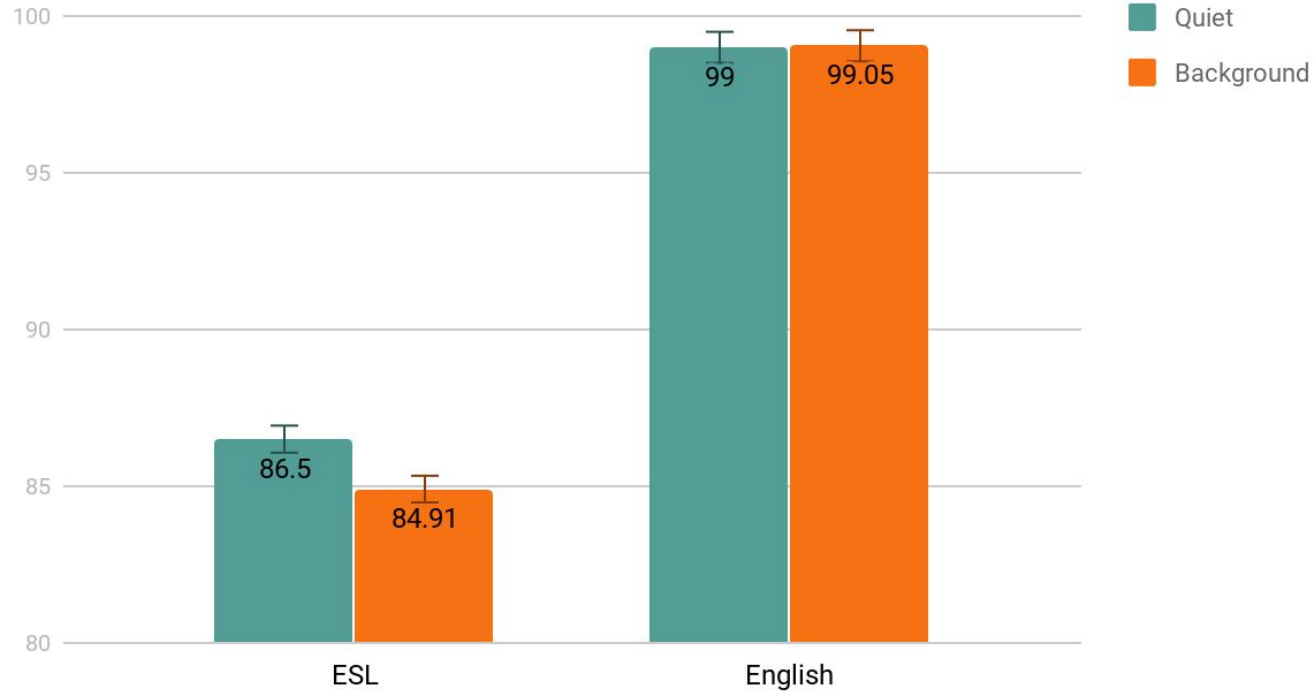
## Data analysis

- We used a paired t-test to determine if the mean score in background noise was less than the mean score in quiet.
- We used a one-way ANOVA to determine if there was a difference in mean overall score between the three language groups.
- We used a t-test for independent means to determine the effect of age of acquisition on overall score. (AOA <8 compared to AOA >8)
- All statistical tests were carried out at the  $\alpha = 0.05$  level of significance.



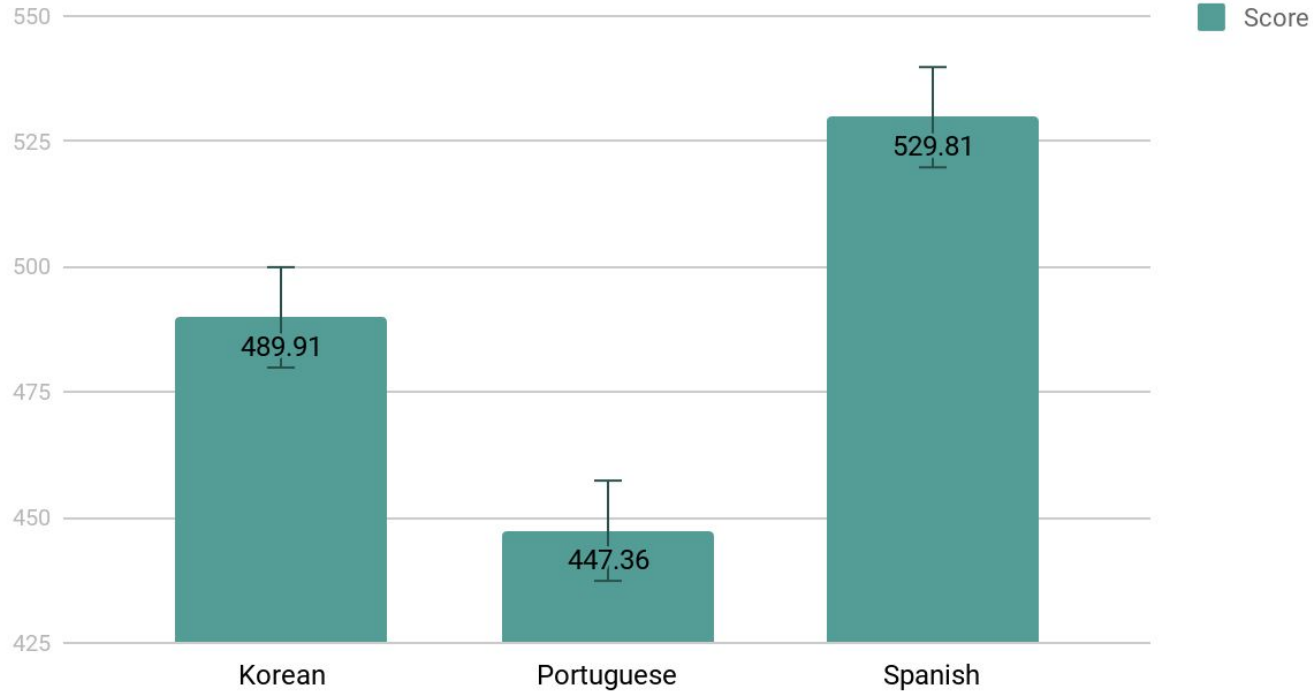
# Results

## Sample Means in Quiet and Background Noise



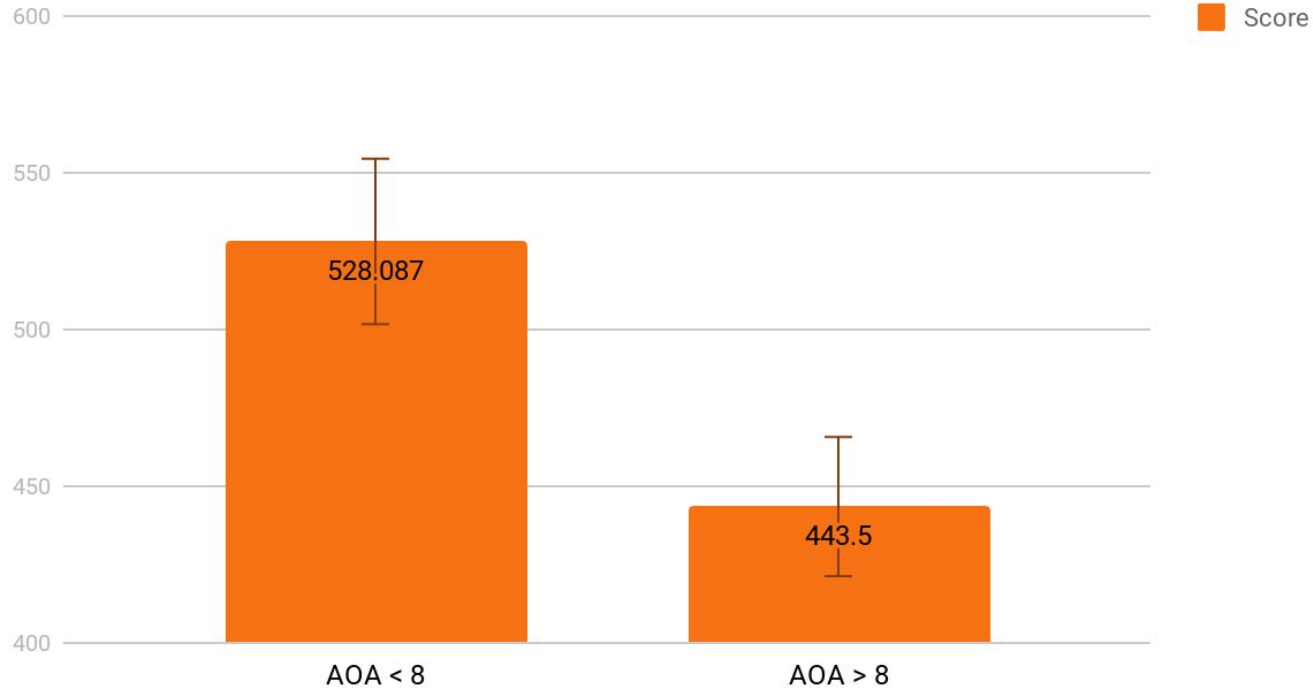
When all ESL students' right and left scores were combined, the mean score in quiet was significantly larger than the mean score in background noise ( $t = -1.759$ ,  $p = 0.043$ ,  $n = 40$ ).

## Sample Means of ESL Subgroups



When we compared the overall scores of Korean<sup>a</sup>, Portuguese<sup>b</sup>, and Spanish<sup>c</sup> speakers, we found that the mean scores between the three groups were significantly different ( $F = 4.517, p = 0.017, ^a n = 11, ^b n = 14, ^c n = 15$ ).

## Sample Means of Age of Acquisition (AOA) Groups



When we combined all scores for all ESL students and compared the mean score for those of age less than or equal to 8<sup>d</sup> to that of those greater than 8<sup>e</sup>, the mean score those in the earlier age group (sample mean = 528.09) was significantly higher than the mean for the older age group (sample mean = 443.50) ( $t = 3.829, p < 0.001, {}^d n = 23, {}^e n = 17$ ).



# Conclusions

## Summary

- Primary language may have an affect on the difficulty of competently learning a new language
- Learning a language at a much younger age is beneficial
- Language difference and auditory processing skills affect speech perception in the second language of bilingual adults
  - Results indicate an auditory processing deficit (lower scores in background noise compared to quiet) as well as a language deficit (lower scores in quiet compared to native English speakers)



## Clinical implications

- Cochlear implant candidacy
  - ESL participants in this study had hearing within normal limits and on average received a score of 86.50% on sentences in quiet and 84.91% in background noise, while the average score for native English speakers was 99% for both quiet and background noise.
  - A person qualifies for a cochlear implant if they score less than 50% on sentence recognition tasks.
  - According to Spahr et al. (2012), the average score of cochlear implant users ranged from 46 to 86 percent.
- Speech therapy included in ESL training programs
- Support for ESL students
  - Cross-cultural testing materials
  - Facilitation of auditory processing in English for school aged ESL learners
  - Classroom accommodations for college aged ESL students



# Suggestions for further research

- Note taking ability of ESL students and classroom accommodations to promote success at the university level
- Include other languages to increase generalizability of results
- Primary language differences and their effect on speech perception of a second language
  - Current study in department using this data
- Inverse study
  - Compare native English speakers who learned a second language to primary speakers of that language
- Age of acquisition
  - Importance of development of underlying auditory skills in a second language



# References



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Autumn Zurek