Linguistics Department Summer Research Program 2020

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APhL
Alberta Phonetics Laboratory

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Thank You to Everyone Who Made This possible!

From the University:

Dr. Tucker

Dr. Nijveld

The Faculty of Arts

WISEST Advisory Board

From My High School:

Mr. Montgomery

Mr. Calihoo

Mrs. Bondarchuk

And:

my Mom and Dad

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Hello!

My name is Ainslie Senger.

I am a Summer Research Program student in the Linguistics department in 2020. I attend Barrhead Composite High School in Northern Alberta.

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1. Placement Basics

Let’s introduce you to my summer research experience

“The job of the linguist, like that of the biologist or the botanist, is not to tell us how nature should behave, or what its creations should look like, but to describe those creations in all their messy glory and try to figure out what they can teach us about life, the world, and, especially in the case of linguistics, the workings of the human mind.”

-Arika Okrent, Linguistics PhD

Basics

- Linguistics is the scientific study of language
- It is the study of how language functions
- It has many fields

Specifics

- I am working in the Alberta Phonetics lab
- Phonetics is the study of the physics and perception of the sounds that make up words[1]
- I am working with Dr. Nijveld
- She is studying how bilinguals process spoken words[2]

Do bilinguals process spoken words differently?

When compared to monolingual listeners

What Has Been Done

- This project is based on Dr. Nijveld and her colleagues are currently working on a study of how bilinguals recognize spoken words[2]
- They have been working on a massive project containing data from 1,013 listeners from 46 individual language backgrounds (L1's)

1,038,281

That is how many responses their study contains.

The Groups

Monolinguals:

- Only English under 5
- Serve as a control group
- 440 people

Bilinguals:

- A second language other than English under 5
- 46 different first languages (L1)
- 573 people
- The bilinguals were split into groups based on the age they learned English:
  - Early: 1-3 years
  - Mid: 3-7 years
  - Late: 8+ years

The Task

Participants listened to auditory stimuli and indicated whether they thought it was a real or made up English word (“lexical decision task”), e.g.:

“happiness” → word!

“contrusion” → not a word!

Responses were monitored for speed (Reaction Time in milliseconds) and accuracy

What I Did to Help

Unexpected Results

Dr. Nijveld found an unusual pattern in her data, and we collaborated to try and understand why it happened.

Literature Study

I searched, read, and summarized relevant papers. Dr. Nijveld and I then formulated a hypothesis to explain the pattern.

Follow-up Analysis

Dr. Nijveld manipulated the data to see if our hypothesis was true or false.

Neighborhood Density

What is ND

Neighborhood density (ND) is determined by the number of words that can be created by changing one phoneme of a word, like *cat, sat, at*. These words are all neighbors.[3]

Why Does it Matter

The more neighbors a word has, the more words compete with it when someone tries to identify it. This results in slower and/or less accurate word recognition when listening.[3]

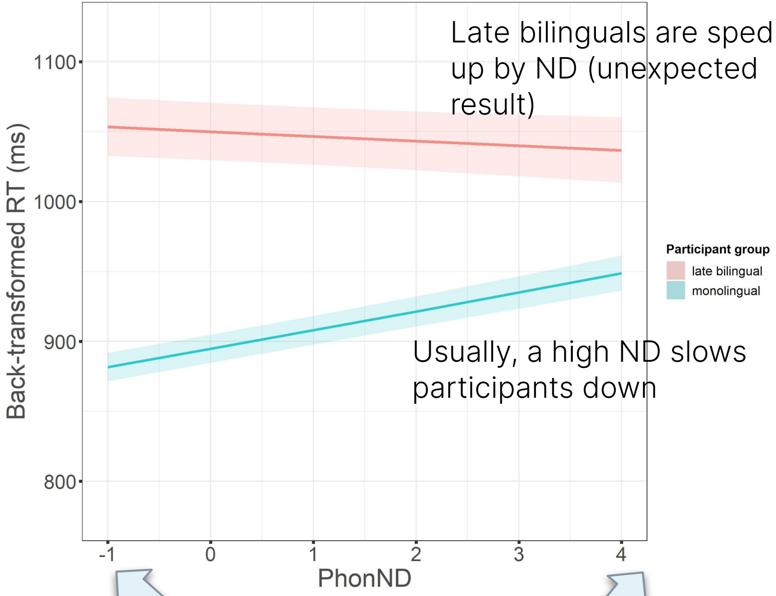
Details

This is how ND works in English, as an inhibitory effect. However, the literature points to this effect operating differently in some languages.[3]

Unexpected Results

Specifics

When looking at the effect of ND, the data showed an unusual pattern among part of the bilinguals (illustrated for RTs here)



Neighbourhood Density
Low → High

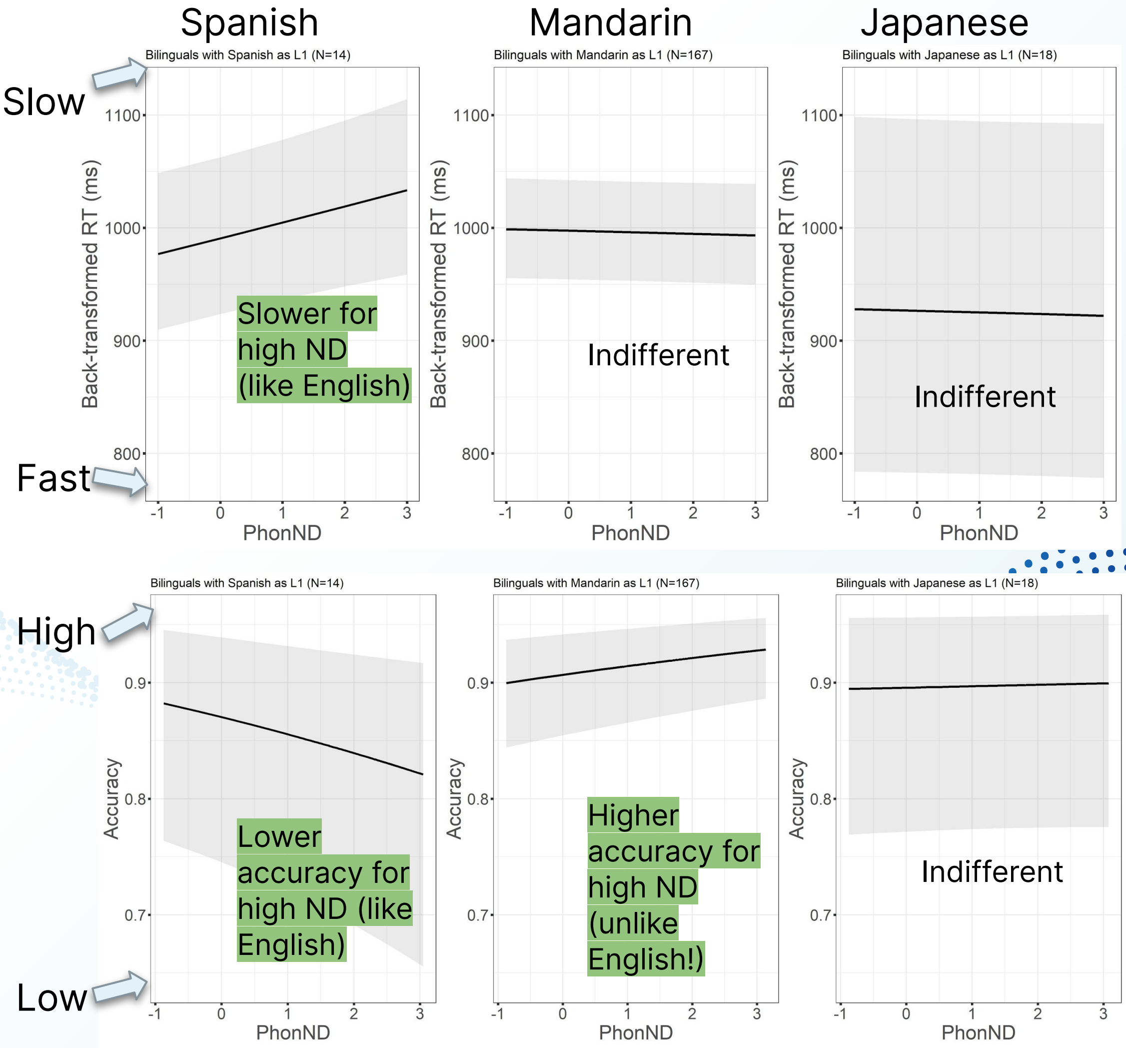
Hypothesis

Could our unexpected pattern be caused by the bilingual participants' specific language background (L1)?

Findings

Through our reading we knew that Spanish[4] , and possibly Mandarin[5] and Japanese[6,7] have a different ND effect than English: perhaps this affected our results. So, we subsetted the bilingual data by these languages and examined ND effects in these subgroups.

Contrary to our expectations, Spanish showed the <u>same</u> ND effect as English. Japanese showed no effect of ND, and Mandarin showed a <u>different</u> ND effect than English in accuracy.



Going Forward

Our analyses showed that Spanish L1 bilinguals did not behave as we hypothesized. Mandarin did.

The Spanish group was small, and with more participants these listeners may show the hypothesized result.

Future research should reveal something more about how ND effects in bilingual English may be influenced by bilinguals' L1.

Perception Lab

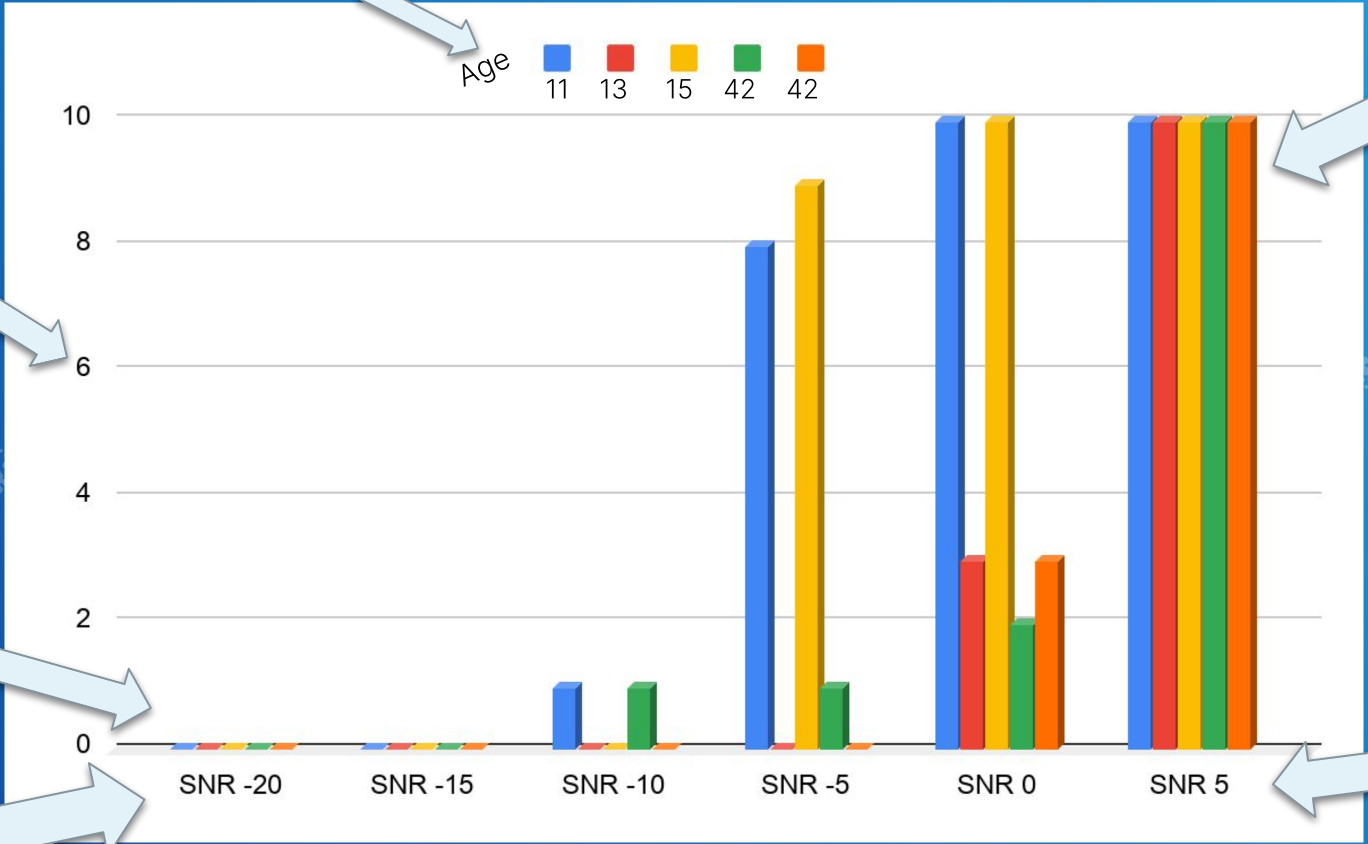
After looking at Dr. Nijveld’s study I created and ran a small-scale perception experiment of my own

The Experiment

- I wanted to see the relationship between speech perception, noise level, and age.
- Using speech manipulation software (“Praat”)[8] , I recorded a sentence and added various levels of background noise using a script.
- Participants from my family listened to the sentences consecutively through headphones going from most to least noise, and transcribed any words they heard for each sentence.

Results

These are the participants, separated by colour



Words Heard, of the 10 present

Here no one heard or understood any words

Most Noise

Here everyone heard and understood all 10 words

Most Signal

The SNR represents the word's loudness relative to the background: Signal to Noise ratio.

Summary of Perception Lab

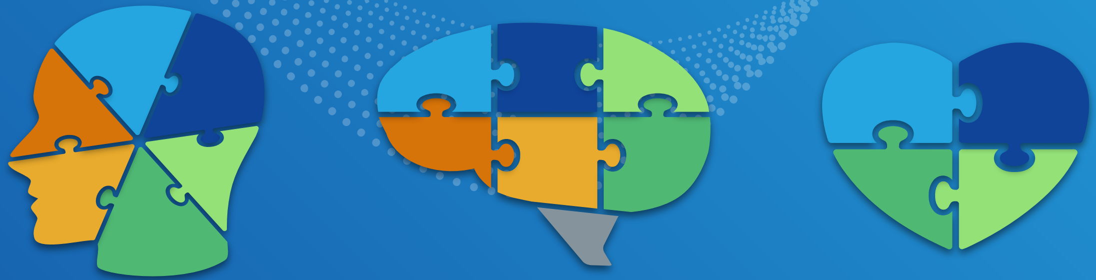
- There was no clear relationship between speech perception and age
- Speech perception was clearly better for lower noise levels
- Despite small scale, I was able to conduct all steps of an experiment

Related activities

- Citiprogram Ethics Training (for working with participants)
- Participated in online Wordlikeness study of the lab (to understand participant's perspective)
- Learned Basics of Praat (software used in experiment)

My Experience

A summary of what I learned on my summer vacation



Challenges and Take-Aways

This year the program ran online due to COVID-19. This shifted the dynamics away from in person experiences and towards digital media exploration. Despite these circumstances, I have made friends and connections while learning a wealth of new skills.

- I got to experience research
- I met professionals in STEAM
- This program allowed me to explore possible future life paths
- I was able to discuss life and education with various mentors and role models

References

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