



How does relative pitch affect a person's ability to reproduce or pronounce languages?



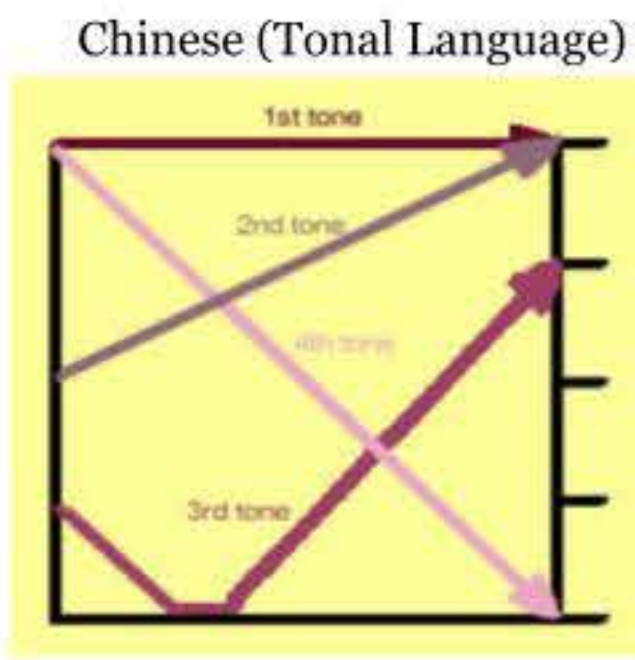
Aim:
To investigate if relative pitch can affect a person's ability to reproduce or pronounce languages.

Why we did this project:
This topic appealed to us, as we both learn music and speak an asian language. We came up with our project when we saw that some studies showed that East-Asians were more likely to develop relative pitch.

Relative pitch: the ability to identify or recreate a given musical note by comparing it to a reference note and identifying the interval between the two notes. An interval is the distance between two tones.

Types of languages:

- *Tonal language*
(language when words can differ in pitch, e.g. Chinese)
- *Pitch language*
(languages that have a pitch or a tone on a stressed syllable or vowel, e.g. Japanese)
- *Non-tonal language*
(Languages that are not affected by tone, e.g. Spanish)



In Chinese, a tonal language, there are four basic tones (as seen in the diagram above) and a neutral tone.

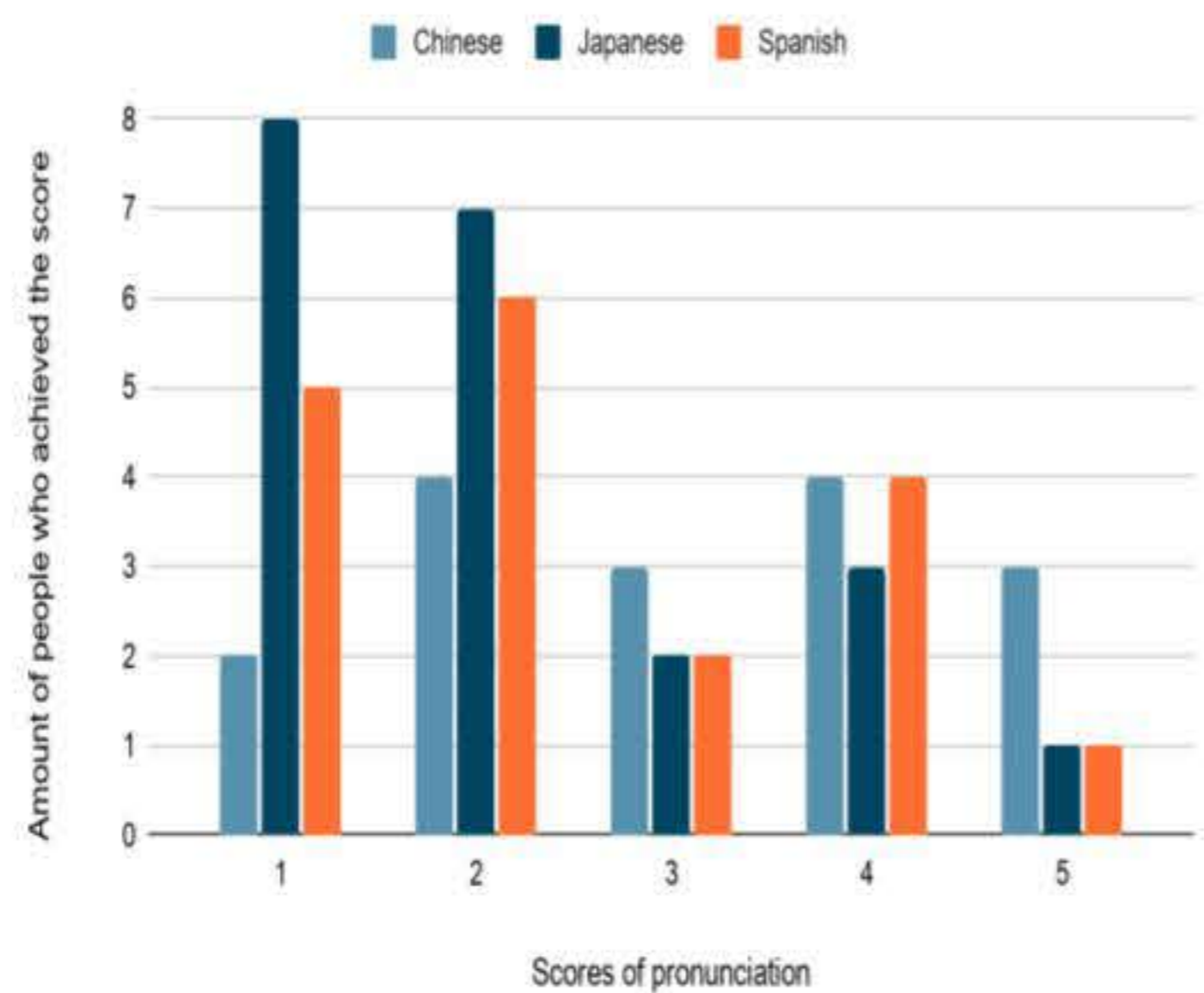
Experimental methods:
We conducted two experiments as paired data. We had a sample size of 54 junior students whose first language was English. Both tests were completed individually with participants to prevent bias or influence from other participants.

Experiment 1
Equipment: A tuner app (soundcorset), and an online keyboard.
- Each participant was played a reference note of middle C on the keyboard
- They were then required to sing three steps up to an E, five steps up to a G and then one step up to a D. If the participant had two or more correct notes, we recorded that the participant had relative pitch. If the participant had less than two correct notes we recorded that the participant did not have relative pitch.

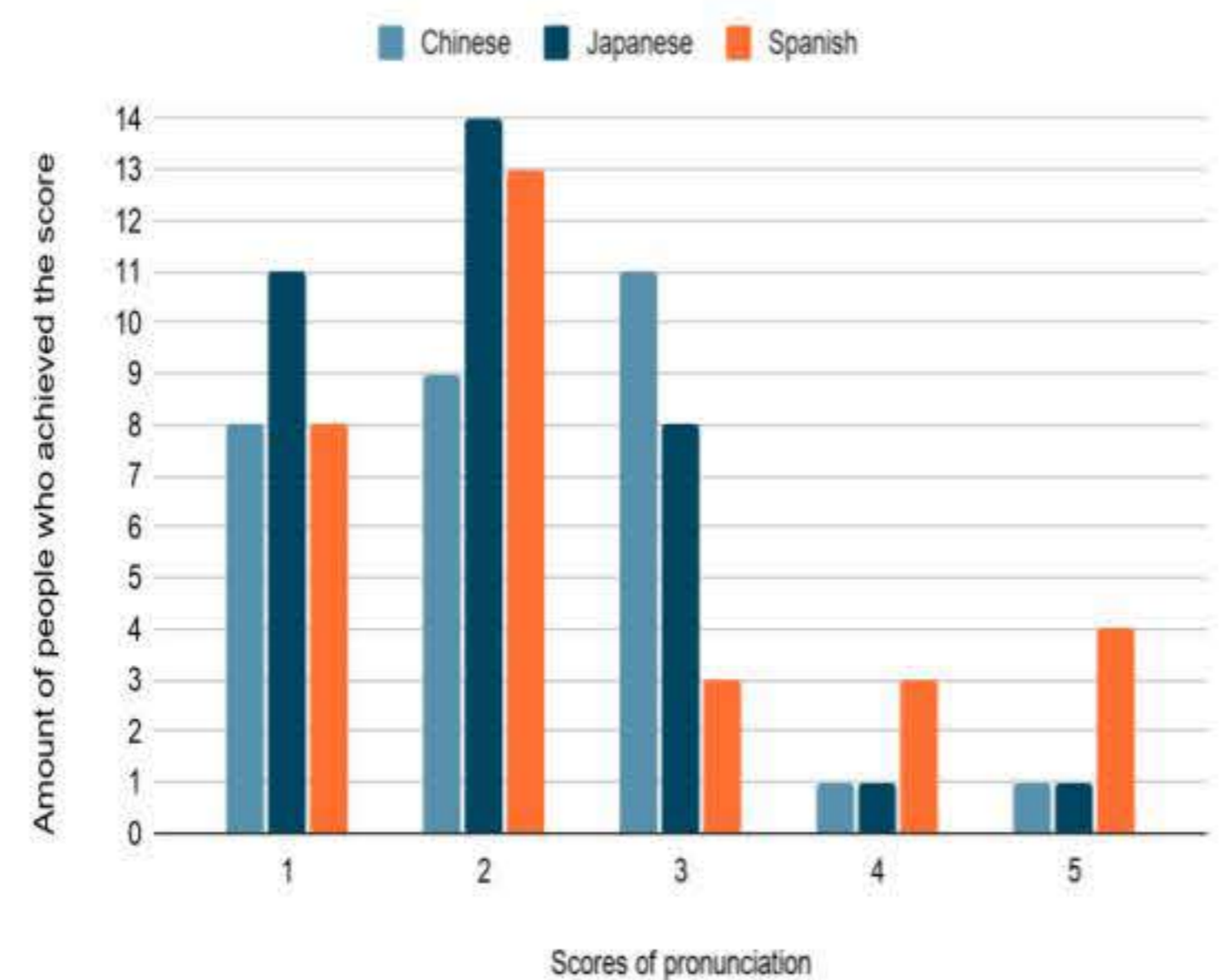
Experiment 2
Equipment: A recording device (phone), and pre-recorded sound files of native people of the specified first language speaking a chosen word.
- The pre-recorded word in Chinese was played three times for the participant.
- The recording device recorded their attempt to reproduce that word once.
- The recordings were analysed by a native speaker of the language who graded them on a five point scale.
- This process was repeated for Spanish and Japanese.

Results:

Graph 1: Number of people who achieved each score who have relative pitch



Graph 2: Number of people who achieved each score who don't have relative pitch



From graph 1 and graph 2 we can clearly see that there is a difference in the scores achieved between people who have relative pitch and people who don't have relative pitch. There were less people who got low marks (1 and 2) out of people who have relative pitch compared to people who don't have relative pitch and there were less people who got high marks (4 and 5) out of people who don't have relative pitch compared to people who have relative pitch. This shows that people who had relative pitch scored better than people who don't.

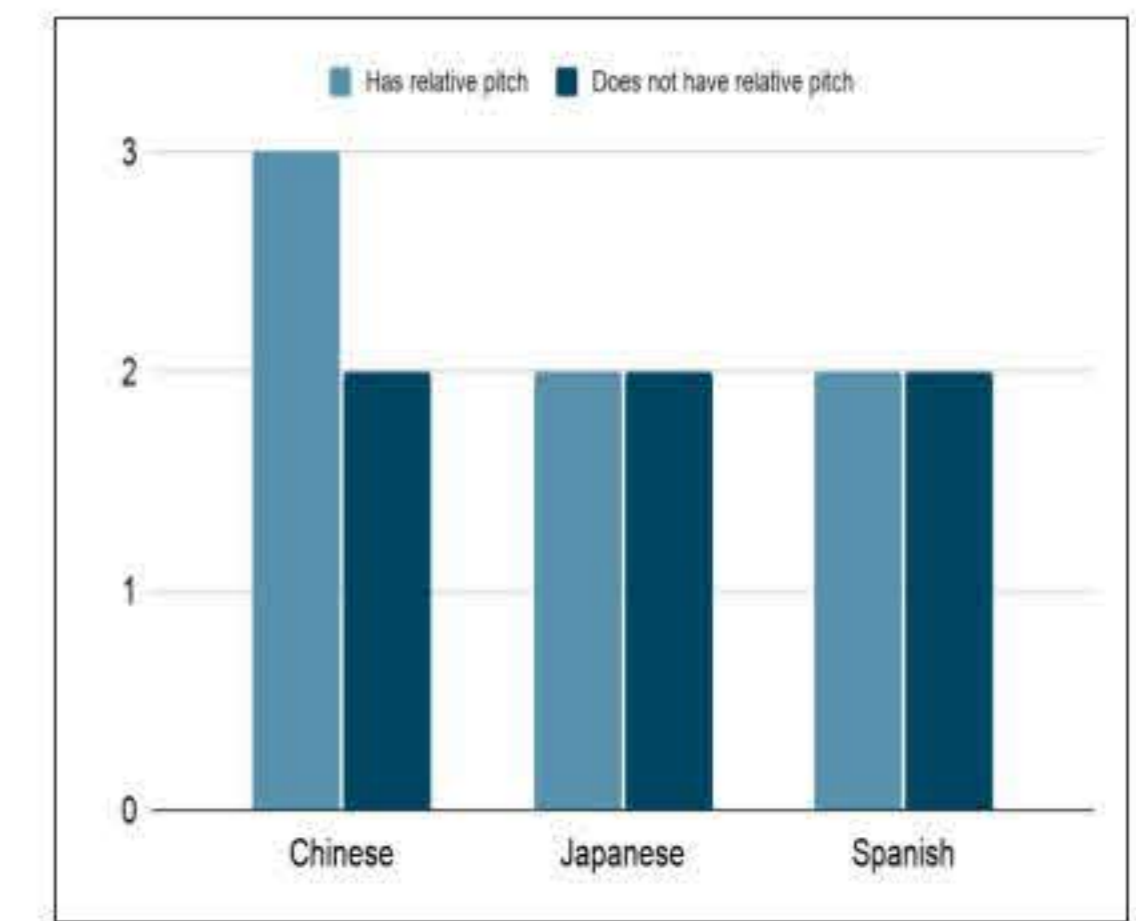
	Have relative Pitch (Median)	Do not have relative pitch (Median)	P values
Chinese	3	2	0.0488
Japanese	2	2	0.9442
Spanish	2	2	0.9442

We completed the Mann Whitney U test to compare our data from our relative pitch test and each of the three language tests for each participant to see if there was a statistical significance between people who have relative pitch and people who don't for each language.

Chinese:
The p value is 0.04883 which is less than the p value of 0.05. This result is therefore statistically significant. We reject the null hypothesis that "Chinese is not affected by relative pitch".

Japanese & Spanish:
The p value of both the languages are over the p value of 0.05 (both are 0.9442), therefore the result is not statistically significant.

Graph comparing the median scores of participants with and without relative pitch, per language



Chinese:
- The participants with relative pitch reproduced Chinese, " a tonal language" the best.
- Chinese had the biggest difference in the scores

Japanese and Spanish:
- The participants with relative pitch had the same median score of Japanese and Spanish " a non-tonal language and pitch language" as the ones without.

Conclusions:
Languages that **are** affected by relative pitch: Chinese, (tonal languages)
Languages that **are not** affected by relative pitch: Spanish, (non-tonal languages) and Japanese, (pitch languages)

Hypothesis: Relative pitch only affects language which use tone in their language, such as tonal languages, since relative pitch makes one's hearing of tone in a word and pronunciation of tone better and easier. Other languages who don't use tone in their languages, such as non-tonal languages like Spanish, don't have any tones on words for people with relative pitch to have better hearing of it or better reproduction.

We believe elements of music relative pitch could be added to the learning of tonal languages to potentially improve the learning of a new language. People may be encouraged to learn a language that may be easier to learn for them due to their musical ability as well. We believe this is especially important now, as Ireland is becoming more diverse.