

IPRO 343: Improving Communication Quality of the Drive-thru Experience

ISSUE

- Low customer satisfaction ratings in quick-service restaurant industry due to inaccuracy in order taking

PROBLEM

- Conflicting speech signals confuse order-takers in drive-thru environment

HYPOTHESIS

- Addition of white noise to babble will improve speech intelligibility, as measured by order taking accuracy

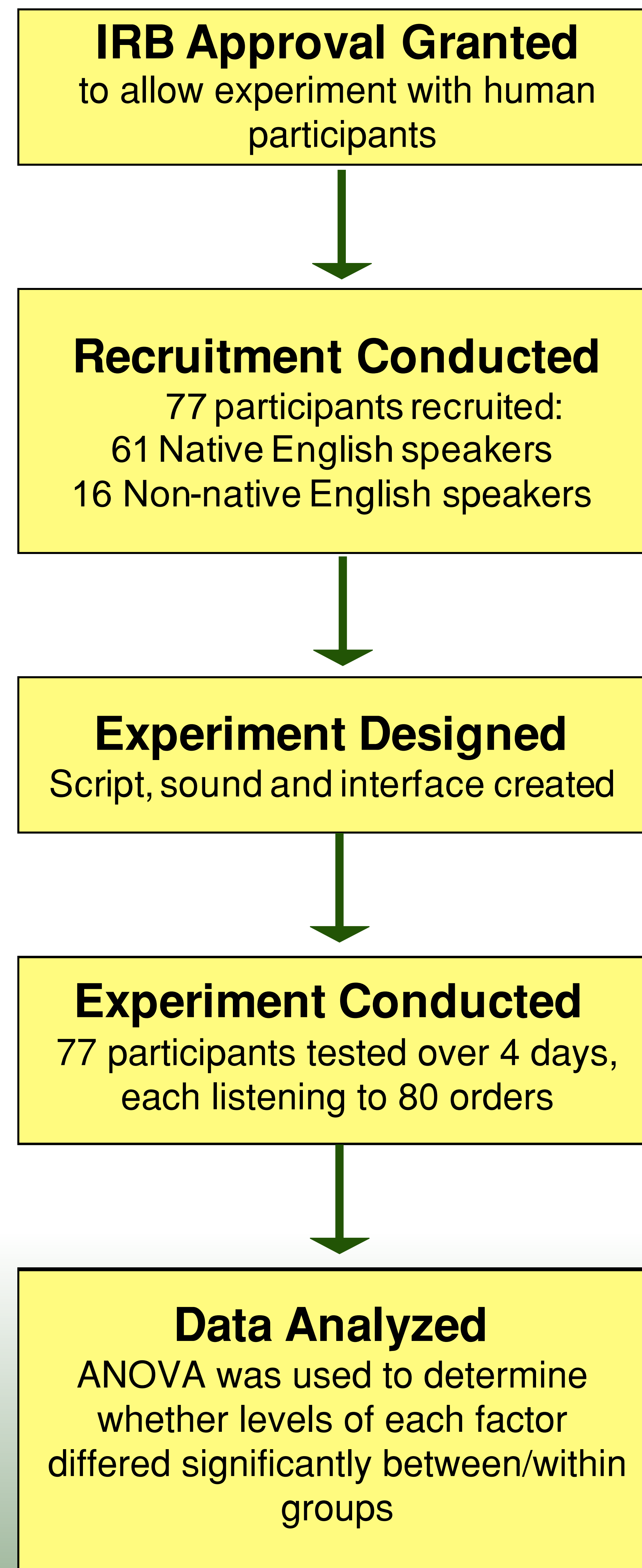


Question: How can we modify the signal to allow the listener to focus on one speech stream?

Answer: Literature review pointed to white noise as a possible solution. Let's take a look at how white noise masks distracting babble.



EXPERIMENT PROCESS



TEAM ORGANIZATION



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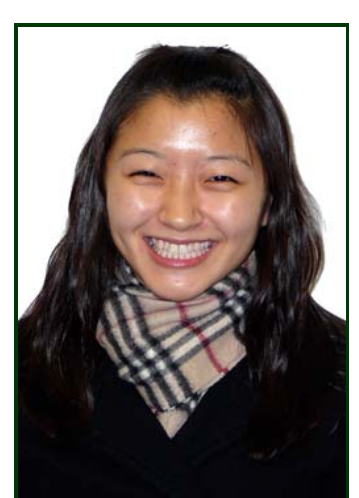
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EXPERIMENT OVERVIEW

Order accuracy was seen as an index of speech intelligibility; therefore:

- Participants listened to 80 orders and indicated what they heard
- Participants were rated based on the time taken and the accuracy of order capture

SOUND CREATION

- **Babble** - four speakers were recorded simultaneously reading different articles from the Chicago Tribune newspaper
- **White Noise** - (TV static) Broadband noise between 100Hz and 10,000Hz was generated using a program called Praat
- **Stimulus** - fast-food orders were recorded by 6 native English speakers. A sample order was "I'd like a number 2, with cheese, without pickles and a diet coke and fries"

PARTICIPANTS

- 77 participants --16 non-native speakers
61 native speakers
- Additional demographics taken:
 - handedness
 - age
 - hearing ability
 - native language

SOUND CONDITIONS

Participants listened to orders under four sound conditions:

	Low Fidelity (Filtered Sound, ie. telephone quality)	High Fidelity (no filter)
Babble	20 Questions	20 Questions
Babble + White Noise	20 Questions	20 Questions

INTERFACE

The 80 orders were then embedded into a PowerPoint interface, allowing participants to complete the experiment at a computer workstation

For each order you hear, please circle, check, or cross out the appropriate word as in the example given below:

"I'd like a number 2, with cheese, without pickles and a diet coke and fries"

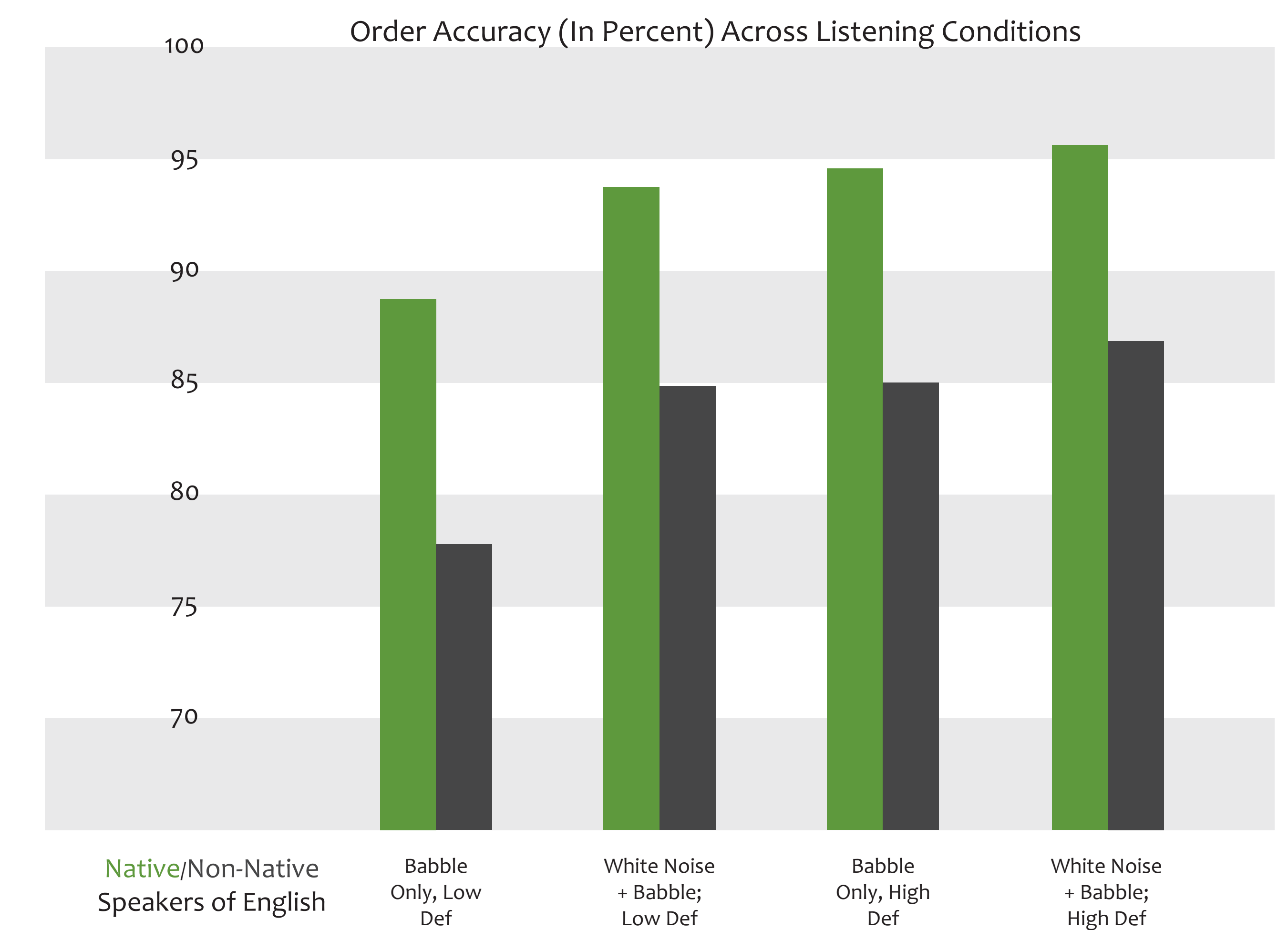
				For Official Use Only	
Q	I'd like a number:	Topping	Side/Drink	Total Correct	Time Taken
1	1 2 3 4 5 6 7 8 9 10	<input checked="" type="checkbox"/> Cheese <input type="checkbox"/> Beans <input type="checkbox"/> Peas <input checked="" type="checkbox"/> Pickles <input type="checkbox"/> Potatoes <input type="checkbox"/> Tomatoes	<input type="checkbox"/> Pies <input checked="" type="checkbox"/> Fries <input type="checkbox"/> Rice <input type="checkbox"/> Sprite <input type="checkbox"/> Coke <input checked="" type="checkbox"/> Diet coke <input type="checkbox"/> Lemonade <input type="checkbox"/> Gatorade		

Press ENTER to continue...

RESULTS

The results support the original hypothesis and indicate:

- White noise improved intelligibility
- Better fidelity improved intelligibility
- Native speakers scored higher on average
- White noise improved intelligibility for native and non-native speakers



CONCLUSION

White noise generation improves speech intelligibility and can be implemented at low cost and with little effort