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# The Impact of Intonation on Memory Retention

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01

# Introduction

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# What is vocal tone?

- Vocal patterns that are used to communicate
- Prosody: The fluctual patterns of how someone speaks
- Certain tones are used to portray certain emotions
- No change in tone/stable tone is known as 'monotone'

# History of Tone Research

- Past research studied tone effects in the classroom (Schiller et al. 2024)
- Tone perception also studied when there are native and non-native speakers in the conversation (Tsurutan 2016)
- Tone research was conducted to analyze the emotional influences it could convey (Block et al. 2009)
- Tone effects on memory was also conducted
  - This is called: **Echoic Memory** (Nuñez 2019)
- Past research indicates that tone does in fact affect memory and levels of attention
- Tone matters across diverse groups of people as different tones used to say the same word are perceived differently

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# Present Study

- Analyzes the differences of short-term echoic memory recall between monotone and excited tones
- Using different tones can garner different attention levels from participants and conclude the effect tone truly has on memory recall
- Memory recall data will be collected via reading quiz after listening to the prompt in a given tone

# Hypotheses

- **Main:** Listeners of the excited tone will retain more of the story due to more fluctuating prosodies garnering more attention
- **Null:** Listeners of both tones will have no significant differences
- **Alternative:** The monotone listeners will recall more of the story than excited tone listeners

# Key Terms

- **Echoic Memory:** Memory of things that were spoken or heard
- **Memory Recall:** The capacity to remember things
- **Prosody:** The fluctuation patterns of one's intonation
- **Monotone:** Known as no tone, is actually single tone that's consistent

02

# Methods



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# Participants

- 20 participants
- Split into two groups either monotone or excited
- 14 female
- 6 male

# Materials

- Two AI generated voices to read the story
- One was an “excited” tone
- One was “monotone”
- Online wheel spinner
- Two macbooks
- Device for test



Ex: excited tone used in the  
experiment

# Materials

What was Lily's reaction when she finally found her keys? \*

- A) She laughed.
- B) She scolded her pet.
- C) She sighed in relief.
- D) She ignored her pet.

What did Lily do after finding her keys? \*

- A) She continued searching her apartment.
- B) She gave her pet a head scratch.
- C) She made breakfast.
- D) She decided to skip work.

What did Lily say to the pet after finding the keys? \*

- A) "Thanks for the help!"
- B) "You're lucky you're cute."
- C) "Bad pet!"
- D) "Let's play later."

How does the story end? \*

- A) Lily gives up looking for the keys.
- B) Lily leaves the apartment happily.
- C) Lily decides to stay home.
- D) Lily finds out her boss also lost their keys.

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- Google form
  - 16 questions
  - 1 filter question to ensure participants responded to questions to their best know
- Based on the story
- Story & questions were AI generated

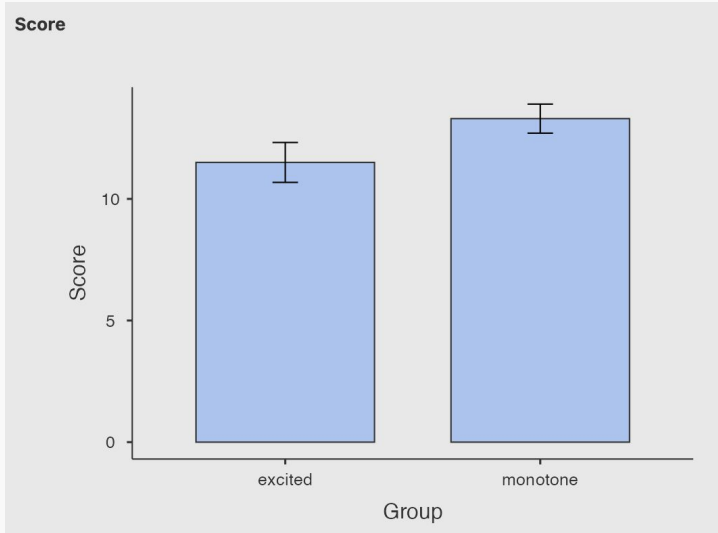
# Procedure

- 2 participants taken into testing room
- Researcher spins the wheel
  - Odd # → Excited tone
  - Even # → Monotone
- Only 1 trial for each participant
- Participants listen to story out loud for 1 min 38 sec
- After story is done take test right away
  - 5 mins to complete test
- Once experiment is complete data analysis begins

03

# Results

# Statistical Analysis



- range: 0-16
- monotone
  - ◆  $M = 13.3$
  - ◆  $SD = 1.89$
- excited
  - ◆  $M = 11.5$
  - ◆  $SD = 2.59$
- monotone avg. quiz score > excited avg. quiz score
- what does that indicate?

## Independent Samples T-Test

### Independent Samples T-Test

	Statistic	df	p	Mean difference	SE difference	Effect Size		
Score	Student's t	-1.77	18.0	0.093	-1.80	1.01	Cohen's d	-0.794

Note.  $H_a \mu_{\text{excited}} \neq \mu_{\text{monotone}}$

### Group Descriptives

	Group	N	Mean	Median	SD	SE
Score	excited	10	11.5	11.5	2.59	0.820
	monotone	10	13.3	14.0	1.89	0.597

→ p-value > 0.05

→ finding?

Did the Data Support Our  
Hypothesis?



# Did the Data Support Our Hypothesis?

No, the data failed to reject the null hypothesis.

- if  $p\text{-value} < 0.05$ , then monotone is better at memory recall
  - ◆ how so?
  - ◆ weakened research significance
    - storytelling, audible books

04

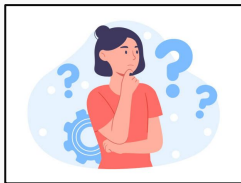
# Conclusion

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# Conclusions: Vocal Tone Effects on Memory Recall

- **Research Objective:** Does short-term echoic memory recall differ between monotone and excited vocal tones?
- **Experimental Hypothesis:** Excited vocal tones will lead to better short-term memory recall compared to monotone tones.
- Not statistically significant, supporting the null hypothesis and failing to show that excited tones enhance memory recall over monotone tones.
- Findings contrast with studies suggesting vocal tones enhance memory recall, suggesting other factors like content relevance or listener engagement may be more critical (Hong et al., 2012; Greene et al., 2008).



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# Present Study Implications: Limitations & Future Directions

## Limitations

- Small sample size ( n = 20)
- Potential biases from individual differences in memory ability (not pre-tested for baseline memory performance).
- Limited scope: single story & two vocal tone conditions
- Audio-only stimuli excludes potential multi-sensory effects (e.g., visual cues) that may influence memory

## Improve Study Design

- Randomize exposure within the same participants (e.g., a within-subjects design where each participant experiences both monotone and excited tones) to reduce individual differences as a confounding variable.

## Future Directions

- Test Different Story Types: Use stories with varying levels of emotional content or complexity to determine if these factors interact with vocal tone to influence memory.
- Measure Engagement Levels: Incorporate measures like self-reported engagement or physiological markers (e.g., heart rate) to understand how vocal tone affects listener attention.
- Combine Modalities: Introduce visual elements (e.g., subtitles or illustrations) alongside the audio recording to examine whether multi-sensory integration enhances memory.

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# Discussion Questions



# Thoughts on Research?

## Narratives

- have two stories for each variable
  - ◆ 2 excited,
  - ◆ 2 monotone

## Testing

- presenting the questions in mixed order

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→ Diversify story genres (e.g., emotional, factual) to explore their interaction with vocal tones.

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→ Include a baseline pre-test to measure participants' initial memory abilities for better comparison.

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→ Test memory recall at multiple intervals (e.g., immediately after, one day later) to assess potential long-term effects of vocal tone.

# References

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- Block, S. D., Greenberg, S. N., & Goodman, G. S. (2009). Remembrance of Eyewitness Testimony: Effects of Emotional Content, Self-Relevance, and Emotional Tone. *Journal of Applied Social Psychology, 39*(12), 2859–2878. <https://doi.org/10.1111/j.1559-1816.2009.00553.x>
- Greene, C. M., Eastwood, J. D., & Smilek, D. (2008). Effects of vocal music, instrumental music, and irrelevant speech on working memory. *Cognition and Emotion, 22*(8), 1387–1392. <https://doi.org/10.1080/02699930701774941>
- Hong, J., Tan, Q., & Tan, S. H. (2012). Neural correlates of emotional prosody and verbal memory: An event-related potential (ERP) study. *Cognitive, Affective, & Behavioral Neuroscience, 12*(1), 72–84. <https://doi.org/10.3758/s13415-012-0132-8>
- Nunez, K. (2019, November). *What Is Echoic Memory, and How Does It Work?* Healthline; Healthline Media.  
<https://www.healthline.com/health/echoic-memory>
- Schiller, I. S., Breuer, C., Lukas Aspöck, Ehret, J., Bönsch, A., Kuhlen, T. W., Fels, J., & Schlittmeier, S. J. (2024). A lecturer's voice quality and its effect on memory, listening effort, and perception in a VR environment. *Scientific Reports, 14*(1). <https://doi.org/10.1038/s41598-024-63097-6>
- Tsurutan, C. (n.d.). <https://files.eric.ed.gov/fulltext/EJ1247031.pdf>
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