

# Speech Pause Dynamics and Anxiety



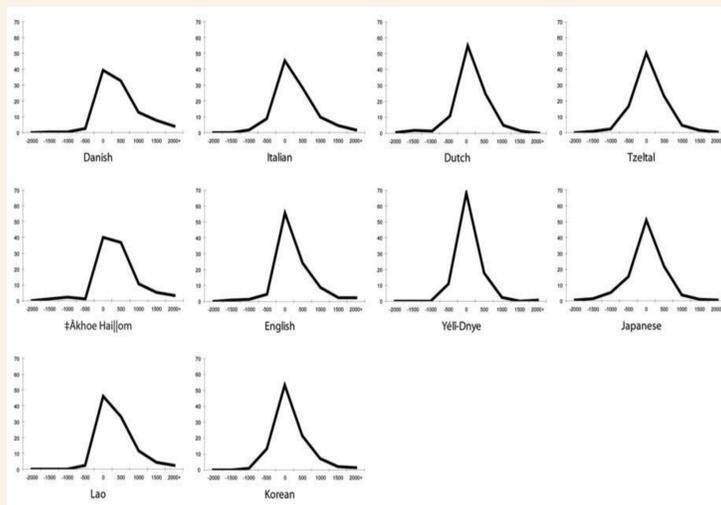
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## Introduction

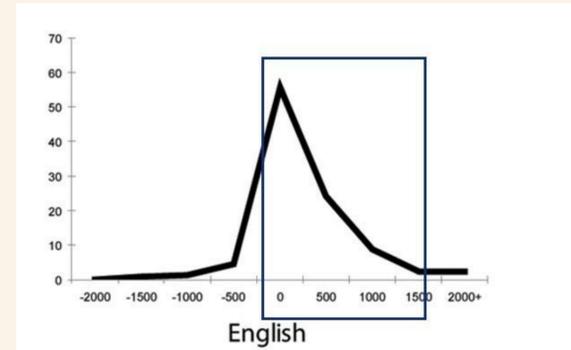
- Non-verbal aspects of speech, especially pauses, are an important part of speech communication. Individuals arrive at inferences regarding their interactants' intentions and emotions based on the pause patterns of their speech.
- Perceptions of pauses in conversation are simple or objective. Indeed, perceptions of inter-turn pauses, much like temporal perception as a whole, are unique and subjective to each individual. Distortions in temporal perception can be caused by mental health conditions, cognitive load, or physical strain (Eysenck, 1992; Grondin et al., 2006).
- Anxiety disorders are one group of mental health conditions that can impact perceptions of inter-turn pause length. The effect of anxiety on speech perception and cognition is important to study because it can produce new knowledge on the subject, which can prove beneficial for developing new diagnostic and treatment strategies. It can also help deepen our understanding of the social implications of speech cognition and perception.

Based on the above, we aimed to investigate the following questions:

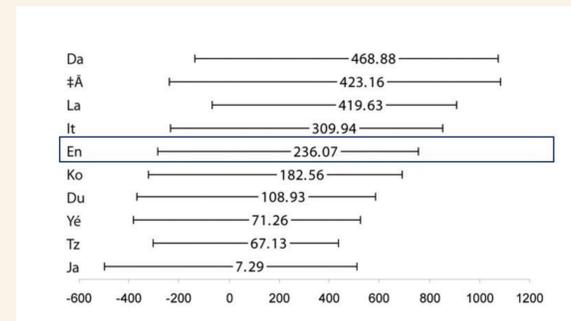
- What is the approximate pause length that would be considered "too long" for an inter-turn pause in conversation?
- How does generalized anxiety this threshold of acceptable inter-turn pause duration?



*Histograms depicting turn-transition durations across 10 languages examined by Stivers et al. (2009). x axis indicates durations in msec (negative values show overlap and position values show gaps). y axis indicates the proportion of occurrences of each gap length*



*Histogram of turn-transitions among the American English sample in Stivers et al. (2009). x axis indicates durations in msec (negative values show overlap and positive values show gaps). y axis indicates the proportion of occurrences.*



*Mean durations of turn transitions across 10 languages analyzed by Stivers et al. (2009). x axis depicts the languages, while y axis depicts the gap/overlap time.*

## Analysis/Results

We conducted a logistic regression analysis with the following variables as predictors:

1. The pause between question and answer (lag)
2. The generalized anxiety score for each person (GAD)
3. The social anxiety score for each person (LSAS)
4. The response latency for each question (atime)
5. The unique temporal bisection point for each person (TBP)

Interactions: lag\*GAD, lag\*LSAS, lag\*atime, lag\*TBP

As predicted, lag had a significant main effect on the outcome variable. As the pause between the question and answer increased, the odds that a participant's response would change from no to yes increased. The lag predictor's effect on the likelihood of a "yes" response was impacted by general anxiety. By contrast, social anxiety scores had no statistically significant effect on the relationship between lag and likelihood of a yes response. Additionally, higher temporal bisection points correspond with a higher likelihood of a "yes" response at the same pause length. Finally, the average response latency of each question was also a statistically significant predictor that was inversely proportional to the odds of a "yes" response to the outcome variable.

## Discussion

- Findings can have important social implications: results help explain differences in pause interpretations in people with anxiety.
- This study also illustrates how the threshold of acceptable pause duration varies across people due to individual variations in the subjective accuracy of elapsed time.
- The results of this study also provide evidence that determinations of acceptable inter-turn pause durations are made based on the expectations surrounding the question asked. Questions perceived as more difficult to answer or more complicated may allow for a longer grace period among interactants.

## Methods

Participants (n=72) completed two behavioral tasks two questionnaires.

- Task 1: "Too Long" Task
  - Participants listened to 21 Q-A pairs with incrementally increasing pauses (600 msec to 1500 msec) and indicated whether the pause was "too long" (yes or no) for each pair.
- Task 2: Temporal Bisection Task
  - This task is commonly employed to measure the alignment between the objective passage of time and an individual's subjective processing of elapsed time (Kopec & Brody, 2010). Participants were exposed to auditory stimuli of 2 durations (400 msec and 1600 msec), described as "long" and "short" sounds (TBT; Wearden, 1991). Next, they were exposed to various stimuli of varying durations (400 msec to 1600 msec) and tasked with indicating whether it was closer in duration to the short or long stimulus (e.g., Allan & Gibbon, 1991; Droit-Volet & Wearden, 2001; Liu et al., 2022; Valerio de Arruda et al., 2024).
- Questionnaire 1: LSAS-SR
  - The LSAS-SR (Liebowitz Social Anxiety Scale) quantifies the symptoms of social anxiety disorder (Liebowitz, 1987). This questionnaire has 24 items and a maximum score of 144.
- Questionnaire 2: GAD-7
  - The GAD-7 (Generalized Anxiety Disorder-7 scale) is a 7-item questionnaire that quantifies the symptoms of general anxiety disorder.

## Visualizations of Selected Results

