Temporal Dynamics of Recognition and Attention in Busy Listening Environments

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Background

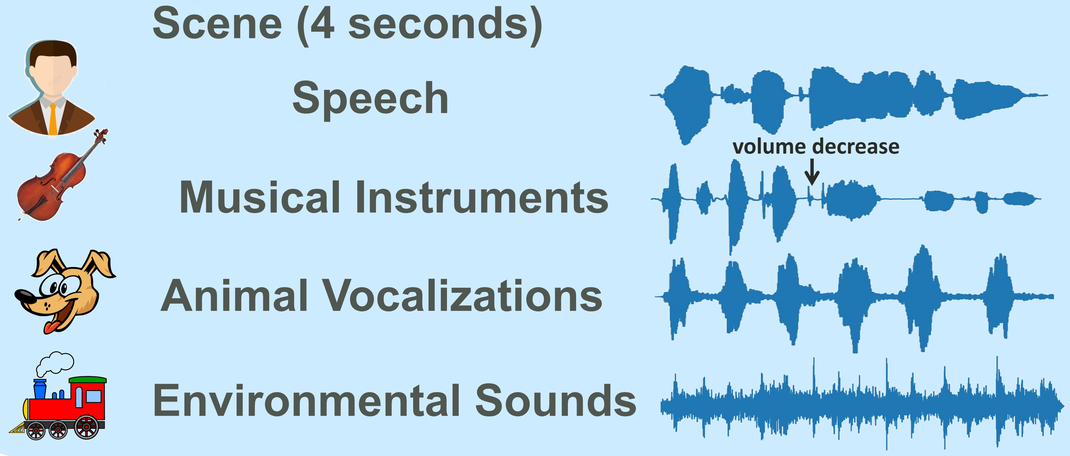
- Humans can distinguish and separate sounds from different sources and attend to one of them in busy listening environments (known as the **cocktail party problem**).
- Auditory **change-detection** tasks are used to explore how people perceive sounds in complex auditory scenes.
- Paying attention to change-relevant objects is crucial for successfully detecting acoustic changes.
- It is unclear whether we need **time** to guide or pay attention to the sound or recognize the sounds before we can detect a change.

Aims

- To explore the temporal dynamics of change detection in busy listening environments
- Examine whether changes can only be detected after participants have had enough time to recognize the sound

Methods

visual word cue



response: change or no change

Stimuli

- Four separate sounds from different superordinate categories were played simultaneously for 4 seconds.
- Volume changes were pseudo-randomly spaced in time (with an equal number of changes in each 500ms window, starting at 0.5s and ending at 3.5s).

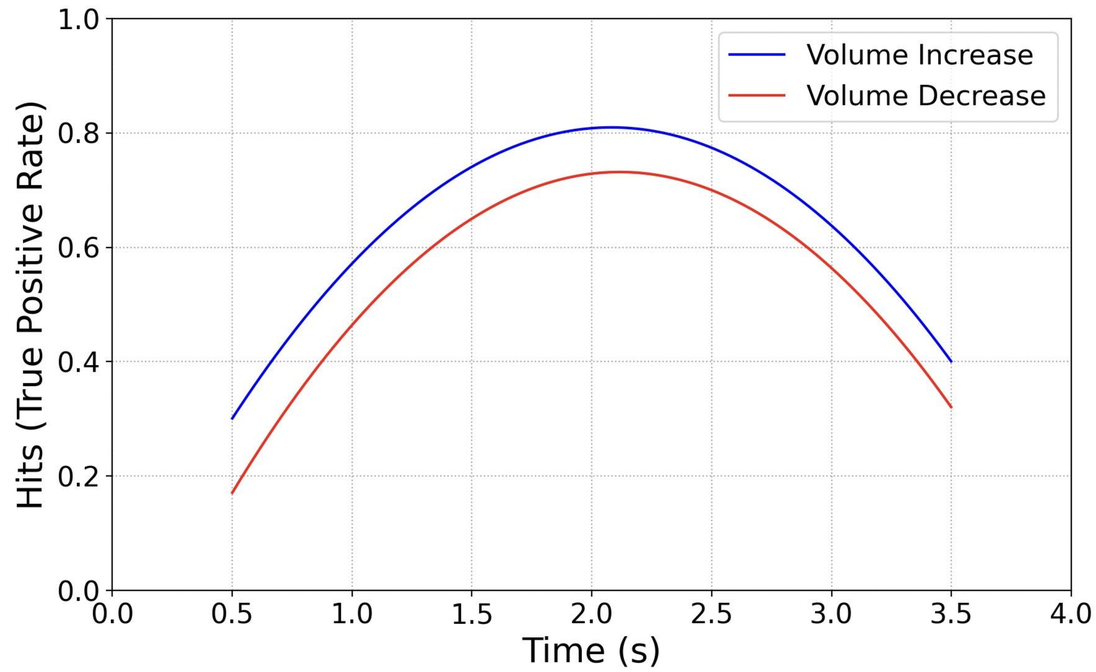
Procedure

- Participants are provided with a visual word cue that directs their attention to one of the sounds and asked to detect whether a volume increase or decrease occurred in that sound.

Planned Analysis

- Accuracy and reaction time will be averaged over sliding windows to assess the temporal dynamics of recognition and attention.
- Analyse the differences in accuracy rates for detecting volume increase and volume decrease.

Predictions



Predicted inverted U-shape for change detection accuracy over time

- There will be an inverted u-shape over the course of the trial, with poor change detection for the 500ms after onset and 500ms preceding the offset and a mid-point when people are skilled at detecting changes.
- Volume changes are better detected after participants have **had time to recognize the sound** or sufficient time to evaluate the volume decrease or increase.
- Volume changes are better detected when people have recognized the sound and also **have enough time to listen to the changed volume**.
- The hit rates for detecting volume increase will be higher than that of detecting volume decrease.

References

[1] Shimozaki, S. S., Chen, K. Y., Eckstein, M. P. (2007). Journal of Vision, 7(12), 10-10.

[2] Ross, B., Hillyard, S. A., & Picton, T. W. (2010). Cerebral Cortex, 20(6), 1360-1371.[3] Mara, T.A., et al. 2019. SIAM Journal on Scientific Computing, 41(1), pp.A316-A338