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# TIMING OF HEAD TURNS TO UPCOMING TALKERS IN TRIADIC CONVERSATION

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## ABSTRACT

In conversation, people listen to an utterance and respond within a few hundred milliseconds, suggesting that interlocutors make use of predictions about when the talker is about to end. We examined whether listeners that are simply following the conversation also predict the turn end in order to shift attention appropriately with the turn switch. Triads of older adults conversed in different levels and types of noise. Analysis focused on the observer during turn switches between the other two parties using head movements to identify when their focus moved from one talker to the next. For non-overlapping turn switches, head movements were tightly clustered around the onset of the new speaker. However, observers turned before the prior talker had even finished speaking in 17% of turn switches. For overlapping utterances, observers started to turn toward the interrupter before they interrupted in 18% of turn switches. Timing of head turns was largely unaffected by noise type and level. These findings demonstrate that listeners try to catch the start of new contributions to a conversation and in doing so often exhibit head movements that anticipate the end of one conversational turn and the beginning of another.

**Keywords:** *head turns, conversation, timing, anticipation.*

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## 1. INTRODUCTION

During conversation, interlocutors leave only a few hundred milliseconds between one person ceasing to speak and another making a reply [1]. This efficient exchange of conversational floor implies that listeners can accurately judge when another person is finishing their utterance. This inference relies on the assumption that simple reaction to the end of the utterance could not be that fast without some anticipation. When directly involved in such an exchange, it would be impolite to anticipate vocally, and so interrupt the current speaker. However, a third party observing the exchange is not so constrained in the redirection of their attention. Therefore, we looked at the third individual in a 3-way conversation at each exchange of floor to see whether they will turn their heads towards the new speaker before the previous speaker has finished.

## 2. METHOD

Groups of three talkers held free conversations in the presence of different levels of background noise, delivered by an array of 8 loudspeakers (Fig. 1). Close microphones monitored when each individual spoke and head trackers monitored their head movement. Further details of the experimental setup are described in [2].

The data were analysed using a purpose-written MATLAB program. In order to establish that a substantial proportion of head saccades were correctly associated with the head movements, chance associations were estimated by analysing the head rotation data from one session with the voice onset/offset times of different sessions. The average number of such chance associations are shown as red lines in Figs. 2 and 3. Using these numbers, binomial probability was used to calculate the probability distribution for different numbers of random associations and the yellow

lines in Figs. 2 and 3. show 95th percentile of this distribution as a threshold of statistical significance.

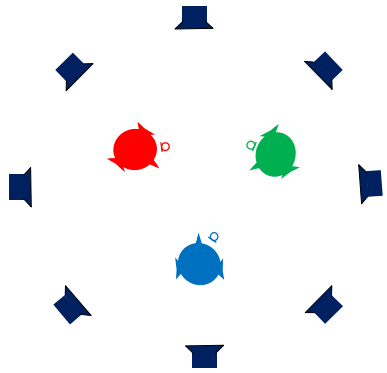


Figure 1. Three experimental participants arranged equilaterally within a ring of loudspeakers.

## 3. RESULTS AND CONCLUSIONS

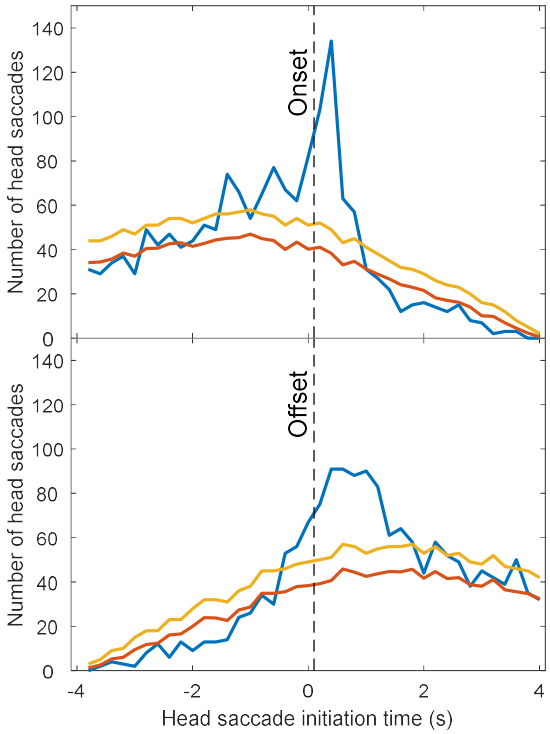
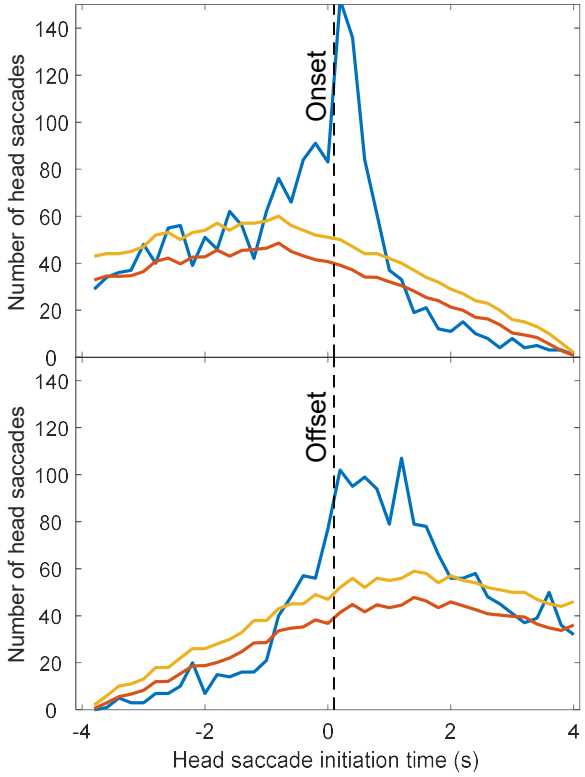



Fig 2. Blue lines: timing of head movements with respect to speech onsets and offsets in speech-shaped noise. Red lines: predicted number of coincidental head movements (i.e. chance). Yellow lines: derived threshold of statistical significance at $\alpha$=0.05.

Figs. 2 and 3 show the results for interfering babble and speech-shaped noise, respectively. Thee blue lines show the timing with which head movements were initiated (the onset times of head saccades) with respect to the time at which the current talker stopped talking (offset) and also with respect to when the next talker started talking (onset). The most striking finding is that initiation of head movements is tightly clustered around each of the two potential triggering events. This was particularly the case for speech onsets in speech-shaped noise. This result suggests that the listeners' behavioural objective is to maintain attention on the current talker, switching over to the new speaker as promptly as possible. The behaviour makes sense in terms of optimizing the benefit of lip reading.




Fig, 3. As Fig. 2, but for speech-shaped noise

For non-overlapping speech, observers turned before the prior talker had finished speaking in 17% of turn switches, demonstrating clear effect of anticipation. For overlapping utterances, observers started to turn toward the interrupter before they interrupted in 18% of turn switches. As shown in the figures, these rates of anticipation were significantly above chance.

## 4. CONCLUSION

When engaged in a real in-person conversation listeners try to catch the start of new contributions to the discussion, turning their heads towards an upcoming speaker. The head movements can anticipate the end of one conversational turn and the beginning of another.

## 5. ACKNOWLEDGMENTS

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## 6. REFERENCES

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