

INTRODUCTION

Components that influence a listener's ability to successfully attend to a signal in noise include:

- Auditory Object Formation
- Binaural Sensitivity

Auditory object formation (AOF) in normal-hearing (NH) listeners necessitates a set of grouping cues that provide the perception of a single auditory stream. However, when the stimulus is dichotic, AOF is limited when frequency-specific binaural channels are not matched¹.

Binaural sensitivity to interaural timing differences (ITDs) in bilateral cochlear implant (BiCIs) listeners is remarkably variable, and it is presently not understood why this variability exists².

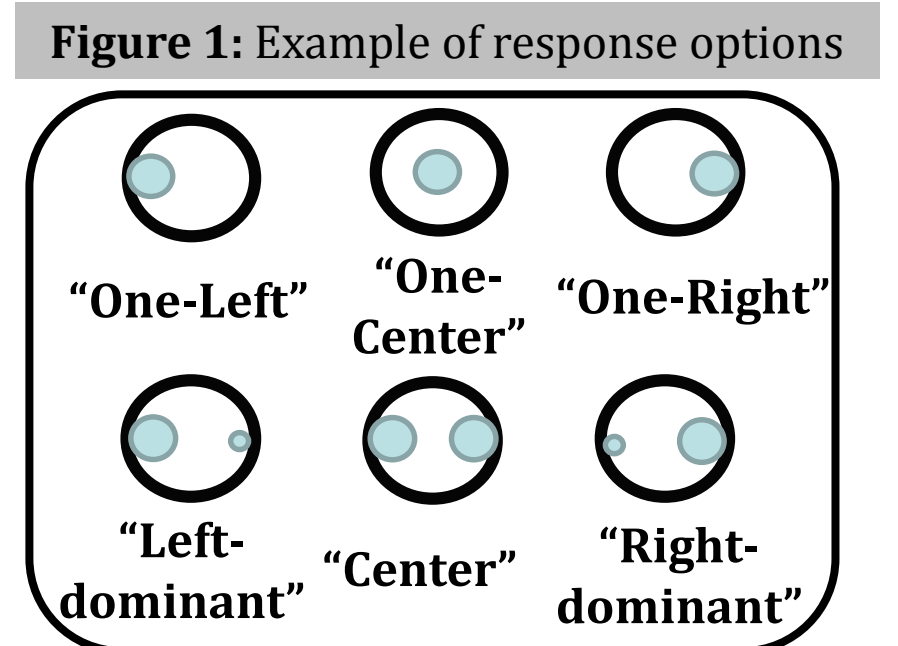
❖ Prior research shows, pulse-rate discrimination in CI listeners reaches an upper limit of ~300 pps³ when presented dichotically and monotically. Thus it is a possibility that BiCI listeners may not exhibit *appropriate* AOF when faced with certain differences between the ears other than binaural cues.

The aim of this study was to investigate how auditory object formation (AOF) occurs in BiCI listeners in the presence of interaurally asynchronous rates, and ITDs.

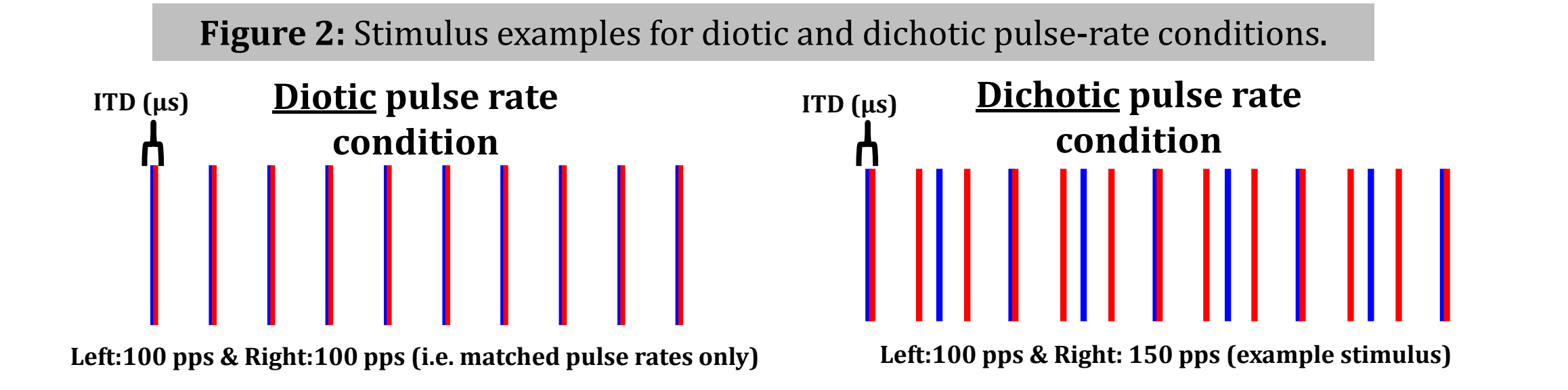
METHODS

- ❖ Listeners responded on a single-interval, six-alternative forced-choice task (see Figure 1) using direct stimulation with synchronized research processors (Cochlear RF Generator) on a single pair of pitch-matched electrodes.
- ❖ Listeners (N=5) had the following individual characteristics:

Listener ID	Age	Years of CI experience (Bilateral)	Etiology	Electrode Pair #	
				L	R
IBF	59	3	Heredity	12	12
IBK	75	5	Heredity	14	13
IBQ	80	6	Meniere's	14	7
ICJ	66	8	Childhood illness	20	16
IAU	68	12	Heredity (from birth)	12	11



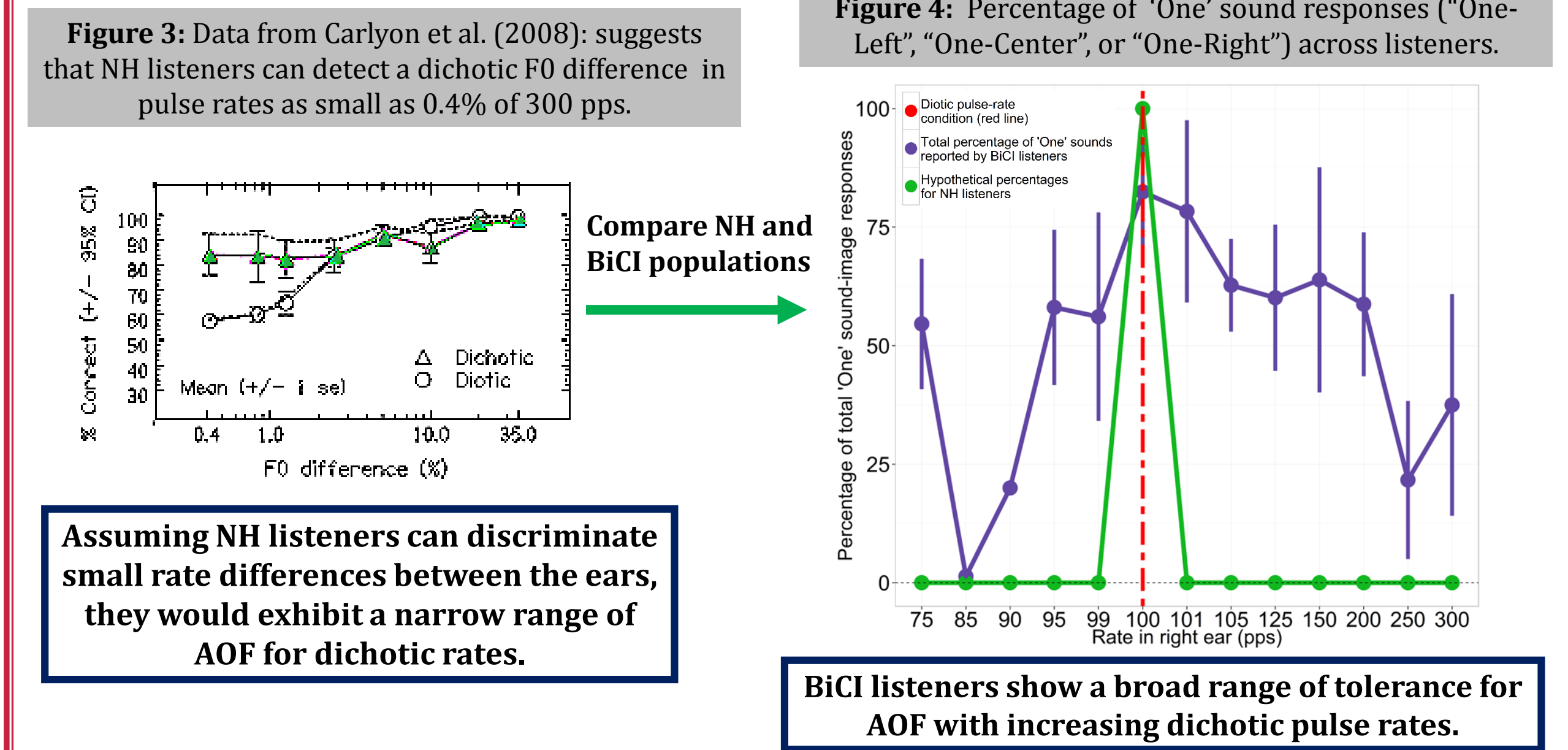
- ❖ **ITD conditions:** ITDs of 0, -500, and + 500 μ s. * ITDs were randomized trial-by-trial.
- ❖ **Rate conditions:** Base rate of 100 pulses per second (pps) in left ear was held constant, while right ear was varied trial-by-trial at a percentage of the base rate, ranging from 25% below to 300% above, making a dichotic stimulus.



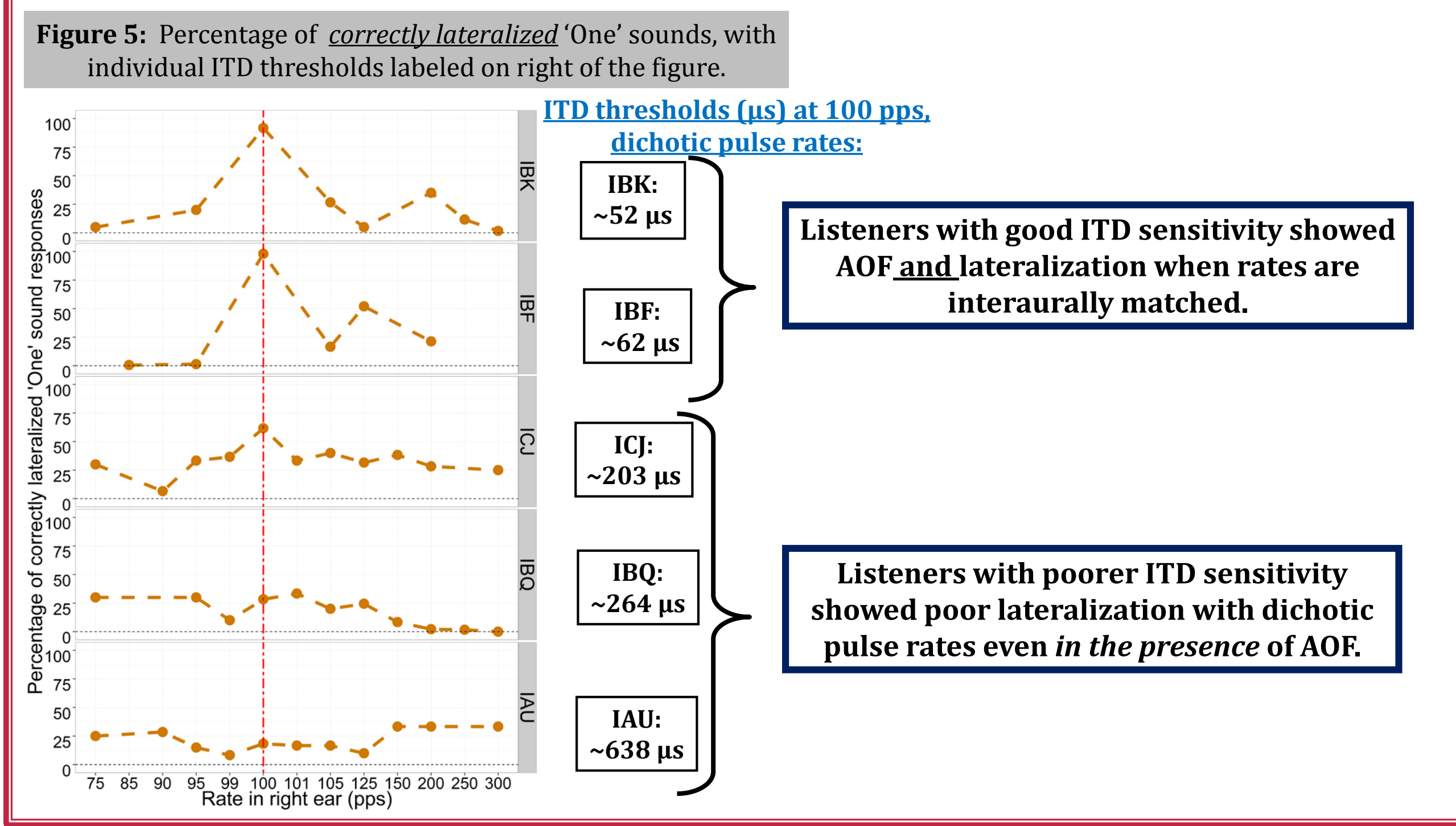
*ITD was increased to ± 800 for listener IAU because they had an ITD threshold beyond 500 μ s.

RESULTS: What is the impact of dichotic pulse rates on auditory object formation and ITD lateralization?

- NH listeners' dichotic pulse-rate discrimination ability:
- BiCI listeners' auditory object formation:

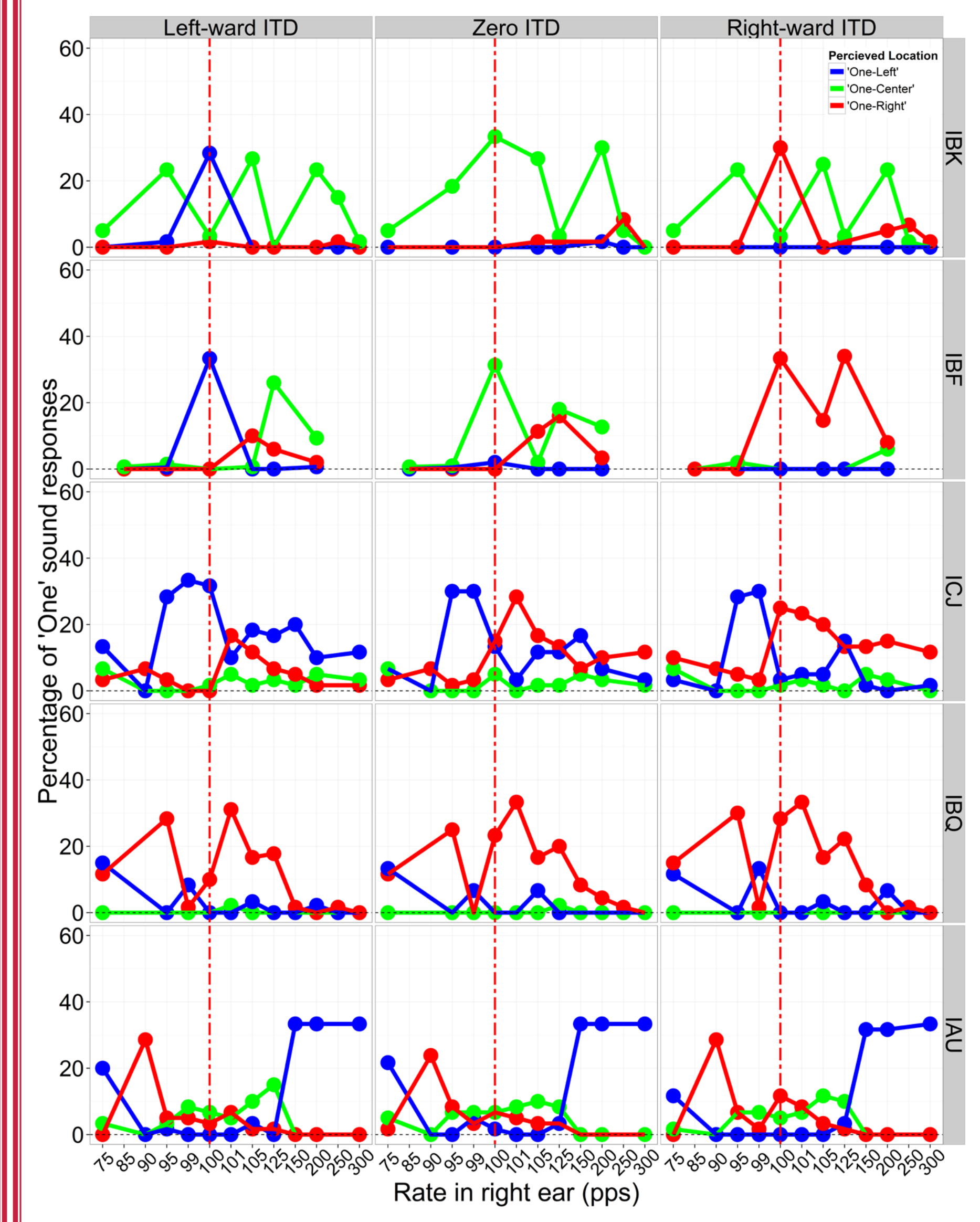


BiCI listeners' ITD lateralization (within all 'One' sound responses):



RESULTS: Perceived lateralization

Figure 6: Percentage of lateralized 'One' sound responses per target ITD.



- Response patterns across listeners appear to differ:
- A) IBK and IBF no longer lateralize the ITD of the perceived single fused image with the introduction of dichotic pulse rates
 - B) ICJ, IBQ, IAU, lateralize by making more "left" and "right" decisions in the dichotic pulse-rate conditions.

SUMMARY

- ❖ Results suggest that dichotic rates presented to BiCI listeners can still lead to a fused auditory image. However, this does not necessarily lead to correct lateralization of the stimulus. Such a result would suggest that grouping of mismatched information *may not lead* to correct lateralization.
- ❖ Furthermore, pulse rate or pseudo-"pitch" may be a preferred strategy in deciding *where* the sound is heard for some listeners.

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