

# Evaluation of source separation for use in object-based audio production



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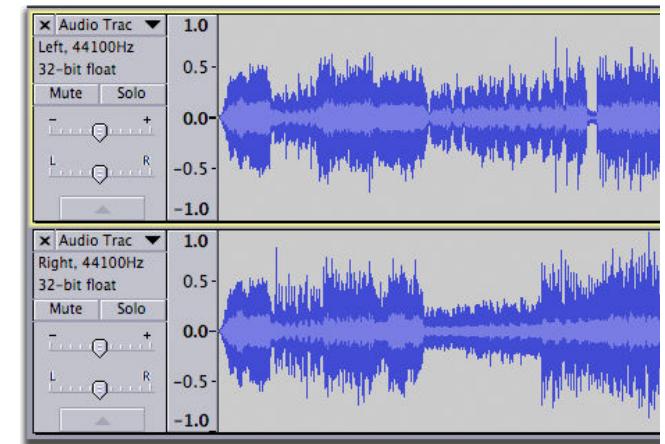
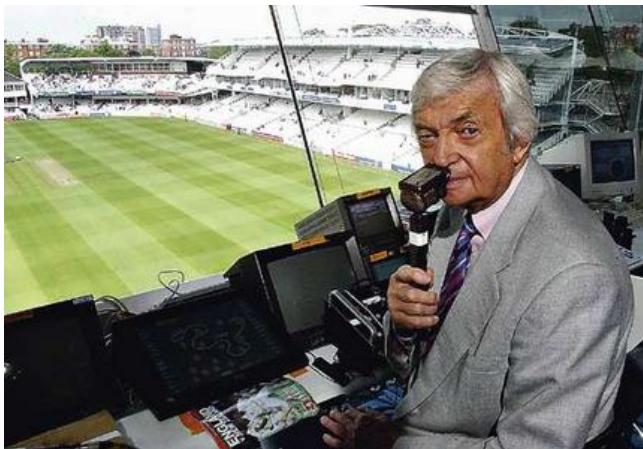
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# Object-based audio

- Send audio objects + metadata
- Advantages:
  - Optimal reproduction for any loudspeaker layout
  - Personalisation and accessibility
- Combination of objects and loudspeaker feeds

# What do we need?

- Audio objects + metadata



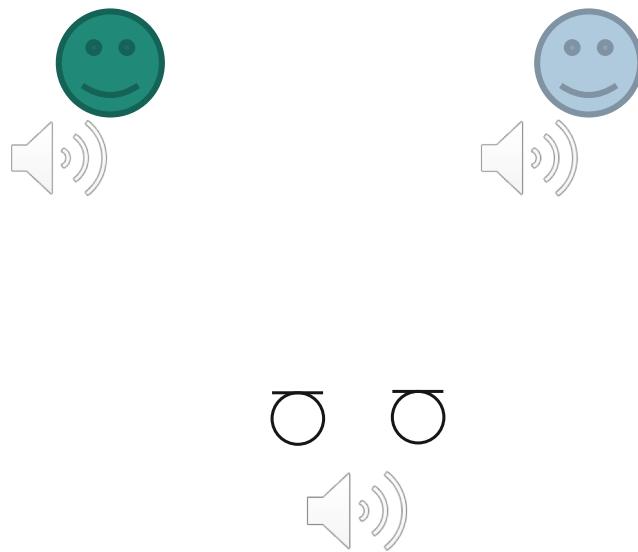
## Two experiments

- Expt. I: Can blind source separation be used to improve speech clarity?
  - [Coleman et al. 2018, *Perceptual evaluation of blind source separation in object-based audio production*, 14th International Conference on Latent Variable Analysis and Signal Separation, Guildford, UK]
- Expt. 2: Can beamforming be used to facilitate mix improvement?
  - [Coleman et al. 2018, *An Audio Visual System for Object-Based Audio: From Recording to Listening*, IEEE Transactions on Multimedia, DOI: 10.1109/TMM.2018.2794780]



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# Can BSS be used to improve speech clarity?



- Two talkers, one quieter (~5 dB)
- Stereo microphones
- Quieter talker estimated using Mandel's method and mixed back in



# Can BSS be used to improve speech clarity?

Point at which the target talker is clear AND the quality is acceptable



Next trial (space)

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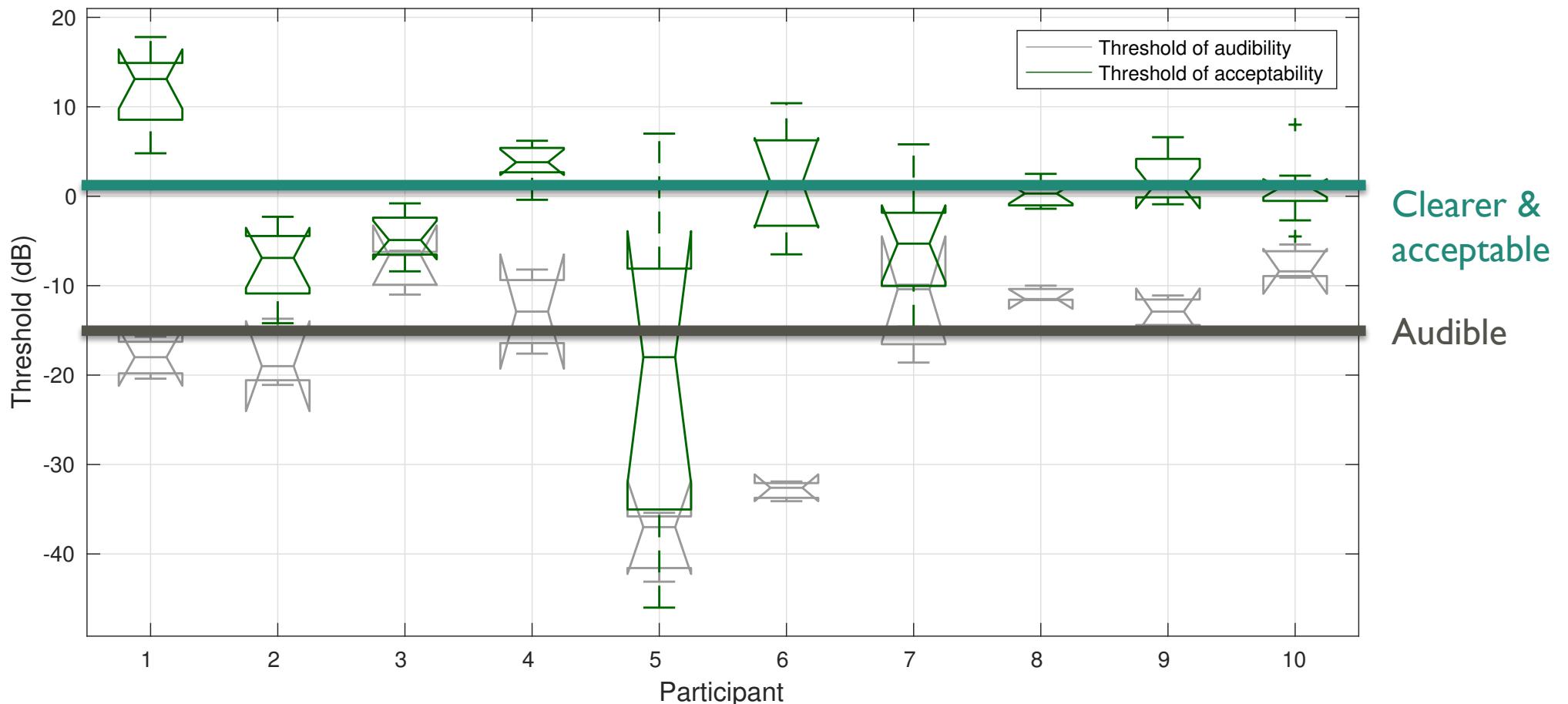


Play reference (1)



Play (2)

# Can BSS be used to improve speech clarity?

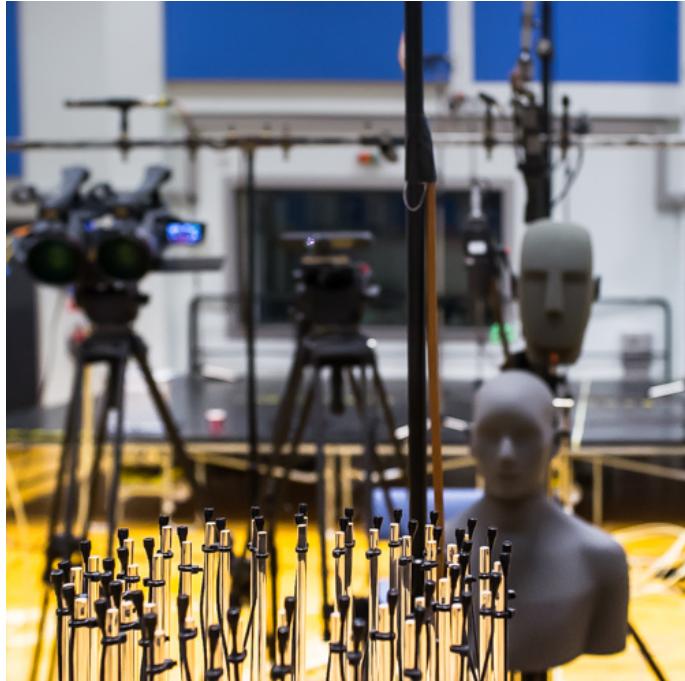


# Can beamforming be used to improve a mix?



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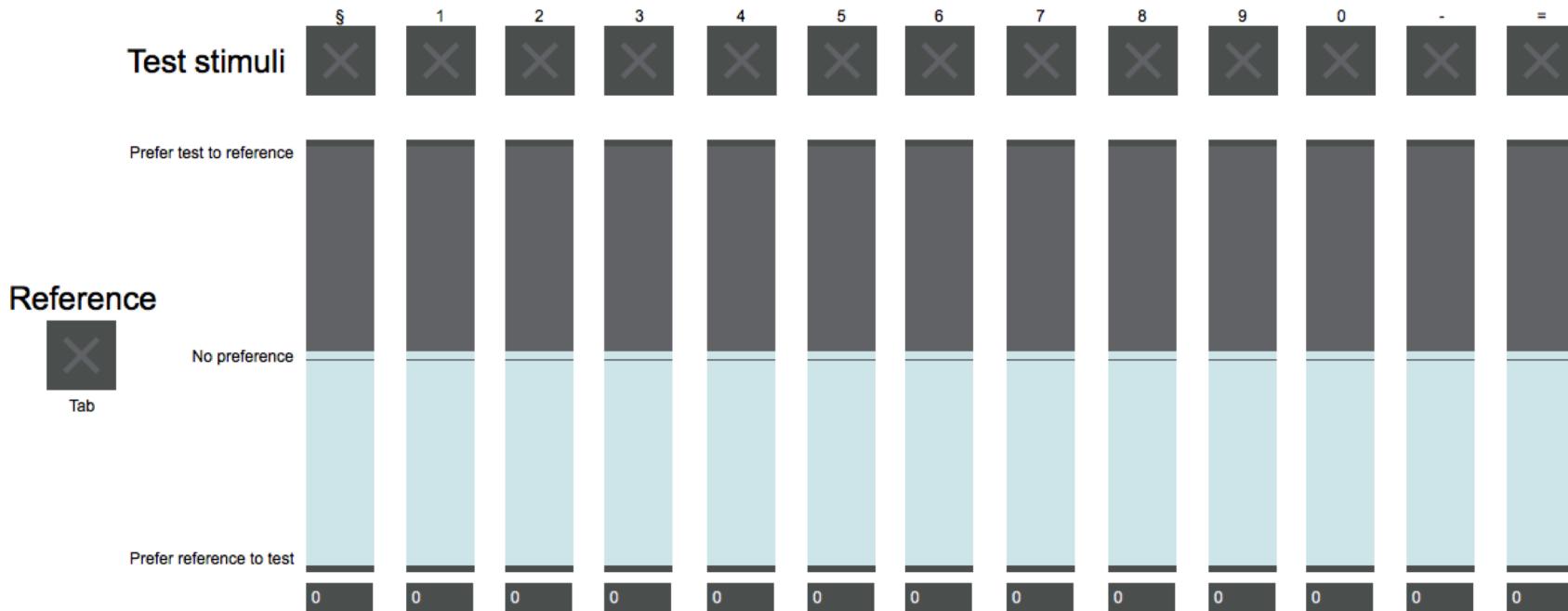
# Can beamforming be used to improve a mix?



- 48-channel microphone array at 4 m
- Piano extracted using 9<sup>th</sup> order hypercardioid beamformer  

- Preference test: beamformer mixed into the 5-channel mix at different levels

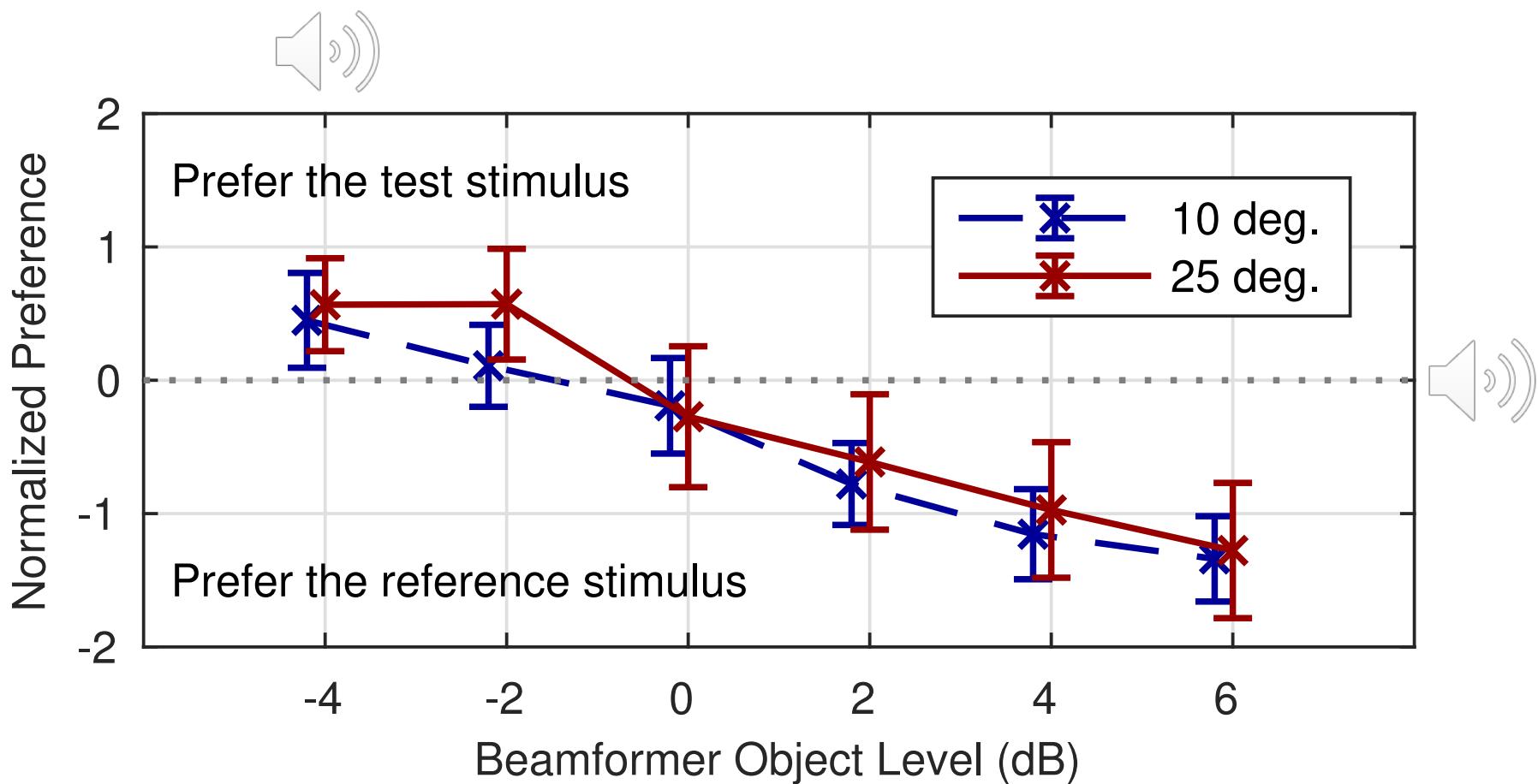
# Can beamforming be used to improve a mix?



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# Can beamforming be used to improve a mix?



# Summary

- In two experiments, objectification was shown to be beneficial for remixing audio
  - Clearer speech
  - More preferable mix
- However, with current state of the art, there are significant limitations
- Listening test design was considered with application in mind, rather than just standard quality ratings

# Future applications

- Immersive audio at home using an orchestrated array of personal devices
  - [Francombe et al. 2017, *Media device orchestration for immersive spatial audio reproduction*, Audio Mostly 2017, London, UK, DOI: 0.1145/3123514.3123563]



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