Rapid accent adaptation and constraints on cross-talker generalization

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Our question

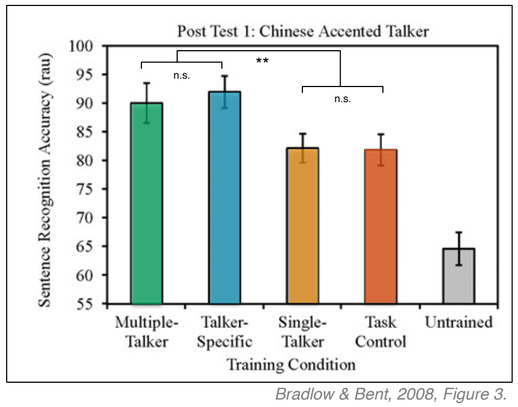
Under what conditions does adaptation to a foreign accent generalize to new talkers with that accent?

To achieve robust language understanding, listeners must adjust for variability in speech (e.g., dialect, foreign accent). Listeners can **adapt** to systematic variability across talkers [1,2]. To the extent that listeners can **generalize learning** from familiar talkers to new similar talkers, they are able to benefit from prior accent experience when encountering a new talker [3]. Such cross-talker generalization requires that listeners distinguish accent-general patterns from talker-specific idiosyncracies.

Previous findings:

Exposure to multiple talkers with the same foreign accent facilitates—and is perhaps *necessary* for—generalization to new talkers with that accent (Bradlow & Bent, 2008).

By contrast, exposure to a single talker appears to result in talker-specific adaptation (i.e., better performance on the trained talker, but no generalization to new talkers).



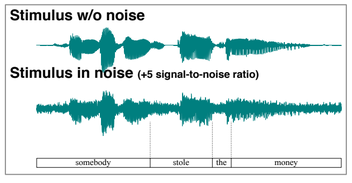
Bradlow & Bent, 2008, Figure 3.

Exposure-test paradigm:

Task: Sentence intelligibility in noise (following Bradlow & Bent, 2008), conducted on Mechanical Turk.

Stimuli: Simple declarative sentences, each containing 2-4 keywords, produced by **native English** or **Mandarin-accented English** talkers.

- *Somebody stole the money*.

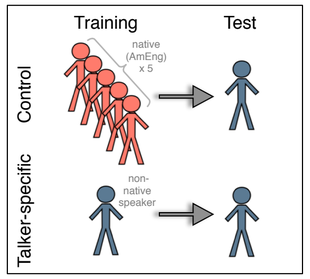


Noise added to avoid ceiling effects.

Outcome variable: proportion of keywords correctly transcribed.

Exp1: Replicating foreign accent adaptation via the web

Conditions.

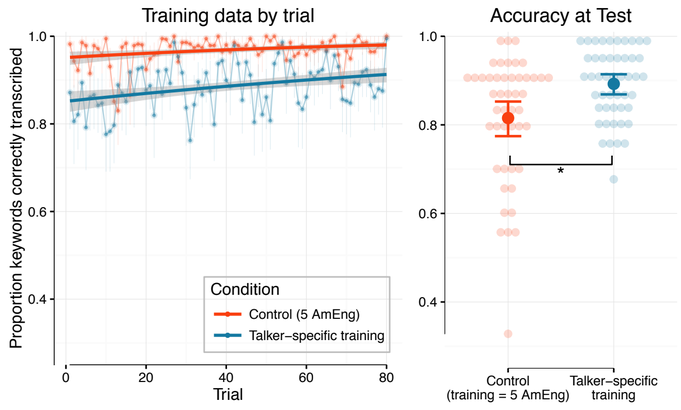


Training materials.
16 sentences repeated 5 times
- by 5 different native speakers, or
- by 1 Mandarin-accented talker

(80 training trials, cf. 160 in B&B2008)

Test materials.
16 sentences produced by a single Mandarin-accented talker.
- (identity of the test talker varied btw subjs; 6 different Mandarin-accented talkers total)

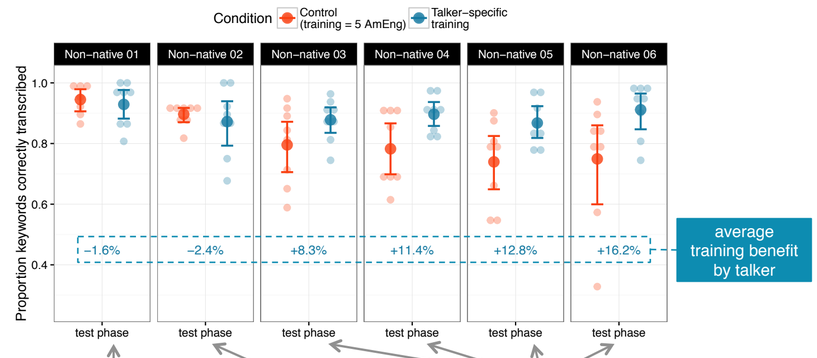
Participants. 95 Mechanical Turkers



Results

- **Training:** participants who heard foreign-accented speech were initially less accurate (relative to control) but improved with exposure.
- **Test:** higher accuracy in the talker-specific condition, relative to control, indicating accent adaptation (beyond task adaptation)
- Effect size for talker-specific adaptation ~10%; comparable to B&B2008

Improved performance (adaptation)—or not—by test talker.



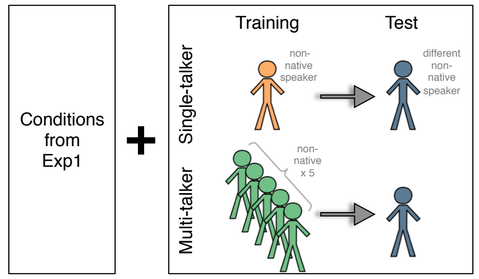
For some talkers, performance was at ceiling regardless of exposure

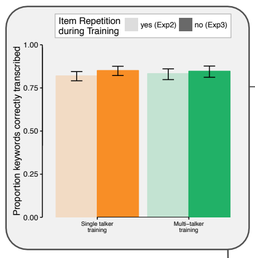
Exposure provided no reliable benefit, despite lack of ceiling effect.

Talkers were relatively hard to understand, but easy to adapt to.

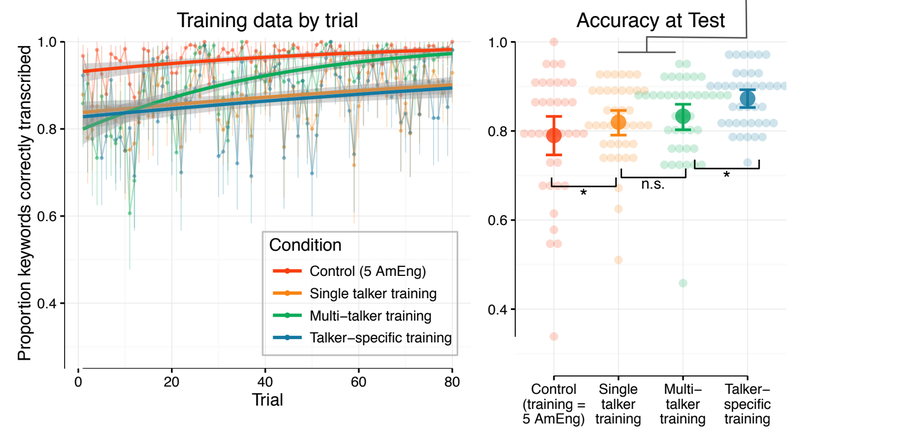
Exp 2 (N = 156): Is multi-talker training *necessary* for generalization?

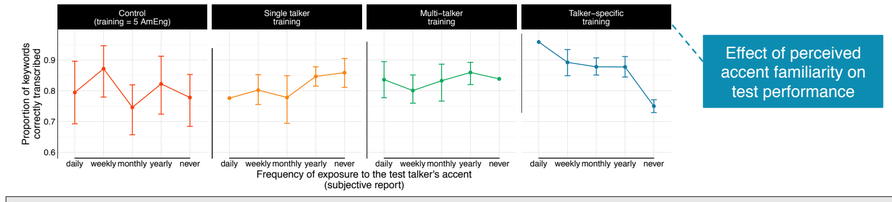
Conditions.





Exp 3. Replicated finding of cross-talker generalization in both the single-talker and multi-talker conditions, after removing item repetition during training.





Effect of perceived accent familiarity on test performance

Results

- **Cross-talker generalization** following both single talker and multi-talker training
- **Strength of generalization:** no discernable benefit of multi-talker over single talker training
- **Imperfect generalization**: multi-talker < talker-specific (cf. B&B, 2008)

Conclusions

We found evidence that generalization of accent adaptation is both **more robust** and **less robust** than previously claimed (cf. Bradlow & Bent, 2008).

- ***More robust*** in that single talker training can be sufficient for cross-talker generalization (i.e., multi-talker training is not a necessary condition)
- ***Less robust*** in that generalization was imperfect (i.e., cross-talker generalization was never as strong as talker-specific training)

Acknowledgments:
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References:
[1] Bradlow, A., & Bent, T. (2008). *Cognition*, 106(2).
[2] Sidaras, S., Alexander, J., & Nygaard, L. (2009). *JASA*, 125 (5).
[3] Kleinschmidt, D. & Jaeger, T. F. (2015). *PsychReview*, 122(2.