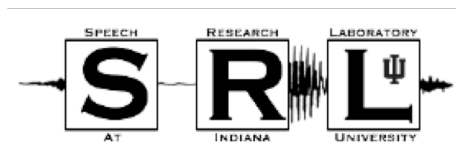


SLPL meeting
January 24, 2011

Cross-linguistic Perception of Multi-Talker Foreign Accents in Spontaneous Speech

Yuan Zhao D'Antilio
&
Terrin N. Tamati



Indiana University
Department of Linguistics
Speech Research Laboratory



Variability in Speech

- Much variability in speech
 - Talker's gender, age, and different aspects of language background
- Listeners perceive and use differences in communication
- Accent variability
 - Communication between speakers of different language backgrounds

Accent Variability

- **Speech intelligibility**
 - Regional dialect (e.g., Clopper & Bradlow, 2008)
 - Foreign-accented speech (e.g., Lane, 1963)

- **Identification of the accent**
 - Sensitivity to variability
 - Perceptual similarity of accents
 - Additional talker variability in natural speech
 - Experience

Perception of Foreign Accents

- Sensitive to foreign accents in native language
- Detect or rate foreign accents (e.g., Flege et al., 1995; Yeni-Komshian et al., 2000)
- Categorize talkers by native language (Vieru-Dimulescu & Boula de Mareüil, 2007)
 - Languages with similar sound inventories more confusable

Non-native Listeners

- Sensitive to accent variability in second language
- Detect or rate foreign accents (e.g., Munro et al., 2006; Mackay et al., 2006)
 - Influenced by shared native language
- Categorization tasks
 - Regional dialects of American English (Clopper & Bradlow, 2009)
 - World varieties of English (Sullivan and Karst, 2006)
 - Sensitive to exposure to varieties

Linguistic Experience

- Experience affects the perceived similarity among regional dialects
 - Residential history (Clopper & Pisoni, 2004a; Clopper & Pisoni, 2006)
 - Geographic mobility (Clopper & Pisoni, 2004b; Clopper & Pisoni, 2006)

- More experience with a variety or varieties
 - Results in easier identification and greater perceived distinctiveness among varieties

The Current Study

- Explore the perceptual structure of foreign accents by native and non-native English listeners

Experiment 1

- Can native English speakers make consistent judgments about the similarity of foreign accents?

Experiment 2

- Can non-native speakers of English make consistent judgments about the similarity of foreign accents?
- How does experience influence the perceived similarity of foreign-accent?

Experiment 1

Accent rating task

- Native listeners rated the similarity of the voices of a set of non-native talkers

Questions

- Will judgments of talker origin reflect the native language background of the talkers?
- Are listeners able to perceive talkers with the same native language as being from the same country more often than talkers with different native languages?

Exp 1: Listeners

- 31 (ages 18-22) monolingual native speakers of American English
- Average 2 months abroad and 2 countries visited

Exp 1: Talkers and Materials

Talkers

- 220 talkers from the CSLU Foreign Accented English Corpus (Lander, 2002)
- 22 (11M, 11F) native speakers of **Arabic, French, German, Hindi, Italian, Korean, Mandarin, Russian, Swedish, and Tamil**
- Moderate to heavy accents

Materials

- Short utterance selected from longer recording
 - Content of the sentence highly variable

Exp. 1: Procedure

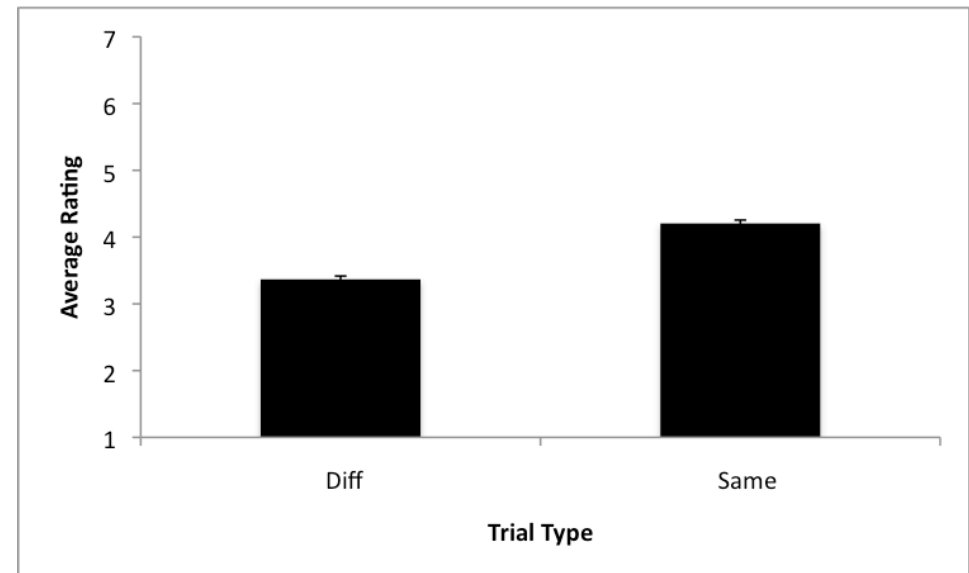
- Listeners rate how likely the two talkers were *from the same country* on a scale from 1 ('very unlikely') to 7 ('very likely')

Talker 1 (1000 ms) **Talker 2** → **RESPONSE (1-7)**

- Two Blocks (Male only and Female only)
- Total of 2 (1/1) judgments for all possible pairs of 10 accents
 - Total of 110 trials
 - 90 (45/45) 'Different Accent' trials
 - 20 (10/10) 'Same Accent' trials

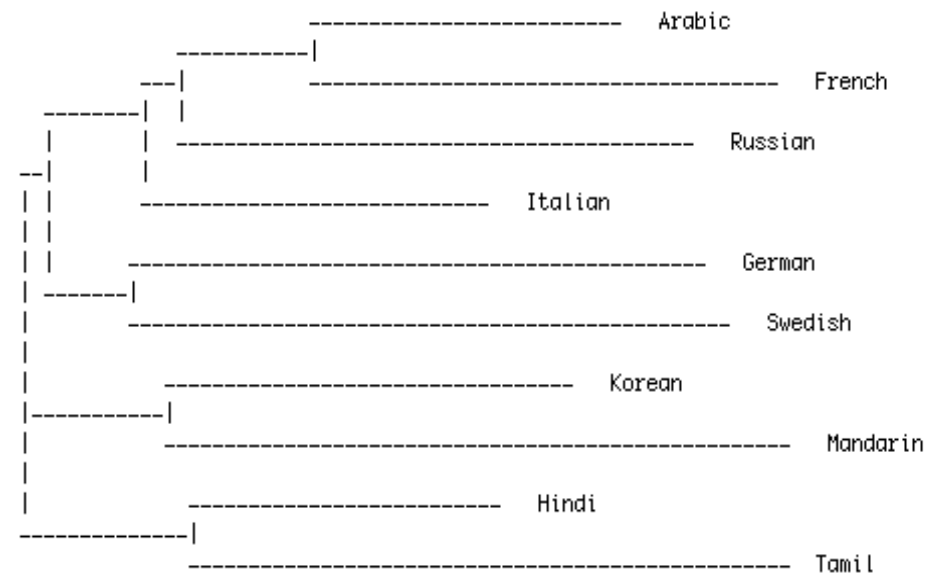
Similarity Ratings

- Listeners gave significantly higher similarity ratings for Same Accent pairs than Different Accent pairs ($t(30) = 7.55, p < .001$)



Exp. 1: Perceived Similarity

- Sensitive to some expected and unexpected sound-based similarities
- May be influenced by other factors
 - Accentedness of individual talkers
 - Materials



Exp. 1: Summary

- Listeners made judgments of talker similarity based on country of origin and foreign accent
 - Ratings
 - Clustering

- ✓ Native listeners were sensitive to cross-talker foreign accent variation in natural speech

Experiment 2

Accent rating task

- Non-native listeners rated the similarity of the voices of a set of non-native talkers

Questions

- Will non-native listeners' judgments of talker origin reflect the native language background of the talkers?
- How is the perceived similarity of the accents affected by the linguistic history of the listener?

Exp 2: Listeners

- Korea
 - 18 (ages 18-37) native speakers of Korean
 - Ave. 2.7 yrs in US (2.8 total abroad) and 3 countries visited

- China
 - 9 (ages 19-26) native speakers of Mandarin and Cantonese
 - Ave. 1.9 yrs in US (2.1 total abroad) and 2 countries visited

- India
 - 9 (ages 19-28) native speakers of Hindi, Bengali, and Marathi
 - Ave. 3.6 yrs in US (3.7 total abroad) and 2 countries visited

Exp 2: Talkers, Materials, Procedure

Talkers (Same as Experiment 1)

- 22 (11M, 11F) native speakers of Arabic, French, German, Hindi, Italian, Korean, Mandarin, Russian, Swedish, and Tamil from the CSLU Foreign Accented English Corpus (CSLU, 2002)

Materials (Same as Experiment 1)

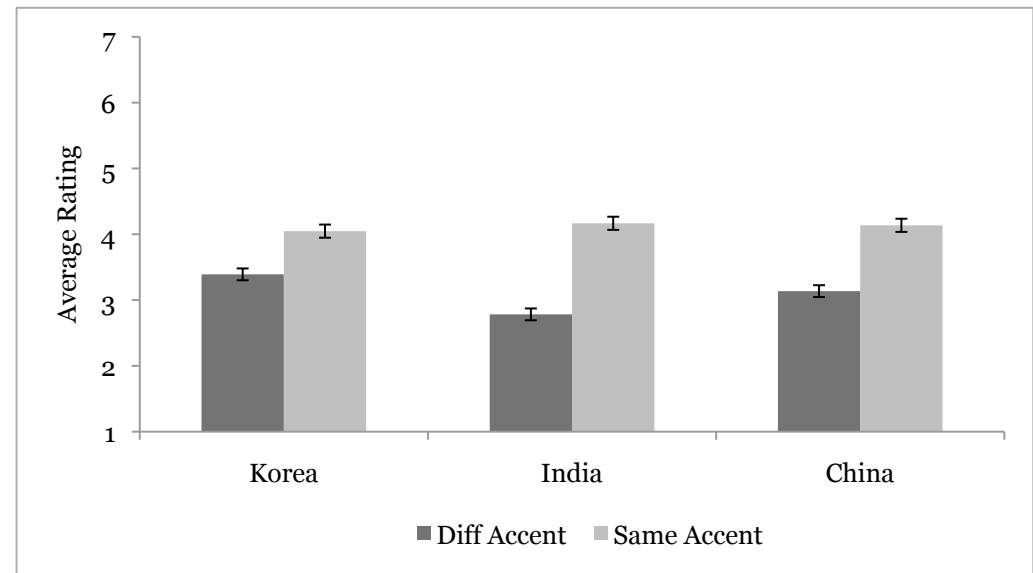
- Short sentences taken from spontaneously produced speech

Procedure (Same as Experiment 1)

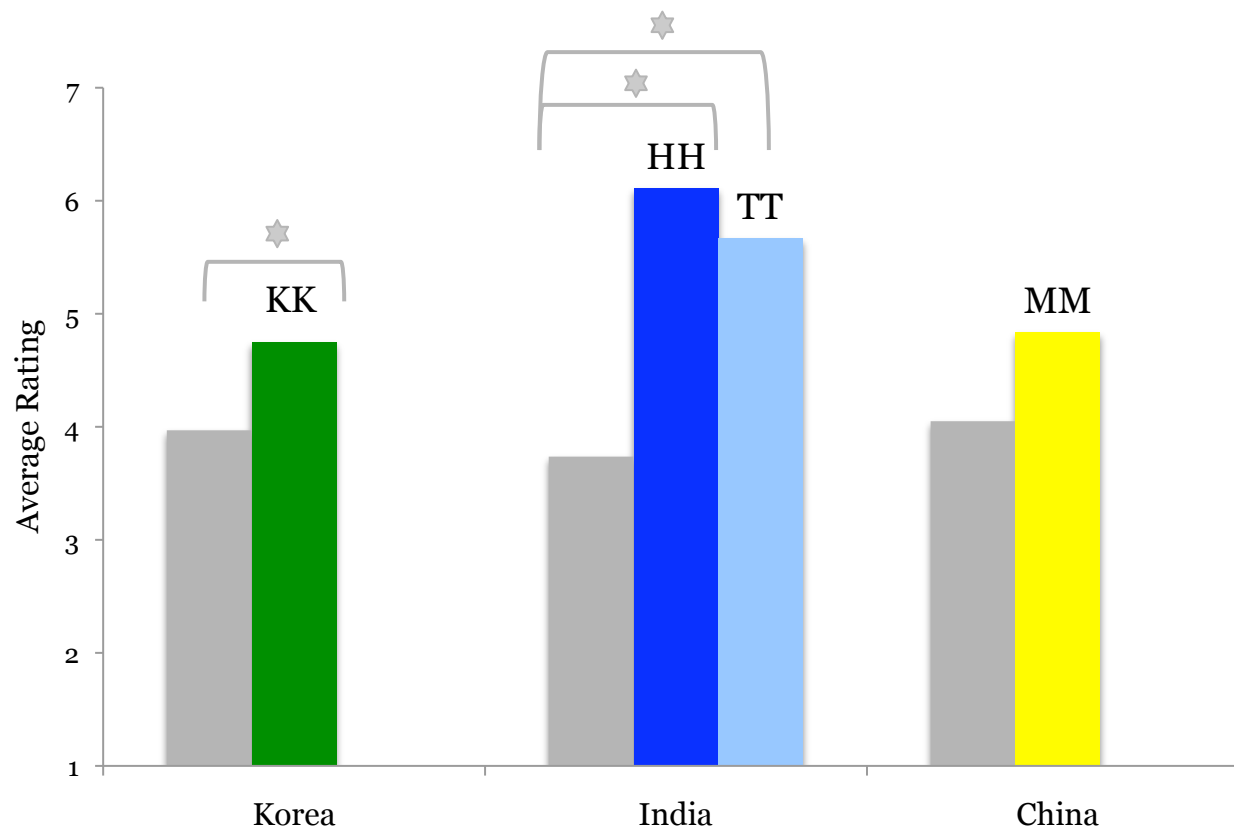
- Similarity rating task (1-7)

Similarity Ratings

- All groups gave significantly higher similarity ratings for Same Accent pairs than Different Accent pairs (all p 's $\leq .01$)

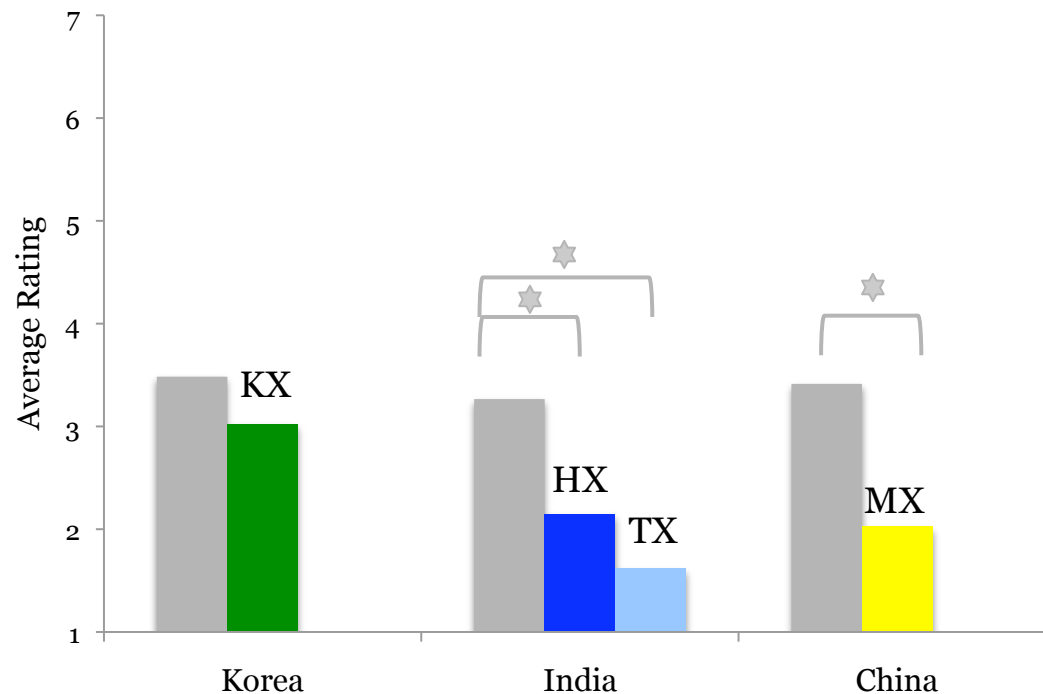


Ratings: Same Accent Trials



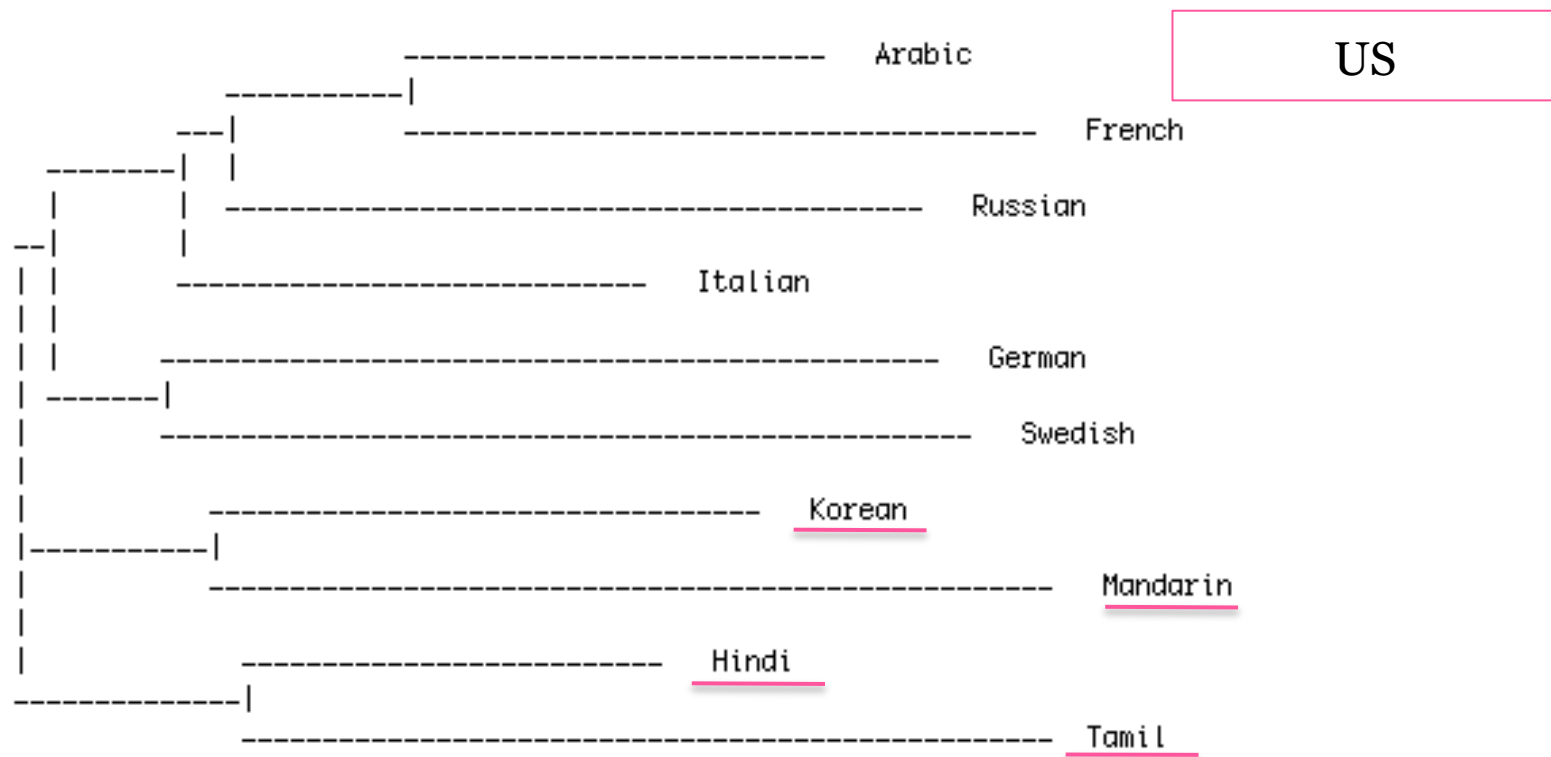
- Familiar accents heard as more similar to each other than unfamiliar accents (* $p \leq .01$)

Ratings: Different Accent Trials

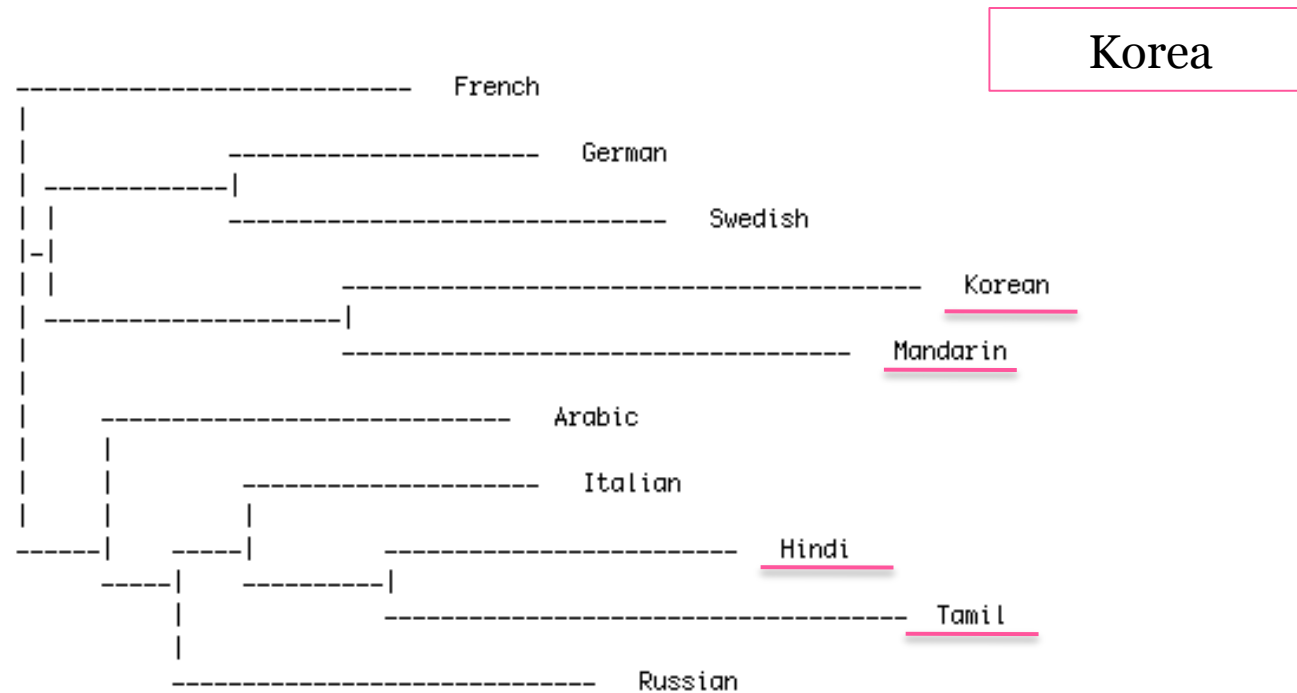


- Familiar accents generally heard as more distinct than other accents by non-native groups (* $p \leq .01$)

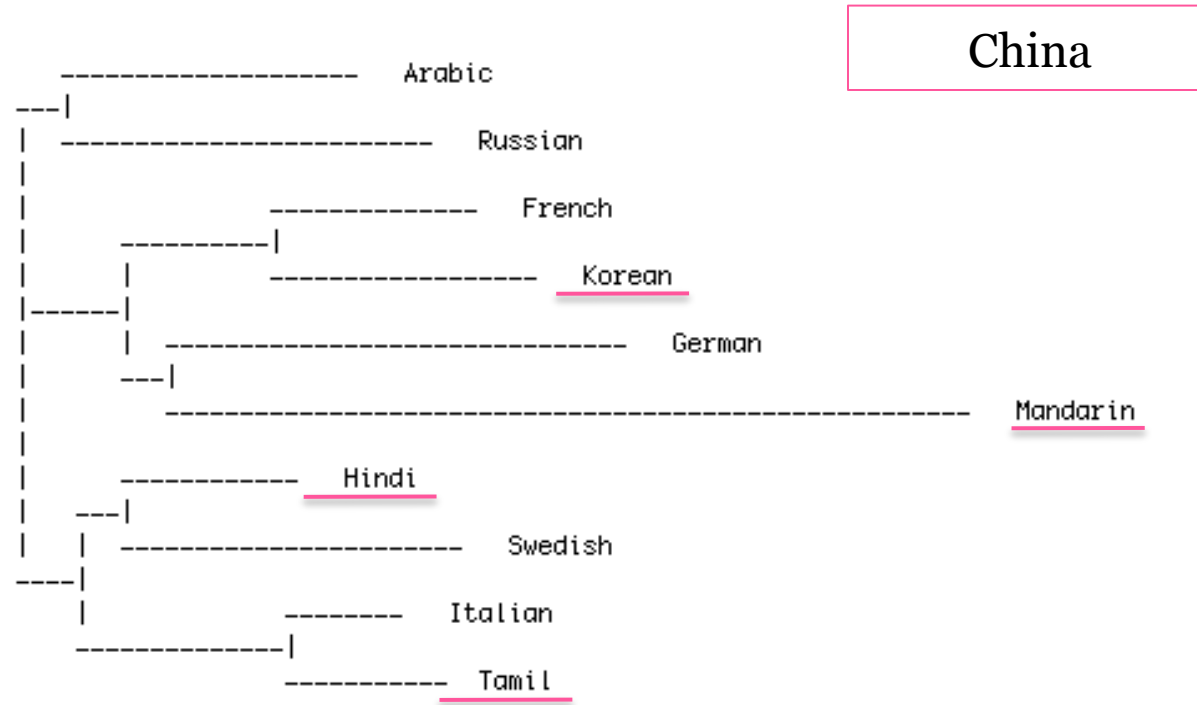
Exp. 2: Experience and Perceptual Similarity



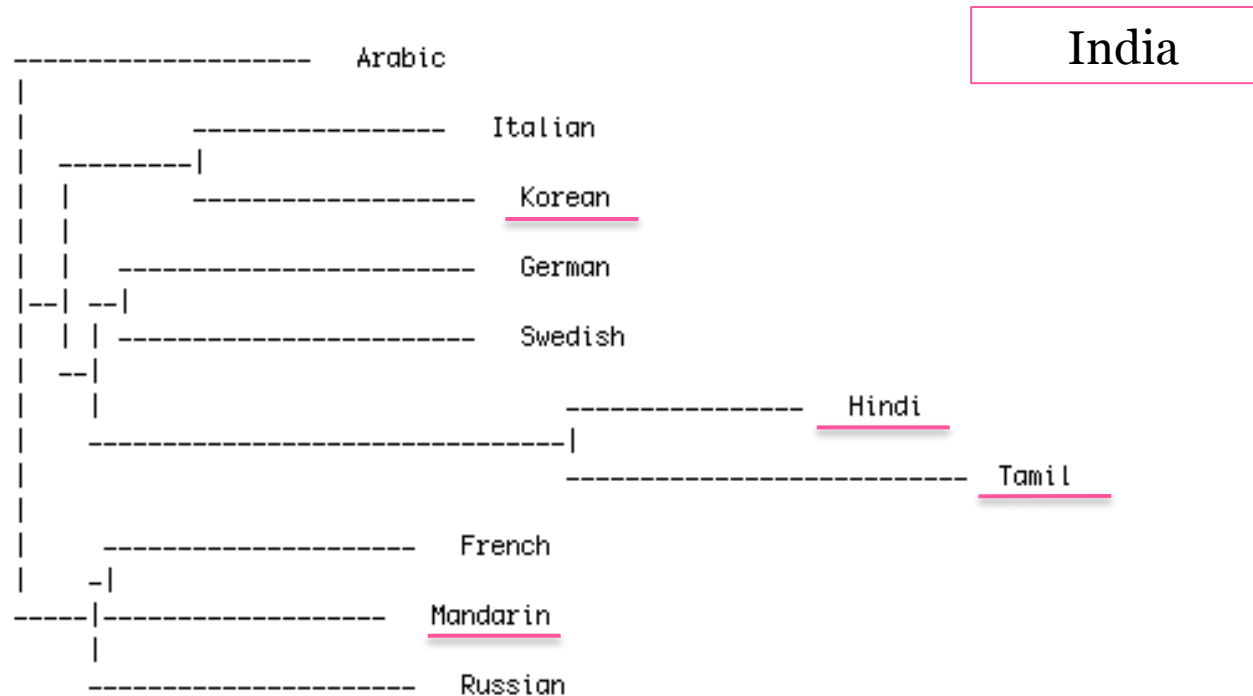
Exp. 2: Experience and Perceptual Similarity



Exp. 2: Experience and Perceptual Similarity



Exp. 2: Experience and Perceptual Similarity



Exp. 2: Experience and Perceptual Similarity

- Not all accents were equally distinctive
 - Indian accents
- Effect of experience
 - Non-native listeners also found their own foreign accents to be very distinctive

Exp. 2: Summary

- Listeners made judgments of talker similarity based on country of origin and foreign accent
 - Ratings
 - Clustering
- ✓ Non-native listeners were sensitive to cross-talker foreign accent variation in natural speech
- ✓ Country of origin influenced perception of foreign accents

Discussion

- Both native and non-native listeners were sensitive to foreign accent variation in spontaneous speech
 - Consistent across multiple talkers and content
 - Sensitive to different degrees of distinctiveness

- Perception of foreign accents influenced by previous experience
 - Differences in similarity spaces
 - Shared or familiar accents

Conclusion and Future Directions

- Perceptual structure of foreign accents
 - Acoustics-dependent
 - Distinctiveness of features
 - Listener-dependent
 - Listeners' linguistic experience

- Other issues
 - Perceived similarity?
 - Strength of accent
 - Experience?
 - Native language effect or familiar accent effect

Acknowledgements

- Thanks to members of the SRL for the valuable feedback and to Luis Hernandez for his helpful advice and assistance with this project.
- This work was supported by NIH-NIDCD Training Grant T32-DC00012 and NIH-NIDCD Research Grant R01-DC000111.

References

- Clopper, C. G., & Bradlow, A. R. (2008). Perception of dialect variation in noise: Intelligibility and classification. *Language and Speech, 51*, 175-98.
- Clopper, C. G. & Bradlow, A. R. (2009). Free classification of American English dialects by native and non-native listeners. *Journal of Phonetics, 37*, 436-451.
- Clopper, C. G., & Pisoni, D. B. (2006). Effects of region of origin and geographic mobility on perceptual dialect categorization. *Language Variation and Change, 18*, 193-221.
- Clopper, C. G. & Pisoni, D. B. (2004a). Some acoustic cues for the perceptual categorization of American English regional dialects. *Journal of Phonetics, 32*, 111-140.
- Clopper, C. G. & Pisoni, D. B. (2004b). Homebodies and army brats: Some effects of early linguistic experience and residential history on dialect categorization. *Language Variation and Change, 16*, 31-48.
- Flege, J. E., Munro, M. J., & MacKay, I. R. A. (1995). Factors affecting strength of perceived foreign accent in a second language. *Journal of the Acoustical Society of America, 97*(5), 3125-3134.
- Lander, T. (2007). CSLU: Foreign Accented English Release 1.2, Linguistic Data Consortium, Philadelphia.
- Lane, H. (1963). Foreign accent and speech distortion. *Journal of the Acoustical Society of America, 35*, 451-453.
- Mackay, I. R. A., Flege, J. E., & Imai, S. (2006). Evaluating the effects of chronological age and sentence duration on degree of perceived foreign accent. *Applied Psycholinguistics, 27*, 157-183.
- Munro, M. J., Derwing, T. M., & Morton, S. L. (2006). The mutual intelligibility of L2 speech. *Studies in Second Language Acquisition, 28*, 111-131.
- Sullivan, K.P.H & Karst, Y. N. (2006). Perception of English accent by native British English speakers and Swedish learners of English. In *Proceedings of the Sixth Australian International Conference on Speech Science and Technology* (pp. 509-514), Adelaide.
- Yeni-Komshian, G. H., Flege, J. E., & Liu, S. (2000). Pronunciation proficiency in the first and second languages of Korean-English bilinguals. *Bilingualism: Language and Cognition, 3*, 131-149.
- Vieru-Dimulescu, B., & Boula de Mareuil, P. B. (2007). Perceptual identification and phonetic analysis of 6 foreign accents in French. In *Proceedings of the XVI International Congress of Phonetic Sciences* (pp. 665-668). Saarbrücken, Germany.