I. Introduction

Background
- People improve in their ability to understand foreign-accented speech after a brief period of training.
- Bradlow and Bent (2008) demonstrated that native English speakers are able to adapt to foreign-accented speech during a brief training regimen.
- Specifically, they showed talker-independent, but accent-specific adaptation when listeners were exposed to 5 native Mandarin speakers and tested on a novel speaker.

• This demonstrates that variation in the training stimuli can help learning (i.e., result in greater generalization).
• The learning demonstrated in Bradlow and Bent is accent-specific. What kind of variation would result in accent-independent learning?
• Variation in the target task during training can also result in learning.
• Passive stimulus exposures alone do not result in learning (Ahissar and Hochstein, 1993; Crist et al., 1997).
- However, preliminary studies of phonetic learning (see Marrone and Wright, 2009) demonstrate that passive exposures, combined with active performance of the target task can result in as much learning as a active performance alone.
• Learning cannot be attributed to the time course of learning, the number of active exposures alone or to the total number of exposures.
• Could this learning pattern generalize to more complex speech stimuli (e.g., whole sentences spoken by non-native speakers)?

II. Methods

Listeners
- 106 native, monolingual English speakers served as listeners for this task.
- All listeners had limited experience with foreign-accented speech.

Materials
- Training and Test sentences: Lists from the Revised Bamford-Kowal-Bench (BKB) Standard Sentence Test (Bamford & Wilson, 1979). Each list contains 16 simple, meaningful English sentences and a total of 500 keywords.
- Speakers were native speakers of languages other than English with similar intelligibility ratings (in a separate experiment).
- 5 native Mandarin speakers for the Multiple Talker Training
- 5 speakers with different native language backgrounds (Thai, Korean, Hindi, Romanian, and Mandarin) for the Multiple Accent Training.
- Two novel speakers for testing (Mandarin and Slovakian).
- Sentences were embedded in white noise at 5 dB.

Procedure - Active Task
- Sentences were presented binaurally over headphones.
- During test and active portion of training, participants were instructed to write down as much of the target sentence as they could.
- Participants heard each sentence only once and were instructed not to go back and change their answers.
- Participants had as much time as they needed to respond to the stimulus.

Training Paradigm
- There were two training conditions: Multiple Talker (Mandarin) and Multiple Accent. Participants were assigned to one of five training groups in either the Multiple Talker or Multiple Accent condition (total of 10 training groups).
- The order of training was either the Multiple Talker or Multiple Accent condition, in which the order of the tasks was reversed.
- • All Active
- • All Passive
- • Short Active
- • Short Passive
- • Active+Passive
- Procedure - Passive Task
- After the Active task, listeners heard the same Mandarin Test sentence as they could during the Passive task. They were instructed to write down as much as they could of what they heard.

• Procedure - Passive Task
- If assigned to the Passive-Passive, Short Active, All Passive or Short Passive training groups, participants completed an unrelated symbol matching task.

Focus of the current studies
We examined (1) whether speakers needed to actively perform the target task for the entire duration of training in order for learning to occur and (2) whether accent-independent learning occurs when speakers are exposed to a more variable training set.

III. Results

Multiple Talker Training (Mandarin Post-test)
1. All Active and Active+Passive training results in significantly different.
2. All Active and Active+Passive training differs significantly from all other training groups.
3. All Passive and Passive Task training results in significantly different.
4. None of the training groups are significantly different (not graphed here).

Multiple Accent Training (Slovakian Post-test)
1. All Active and Active+Passive training results in significantly different.
2. All Active and Active+Passive training differs significantly from all other training groups.
3. All Passive and Passive Task training results in significantly different.
4. None of the training groups are significantly different (not graphed here).

Multiple Talker Training (Mandarin Post-test)
1. The one exception is the Short Active (Reverse) group in the Multiple Accent condition, in which the order of the tests was reversed.
2. The Active+Passive group performed better than the Multiple Talker group even in training conditions that typically do not result in learning (e.g., Short Active and All Passive).
3. This suggests that Multiple Accent training can result in very strong learning independent of active exposures to the stimulus.
4. Multiple Accent Training resulted in accent-independent adaptation to foreign accented English.
5. The Multiple Accent group performed as well as the Multiple Talker group on the Mandarin test and better on the Slovakian test.

Multiple Accent Training
1. The Multiple Accent group performed better than the Multiple Talker group even in training conditions that typically do not result in learning (e.g., Short Active and All Passive).
2. This suggests that Multiple Accent training can result in very strong learning independent of active exposures to the stimulus.

Future Directions

Multiple Talker Training
- Future studies can manipulate the time-course properties of the Active+Passive training by blocking the active and passive training (rather than interleaving it), by starting with passive training first, or by manipulating the proportions of active and passive training.

Multiple Accent Training
- This training included speakers that were equated for intelligibility and the accents were chosen from a previous set of recordings.
- Future studies can manipulate the relationships of accents to one another as well as the degree of accentness.

IV. Discussion

Multiple Talker Training
- The one exception is the Short Active (Reverse) group in the Multiple Accent condition, in which the order of the tests was reversed.
- The Active+Passive group performed compared to the All Active group.
- The Active+Passive group learned more than the Short Active group.
- This means that the learning demonstrated here cannot be accounted for only by the number of active exposures or the time-course of learning.
- The Short Passive group performed more than the All Passive group.
- This means that learning cannot be accounted for by the total number of stimulus exposures.
- The Short Passive group performed compared to the untrained group (in Bradlow & Bent, 2008).
- This suggests that the number of passive exposures alone in the Active+Passive group does not result in any improvement.

Multiple Accent Training
- The Multiple Accent group performed better than the Multiple Talker group even in training conditions that typically do not result in learning (e.g., Short Active and All Passive).
- This suggests that Multiple Accent training can result in very strong learning independent of active exposures to the stimulus.

V. References


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