Despite great phonemic variation among different language varieties, speakers of the same language are able to understand each other. But how is this achieved? Previous literature suggests that perceptual learning and categorization of a new linguistic variety is enhanced by exposure to multiple talkers of that variety (Kraljic, Brennan & Samuel, 2008; Clopper & Pissoni, 2004). However, the kind of input that is best to ensure perceptual learning is still a matter of debate. There is evidence suggesting that some type of “desirable difficulty” (see, Bjork & Kroll, 2005 for a review) enhances learning; however, it is not clear what constitutes desirable difficulty when learning phonemic variation. Hence, the present study focuses on perceptual learning in the aspiration of the final /s/ present in some varieties of Spanish. The aim is to explore whether consistent input aids in the learning of a new phonemic feature, or whether inconsistency as a form of desirable difficulty would be a better predictor of long-lasting perceptual learning. To explore this, we presented Spanish speakers of Bogotá (a variety that fully expresses final /s/ in words and syllables) with noun phrases that either contained a full expression of the final /s/ and noun phrases with aspiration of the final /s/. The noun phrases were either masculine (no ambiguity, for example, “el carro rojo” vs. “los carros rojos” or “loh carroh rojoh”) or feminine (ambiguous, for example, “la casa roja” vs. “las casas rojas” or “lah casah rojah”).

Method

Participants. 136 Spanish monolinguals from the Bogotá variety of Spanish were tested. All were born and raised in the Bogotá area, and reported not having lived in areas where /s/ aspiration takes place.

Materials and Procedure

Participants viewed an array of four objects: a target object (e.g. red doors), a competitor object (e.g. a red door) and two distractors presented on a computer screen (Figure 1) while they heard pre-recorded sentences played through headphones (e.g. Vimos las puertas rojas – “We saw the red doors”). Sentences contained both masculine and feminine nouns with a fully realized /s/ or an aspirated /s/. Participants were asked to select the object spoken in the sentence as fast and as accurately as possible. Accuracy was used as the dependent variable. If aspirated /s/ is not perceived, a potential competition between the singular and plural for nouns with feminine marking will be presented, affecting the accuracy in feminine trials, in comparison with the masculine trials.

During the course of the experiment, trials were presented in three blocks: a learning block, and testing block and a control block, described in turn below:

1. Learning block: Participants heard noun phrases (NPs) with or without /s/ aspiration under three conditions to test how different types of input affect learning outcomes:
   a. Single speaker (female speaker) who aspirated half the time and did not aspirate the other half (single speaker inconsistent condition).
b. Two speakers (one female, one male), one who always aspirated the final /s/, and one who always realized the final /s/ (multiple speakers consistent condition).

c. Two speakers (one female, one male), who both aspirated half the time, and fully realized the final /s/ the other half (multiple speakers inconsistent condition).

2. Testing block: Participants heard two speakers (different from the speakers in the learning block); both speakers always aspirated the final /s/. This block served to assessed which of the learning conditions was more effective at learning /s/ aspiration.

3. Control block: In this block /s/ was always fully-realized.

Results and discussion

A generalized linear mixed model was constructed, with a binomial distribution. The random structure was selected by using the buildmer function in the buildmer package in R (v. 1.3, Voeten, 2019). Results showed that the overall accuracy of feminine trials (i.e., the trials that were ambiguous between singular and plural nouns) was lower than masculine trials (z = 2.606, p = 0.009). In the Learning Block, there were no differences between conditions; however, in the Testing Block the multiple speakers inconsistent condition yielded a significantly lower accuracy than either single speaker inconsistent or multiple speakers consistent conditions in the feminine trials (with no differences between these two) (z = 2.474, p = 0.014) (Figure 2).

Overall, the results suggest that inconsistency among multiple speakers can hinder long term learning of perceptual cues. However, inconsistency within a single speaker does not seem to hinder performance, rendering learning that resembles that of a more consistent and controlled setting. Interestingly, the analysis of accuracy along trials in the learning condition showed that learning takes place fast and it is stable in the single speaker condition, while it fluctuates more in the multiple speakers consistent condition. These results suggest that the inconsistent nature of the single speaker may have rendered some level of difficulty that produced faster learning.

References


