PERCEPTUAL TRAINING AFFECTS L2 PERCEPTION BUT NOT CROSS-LINGUISTIC SIMILARITY

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ABSTRACT

L2 learners need to detect differences between native and target language sounds in order to categorize them, and thus perceive and produce them, accurately. The current high variability perceptual training study explored the effect of identification and discrimination training on the perceived similarity between Spanish and English vowels and on the ability to identify and discriminate target English sounds. Cross-linguistic similarity was assessed by means of perceptual assimilation tasks.

The results showed that a 6-session perceptual training regime was insufficient to affect cross-linguistic similarity relations, as no consistent change in perceived similarity between L1 and L2 vowels was observed from pretest to posttest. Despite this, training was effective in improving identification and discrimination of L2 vowels. Further, posttest scores were replicated four months later, showing long-term effects of perceptual training on L2 perception. Results are discussed in terms of the relationship between cross-linguistic similarity and categorization of L2 sounds.

Keywords: Phonetic training, L2 speech perception, cross-linguistic similarity.

1. INTRODUCTION

According to current models of second language (L2) speech, e.g., [1, 8], in order to establish target-like categories for L2 sounds, learners need to be able to discern differences between L1 and L2 sounds. This can be achieved given sufficient L2 input and experience [8]. However, sufficient input may not be readily available to L2 learners in instructional or even naturalistic settings. Phonetic training is an alternative source of focused input that has been found to improve L2 learners' ability to perceive and produce target-language sounds [2, 19]. Therefore, phonetic training may also have an effect on the learners' ability to distinguish L2 from L1 categories, thus facilitating target-like categorization of L2 sounds.

The current paper examines which of two types of perceptual tasks is more efficient for training L2 learners to discriminate and identify L2 vowels, and also examines whether phonetic training can have an effect on the perceived similarity between native and target language sounds. The study follows a high variability phonetic training (HVPT) approach, which involves training by means of stimuli from a variety of talkers, phonetic contexts, tokens, etc. ([3, 14, 16, 23] among many others). Most perceptual training studies make use of identification (ID) and/or discrimination (DIS) tasks, and the ID task is said to be superior to the DIS task [6, 15, 17, 22]. However, some studies using a categorical DIS task have found that both tasks can be effective for improving L2 perception [3, 9, 20]. Carlet [3] in fact found that both ID and Categorical DIS were equally effective to improve the identification of initial stops by Catalan learners of English, but ID proved superior to DIS with L2 vowel identification. Finally, in addition to improvement from a pre-training to a post-training test, other suggested indicators of a successful phonetic training regime include generalization to untrained structures and retention of learning over time [2, 9]. These two factors provide evidence of robust learning [17].

This study thus aimed at testing whether ID and categorical DIS training result in improvement of both identification and discrimination. Secondly, it tested whether a perceptual training regime can affect the learners' perceived similarity between L1 and L2 sounds, and if modifying cross-linguistic perceived similarity is then related to improvement in L2 perception. To that effect, a group of Catalan learners of English completed either a DIS or ID perceptual training regime and were tested before and after training on the identification and discrimination of English vowels, and the perceived similarity between L1 and L2 sounds. Further, generalization to untrained words and retention of learning four months later was also tested.

2. METHODOLOGY

2.1 Participants

The initial participants were 45 Spanish/Catalan bilinguals in their first year of an English Studies University degree at a Spanish institution. Their average age was 19.4 and most had started learning

English as children at school, although very few had spent time in an English-speaking country beyond short summer visits. They were divided into two experimental groups (discrimination training (DIS) and identification training (ID)), and a control group (CTL). A few students did not complete the training or posttest and their data was discarded. The final number of participants per group was 14, 13 and 11 for the DIS, ID and control groups, respectively. All reported normal hearing and received payment for their participation.

2.2 Study design and materials

Participants were tested on their perception of target vowels before training (pretest), after training (posttest) and four months later (delayed posttest). At each testing time, learners' perception was measured by means of an identification task and a categorical AX discrimination task. Cross-linguistic similarity was tested by means of a perceptual assimilation task (PAT). Table 1 shows the study design. The CTL group remained untrained from pretest to posttest but was administered a combined DIS + ID training after the posttest and completed the posttest again after that (posttest2).

Table 1: Study design.

Pretest	Training (6 sessions)	Posttest & Delayed Posttest
7AFC ID AX cat DIS PAT	ID group DIS group Control group	7AFC ID AX cat DIS PAT
Stimuli: nonwords real words	Stimuli: nonwords	Stimuli: nonwords real words

Training stimuli consisted of 84 unmodified CVC nonwords from a previous study [3] containing the seven Southern Standard British English (SSBE) vowels /æ, ʌ, ɪ, i, ɜː, e, ɑː/ preceded and followed by an obstruent (e.g., *jeet, jit, dadge, dudge, jurb, jed, jarb*). Stimuli were recorded by four SSBE speakers (2 female, 2 male). Testing stimuli involved 32 CVC real words and 32 new nonwords elicited from two new talkers (1 female, 1 male). The pretest, the posttests and the delayed posttest were identical and tested the perception of SSBE /æ, ʌ, ɪ, i, ɜː, e, ɑː/.

2.3 Training tasks and procedure

Training consisted of six 30-minute training sessions over several weeks, carried out at a university's speech laboratory and delivered using the software TP [18]. The ID group was trained by means of 7-alternative forced choice identification tasks. The response options were the seven English vowels tested (/æ, ʌ, ɪ, i, ɜː, e, ɑː/) indicated by a symbol and two common words containing the vowel. The DIS group was trained by means of a categorical AX discrimination task. The two stimuli were always from two different speakers, and different-category trials involved the following vowel pairs: /æ-ʌ/, /ɪ-iː/, /ɜː-e/, /ɜː-ɑː/. The two training tasks made use of the exact same stimuli, so that all learners were provided with the same input, independently of the training regime they underwent. Hence, each ID session included a total of 480 trials while a DIS session consisted of 240 trials. Immediate feedback was provided after each trial and global feedback at the end of each session.

2.4 Testing

2.4.1 Identification and discrimination tests

The identification and discrimination tests had the same procedure and involved the same target sounds as the ID and DIS training tasks. Two versions of each test were created, one involving new nonword stimuli and one consisting of real word stimuli. Thus, the identification test was a 7AFC ID task totalling 104 trials (four words per vowel per talker and several repetitions). The response options were pairs of two common English words containing and representing each of the vowels tested (/æ, ʌ, ɪ, i, ɜː, e, ɑː/). The discrimination test was a categorical AX (same/different) DIS task involving the trained vowel pairs: /æ-ʌ/, /ɪ-i/, /ɜː-e/, /ɜː-ɑː/. The total number of trials was 96 (48 same, 48 different).

2.4.2 Perceptual assimilation task

In the PAT [11, 21], listeners were presented with L2 (English) stimuli and had to identify them in terms of L1 (Spanish) categories[1] and then provide a goodness of fit rating on a 7-point scale. The stimuli consisted of nine English vowels (/iː ɪ ɛ ɜː æ ʌ ɑː aɪ eɪ/) produced by three male native speakers of SSBE in bVt sequences. The response alternatives were the Spanish vowels /i e a o u/ and the diphthongs /ai ei oi/. The total number of trials was 108 (9 vowels x 3 talkers x 2 tokens x 2 repetitions).

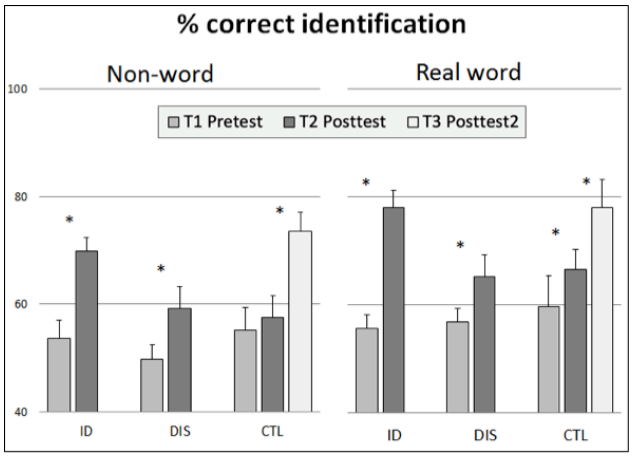
3. RESULTS

3.1 Identification test results

The percentage of correct identification scores with real and nonwords was calculated for each group at pretest and posttest (and posttest2 for CTL). The results are presented in Fig. 1. A series of GLMM analyses with test and group as fixed effects

and percentage correct identification/correct discrimination as the dependent variables were conducted for the nonword and the real word conditions. The analyses yielded a significant effect of test (nonwords: [F(2, 9.041) =107.4, p = .000]; real words: [F(2, 9.041) = 84.52, p = .000]) and a test x group interaction (non-words: [F(2, 9.041) = 24.25, p = .000]; real words [F(2, 9.041) = 13.85, p = .000]), and no effect of group. Pairwise comparisons showed that DIS and ID improved significantly from pre- to posttest. The ID group, with an accuracy increase of 16.3 (nonwords) and 22.6 (real words) percentage points from pre- to posttest outperformed the DIS group (9.3 and 8.5, respectively). This shows that while both training methods were effective, ID trainees improved the most. CTL did not improve with nonwords, but were more accurate with real words at posttest by 6.8 percentage points, showing a smaller improvement than the trained groups, but significant. CTL's greatest improvement took place after receiving training in the second phase of the study (posttest2).

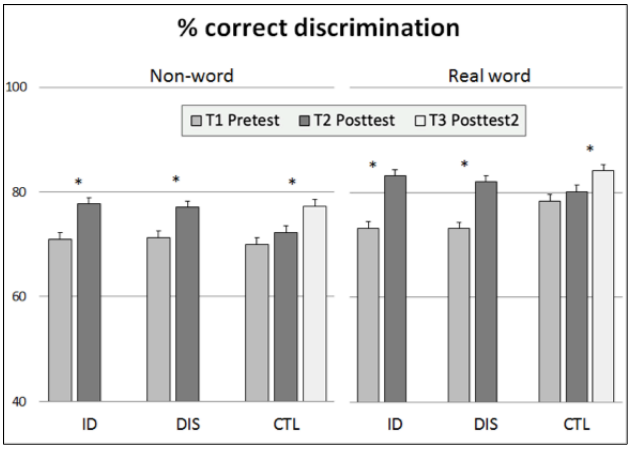
Figure 1. Identification results per group at pretest and posttest (and posttest2 for CTL)



3.2 Discrimination test results

Discrimination results were analyzed in terms of percentage correct responses and are shown in Fig. 2. As with the identification results, participants performed better with real word stimuli than with nonwords. A series of GLMM analyses were conducted in the same fashion as with the identification results. The analyses yielded a significant effect of test (nonwords: [F(2,8.345) = 18.97, p = .000]; real words: [F(2,8.345) = 30.7, p = .000]) and a significant test x group interaction for real words ([F(2,8.345) = 6.36, p = .002]). Pairwise comparisons revealed significant differences between pre and posttest for ID and DIS, but not for CTL. Significant improvement was observed for CTL after the training phase (posttest2).

Figure 2. Discrimination results per group at pretest and posttest (and posttest2 for CTL)



3.3 Delayed test results

Most of the participants carried out a delayed test, which was identical to the pretest and the posttests, four months after the completion of posttest (CTL n=7, DIS n=11, ID n=10). The results were almost identical numerically to the posttest results, both in identification and in discrimination scores (see Table 2). In fact, GLMM analyses revealed no significant differences between the posttest and the delayed test results for any group, indicating that the improvement from pretest to posttest was retained four months later.

Table 2: Posttest and delayed test results (%correct).

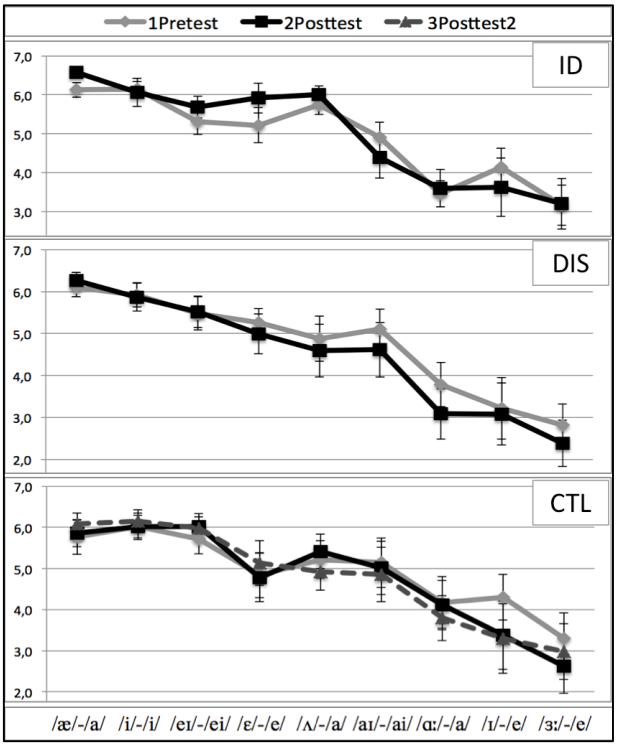
	Non-word		Real word	
Identification	Posttest	Delayed t.	Posttest	Delayed t.
ID	70	71	79	77
DIS	57	59	63	59
CTL (Postt. 2)	75	74	80	74
Discrimination	Posttest	Delayed t.	Posttest	Delayed t.
ID	76	76	83	82
DIS	77	77	82	85
CTL (Postt. 2)	75	81	85	88

3.4 Perceptual assimilation task results

For each target English vowel the percentage of identification as one of the Spanish vowels and the corresponding average goodness ratings were calculated. The results showed the following patterns of L2-L1 perceptual assimilation: /æ/-/a/, /i/-/i/, /eɪ/-/ei/, /ɛ/-/e/, /ʌ/-/a/, /aɪ/-/ai/, /ɑ:/-/a/, /ɪ/-/e/ and /ɜ:/-/e/, which are in accordance with previous findings [5]. Following [11], in order to capture differences in goodness of fit across the different patterns of assimilation, a composite fit index score for each pair was calculated by multiplying the identification score by the goodness rating. Fig. 3 shows the PAT results for each group at pretest, posttest and posttest2 (for controls). As can be seen, the results were fairly consistent across groups and

testing times. GLMM analyses conducted on the fit index scores and exploring the effects of testing time and group yielded no significant differences and no interaction, despite some numerical differences between groups and tests. Thus it seems that neither training method had an impact on the perceived similarity between L1 and L2 vowels.

Figure 3. Fit Index scores for the ID, DIS and CTL groups.



4. DISCUSSION AND CONCLUSIONS

This paper set out to examine the effect of two types of perceptual training on the ability to identify and discriminate target language sounds and if training had an effect on crosslinguistic perceived similarity.

The results of the identification and discrimination pre- and posttests indicate that training was effective in improving learners' identification and discrimination of L2 sounds. Improvement was observed for all trainees in both identification and discrimination and of both nonword and real word stimuli. The efficacy of training was further supported by evidence of generalization and retention [8, 17]: improvement was found with untrained elements (new nonwords and real words), and was retained four months after training had finished. These results are largely in agreement with previous HVPT studies [3, 9, 14, 20]. Furthermore, the finding that ID trainees outperform DIS trainees in the identification of L2 vowels replicates Carlet's [3] finding for vowels. Carlet argues that this difference may be related to cross-task differences in the nature of the response alternatives and the role of feedback, or to the fact that ID tasks are better at enhancing between-category sensitivity while DIS tasks promote within category sensitivity [17]. Nevertheless, all trainees, including the CTL group in the second phase of the study, improved significantly after training, lending support to the overall efficacy of HVPT [16, 17].

Regarding cross-linguistic similarity, the results of the PATs showed that some English vowels are perceived as highly similar to Spanish vowels, while others have a poorer match in the L1 inventory, in line with previous studies [5]. However, perceptual training did not seem to modify the participants' perceived similarity between L1 and L2 sounds as no significant differences emerged between pre- and post-training tests. The current results are in fact in accordance with previous results from another longitudinal study [12] and two cross-sectional studies [4, 10]. For instance, Cebrian [4] reported no difference between Catalan learners of English in their home country and long-term Catalan residents in Canada in their perceived similarity between L1 and L2 vowels. Nevertheless, other studies have reported that increased experience with the target language can affect the perceptual similarity between L1 and target language vowels [7, 13].

To our knowledge, the current study is the first one to examine the relationship between L2 perceptual training and cross-linguistic perception. It is possible that six 30-minute sessions of specialized phonetic training are not enough to trigger changes in interlingual perception. However, it does not seem to be the case that learners need to be better at detecting differences between native and target language sounds in order to perceive L2 sounds more accurately since L2 identification and discrimination improved while perception of cross-linguistic similarity remained unchanged. Further studies may need to evaluate the actual impact of perceptual training on the categorization of target language sounds in relation to L1 sounds. In addition, longer or different training regimes may be necessary, for instance involving both L1 and L2 stimuli. Finally, this paper has analyzed group performance only. An analysis of individual learner data may reveal different patterns of development of cross-linguistic similarity and L2 perception. Examining these issues is left for further research.

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[1] The L1 in the PAT was Spanish as all participants spoke Spanish even if many of them were Spanish-Catalan bilinguals. Participants filled out a questionnaire about their language background. No differences were observed in the results of the PAT related to the language dominance indicated on the questionnaire.