Stress perception

Effects of training and a study abroad program for L1 English late learners of Spanish

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This study assesses the claim that English late learners of Spanish do not perceive stress like native Spanish speakers, and that a short targeted stress perception training intervention during a study abroad Spanish language course has clear positive effects on stress perception. Fifteen English speakers were exposed to 90 hours of Spanish lessons during a three–week study abroad experience in Mar del Plata, Argentina. The trained group (N = 8) received 10 minutes of perceptual training on vowel and stress contrasts with nonce words three days a week, while the L1 English control group (N = 7) received communicative training focused on consonants, and the native Spanish control group (N = 7) received no training. Participants' perception was assessed at pretest and posttest, both consisting of identification tasks with nonce words. Results indicated that all English speakers experienced difficulties in perceiving Spanish stress when compared to native Spanish speakers in the pretest. At posttest, however, the English trained group performed comparably to the native Spanish group and differed significantly from the control group, indicating an effect of training on the perception of L2 stress. The results show that English speakers evidenced perceptual difficulties when learning Spanish stress, which could be overcome with a very small dose of targeted training with nonce words. Even though L2 immersion in a study abroad context was beneficial for the acquisition of Spanish stress, only students receiving stress training performed like native speakers.

Keywords: perception, stress, Spanish, English, training

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1. Introduction

1.1 Predicting stress perception problems

Stress 'deafness' (Dupoux, Pallier, Sebastián, & Mehler, 1997; Dupoux, Peperkamp & Sebastián-Gallés, 2001; Dupoux, Sebastián-Gallés, Navarrete & Peperkamp, 2007; Peperkamp & Dupoux, 2002) refers to difficulty in the perception of stress at the phonological level. Dupoux et al. (1997, 2001) demonstrated that native speakers of French, as opposed to native speakers of Spanish, exhibit a robust stress 'deafness' effect, that is, they have a great deal of difficulty perceiving stress contrasts. Unlike Spanish, French does not have contrastive stress at the lexical level, and French speakers were found to be 'deaf' to stress contrasts when listening to non-words in both Spanish and French recorded by a native Dutch speaker (Dupoux et al., 2001). Stress 'deafness' does not have to be understood as the failure to perceive stress at all, but rather, as difficulty in perceiving stress (Dupoux et al., 2001; Peperkamp & Dupoux, 2002).

The Stress Deafness Model (SDM, Dupoux et al. 1997, 2007; Peperkamp & Dupoux, 2002; Peperkamp, Vendelin & Dupoux, 2010) is a psycholinguistic model of language perception. The model predicts that stress perception is determined by the regularity of the L1 metrical system: the rate of success in perceiving stress differences in a language decreases with increasing regularity of stress assignment in the L1. It classifies languages according to the regularity of stress and posits that if word stress is regular, and hence, non-contrastive (i.e., either fixed or predictable from acoustic, phonetic, phonological or phonotactic cues), it does not need to be encoded in the phonological representation of the word in the mental lexicon. That is, the more regular and predictable stress assignment in the L1 is, the harder it is to perceive stress differences in the L2.

Stress 'deafness' in French speakers has been observed both in an ABX discrimination task (Dupoux et al. 1997) and a sequence recall task (Dupoux et al. 2001, 2007; Peperkamp & Dupoux, 2002; Peperkamp et al. 2010). Most studies on stress 'deafness' by Dupoux, Peperkamp and colleagues tested L1 stress perception within native French and native Spanish speakers, as well as speakers of some other non-contrastive languages, by using non-existing words recorded by native Dutch speakers. Dupoux et al. (2007), however, extended the SDM to L2 stress perception by studying the perception of Spanish stress by French late learners of Spanish. The Spanish stimuli used in this study were produced by a native French speaker trained to produce Spanish stress. This study confirmed the results found in the L1 studies: a stress 'deafness' effect was observed in both French late learners of Spanish and French monolinguals with no knowledge of Spanish. Both groups evidenced difficulties in the perception of Spanish stress, performing differently from native Spanish speakers. In addition, French late learners of Spanish did not show an effect of practice: advanced learners who had lived in a Spanish-speaking country performed as badly as beginners with only a few months of practice with Spanish. Spanish speakers, on the contrary, showed no difficulties in the perception of stress (Dupoux et al., 2007). The SDM suggests that stress 'deafness' is resistant to exposure to an L2 and even to training (Dupoux & Peperkamp, 2002; Dupoux et al., 2007). Peperkamp & Dupoux (2002, p. 3) propose that "once tuned, the phonological representation of words becomes fixed and is relatively unaffected by later acquisitions in either the same or a different language."

It is worth noticing, however, that most research on stress 'deafness' has focused on how speakers of languages with non-contrastive stress, such as French and Hungarian, perceive stress contrasts as compared to speakers of languages with contrastive stress, such as Spanish (Dupoux et al. 2001, 2007; Peperkamp & Dupoux 2002; Schwab & Llisterri (2013). Fewer studies (Ortega-Llebaria, 2007; Ortega-Llebaria, Gu & Fan, 2013; Saalfeld, 2012) have compared perception from one contrastive stress L1, like English, to another contrastive stress L2, like Spanish. In this case the reasons for difficulty with stress perception cannot be attributed to the absence of contrastive stress in the L1.

The Stress Typology Model (STM, Vogel, 2000; Altmann & Vogel, 2002) expanded on the SDM by including not only non-contrastive stress languages, but also contrastive stress languages and non-stress languages such as Chinese or Japanese, where tone and pitch accent are the word-level prosodic features that function in the same contrastive way as word stress in languages like English and Spanish. Altmann (2006) found a stress 'deafness' effect in learners whose L1 had phonologically predictable word stress (Arabic, Turkish and French) when listening to nonce words in English, but she found no 'deafness' effect in either speakers of certain non-stress L1s (Chinese, Japanese and Korean, with contrastive tone or pitch accent rather than stress) or speakers with contrastive L1 stress (Spanish). Speakers of both language types performed like native English speakers and showed almost perfect perception scores for English stress. Thus no stress deafness effect is predicted by the model for participants whose L1 is a contrastive stress language.

However, other experimental studies on the perception of Spanish stress by native English speakers (Ortega-Llebaria et al., 2013; Saalfeld, 2012), and on the perception of Polish stress by native English and Spanish speakers (Kijak, 2009), have indicated that there are perceptual differences between English and Spanish speakers that could not be attributed to the gross typological similarities between English and Spanish. Differences in the perceptual behavior of speakers could be related to other language specific factors like the role of stress in word recognition (Kijak, 2009) or the specific phonetic cues to stress that English speakers use in their L1 (Ortega-Llebaria et al., 2013).

1.2 Stress in Spanish and English

It is generally assumed that English and Spanish belong to the same group according to their stress typology: they are contrastive stress languages, as opposed to non-contrastive stress languages. Primary word stress is not fixed in one position, but rather falls on one of the word's last three syllables, so stress cannot be predicted based on the phonological shape of a word alone. It serves a contrastive function, which means that different placement of stress within a word may result in meaning differences. Even with no possibility of contrast, incorrect stress assignment is noticeable to native speakers and thus can impede comprehension (e.g. Field 2005). Therefore, speakers must store stress in the phonological representation of each word (Peperkamp & Dupoux, 2002); it cannot be derived from a general phonological rule affecting all words.[1]

Lexical stress in English and Spanish is assigned at the right edge of the word and it involves binary trochaic feet, containing a strong and then a weak syllable (Ortega-Llebaria et al., 2013). In both languages penultimate stress is the most frequent stress pattern. According to Clopper's (2002) analysis (Post da Silveira, 2011), penultimate stress is the most frequent stress pattern for two syllable words in English while antepenultimate stress is the most frequent pattern for three and four syllable words, with an overall frequency of 60.55% for the penultimate stress pattern in English. Penultimate stress is the most prominent stress pattern in Spanish, with 70% to 80% of words having primary stress on the penultimate syllable (Harris, 1983; Quilis, 1984; 90% according to Hualde (2005).

Despite the similarities between English and Spanish stress systems, there are important differences between them relating to the phonetic and morphosyntactic properties of stress. Phonetically, Spanish and English stress affect vowel quality differently. In Spanish, vowels are given their full quality whether stressed or not. According to Llisterri, Machuca, de la Mota, Riera & Ríos (2003), the fundamental frequency (F0) is the relevant acoustic cue in Spanish for the perception of lexical stress in combination with duration, intensity or both duration and intensity. On the other hand, in English the stressing of a vowel in one syllable is systematically (but not always) accompanied by vowel reductions in one or more surrounding syllables (Tyler & Cutler, 2009). In this sense, stress in English is often marked in two different segments: pitch and/or duration increases on the stressed syllable, while the vowel of another syllable is reduced. This suggests a possible difficulty

1. Speakers of non-contrastive stress languages always place stress in the same position, for example, on the last syllable of words or phrases in French, or on the first one in Hungarian (Peperkamp et al., 2010).

for English speakers in perceiving lexical stress in a language like Spanish where are found only on the stressed vowel.

English and Spanish stress have different morphosyntactic properties. While in English contrastive stress most frequently signals whether a word is to be considered a noun or not, as in ***per**mit* / *per**mit*** (noun-verb) or ***con**tent* / *con**tent*** (noun-adjective), in Spanish it is most frequently used to signal different verbal meanings. Penultimate stress (in bold) signals regular present tense forms, as in ***llo**ro*, ***llo**re* 'I cry' in the indicative and subjunctive respectively, and final stress indicates regular past tense forms, as in *llo**ró***, *llo**ré*** 'He cried, I cried' (e.g., Menegotto, 2005a; RAE, 2011). Thus in both English and Spanish, stress is meaningful. However, contrastive stress in English is limited to a rather small subset of lexical items, and is no longer productive in the noun/non-noun derivational morphology distinction, whereas in Spanish it is highly productive in the verbal inflectional system. Both languages have only a very small number of lexical contrasts that do not fall into these categories (e.g. in English ***fore**arm* vs. *fore**arm***, ***trus**ty* vs. *trus**tee*** (Cutler, 1986); in Spanish ***pa**pa* (potato or pope) vs. *pa**pá*** (father), for example). Thus stress is far more frequently used in Spanish to mark grammatically and semantically important information than it is in English, again suggesting a possible disadvantage for English speakers when acquiring Spanish stress.

These differences between English and Spanish are disregarded by both of the typological models presented above, which predict that speakers of English and Spanish should perform comparably well in the perception of Spanish or English L2 stress, given that both languages have at least some non-predictable cases of contrastive stress. Thus this study examines L2 stress perception in two contrastive stress languages with the differences described above.

1.3 Training effects on speech perception.

Research has shown substantial improvement after phonetic laboratory training on the perception of vowels (Nishi & Kewley-Port, 2007, 2008), consonants (Bradlow, Pisoni, Yamada & Tohkura, 1997; Bradlow, Yamada, Pisoni & Tohkura, 1999; Lively, Logan & Pisoni, 1993; Logan, Lively & Pisoni, 1991), and lexical tones (Wang, Spence, Jongman & Sereno, 1999; Wang, Jongman & Sereno, 2003). Results of these studies revealed that phonetic identification tasks using highly variable, naturally produced stimuli (i.e. produced in different phonetic contexts by various speakers) yield the greatest improvement. None of them, however, were conducted in an L2 immersion setting, and none of the control subjects went through any perceptual training. Thus, they received a smaller amount of L2 input than the trained group.

Little research (Schwab and Llisterri, 2014; Saalfeld, 2012) has reported the application of training procedures to the acquisition of Spanish lexical stress; however, none of these studies implemented a phonetic laboratory training procedure such as the one described above.

Schwab and Llisterri (2014) trained a group of French speakers on the perception of Spanish lexical stress by using a shape/pseudoword matching task. Listeners had to listen to six pseudowords, which contrasted the position of lexical stress, and associate them to different shapes presented on a computer. A very limited number of stimuli produced by one single speaker was used in one 25-minute training session. The control group did not receive perceptual training but had to perform a task consisting in clicking on a shape that appeared on the computer screen without hearing any oral stimuli. The effect of training was tested by means of a stress identification task administered before and after training to the trained and control French speakers. Results of this study revealed that the difference between the trained speakers and the control speakers with no training was larger in the posttest than in the pretest, and that the trained speakers did not improve from pre- to posttest, unlike the controls.

Saalfeld (2012) assessed the effect of instruction on the perception of Spanish stress by American English speakers. She trained learners for 10–15 minutes every day for four months in the perception and production of stress by using a variety of classroom activities, with low phonetic variability (all stimuli were recorded by the author). Pre and post testing consisted of an ABX sentence discrimination task, in which A and B differed only in the location of verbal stress and X was identical to either A or B. The task chosen for the experiment imposed a heavy strain on memory, as learners had to listen to two entire sentences and then a third one, and remember which of the first two matched the third. There were no effects of training in this experiment; the one marginally significant effect ($p = .055$) was in the direction opposite to the author's prediction: the untrained group performed better than the trained group at posttest. However, that finding might be attributed to a statistical error as the degrees of freedom for the comparison as reported are far higher than justified by the sample size.

As far as we know, no other research has examined whether English speakers can overcome their stress difficulties with brief, focused perceptual training, nor has any other study assessed the effects of training in a study abroad immersion program like the one described here. It would be of particular interest to discover whether there is any improvement in stress perception without any special perceptual training, as Saalfeld (2012) reports for students in a foreign language classroom environment, or if English speakers' stress deafness is resistant to training, as Dupoux et al (2007) reported with French speakers.

As the training procedures implemented in the studies of Schwab and Llisterri (2014) and Saalfeld (2012) proved to be ineffective for improving stress perception, our experiment adopted a phonetic laboratory training procedure to the acquisition of Spanish stress. In the present study we used an identification task with naturally produced nonce stimuli in testing and training.

1.4 The present study

The purpose of the current study is to investigate the perception of final and penultimate stress on words ending in open syllables by a group of adult American English speakers learning Spanish in a three week study-abroad language program in Mar del Plata, Argentina, as compared to a group of native River Plate Spanish speakers. It also explores whether L2 learners improve their perceptual accuracy on stress contrasts after a brief period of perceptual laboratory training with nonce words, focused on stress.

The English learners were separated into two groups. One of them received perceptual training focused on three word-final vowels (a-e-o) and on two stress patterns (final and penultimate), while the control group received no particular perceptual training on lexical stress. The perceptual training consisted of nine 10-minute sessions over the three-week course. Both English groups were tested by means of a pretest and a posttest. A native Spanish group was tested once, at the outset of the experiment, as no change in perception was expected in this group.

This study addressed the following questions:

1. Do low intermediate English speakers show difficulties with the perception of Spanish stress at the beginning of the course?
2. Are three weeks of immersion in Spanish in a study abroad program enough to improve stress perception, even without targeted perceptual training?
3. Is there an additional perceptual training effect for the experimental group?

Hypotheses:

1. According to the SDM, given that both English and Spanish are contrastive stress languages, English speakers learning Spanish should evidence no difficulties in the perception of stress (i.e. no stress 'deafness'); they should perform as well as Spanish native speakers in the identification of Spanish stress. However, previous research has shown that language specific factors such as the use of phonetic cues to stress in the L1, morphosyntactic properties, and the relative productivity of stress contrasts in the two languages might affect English speakers' perception of Spanish stress. In that case we would expect English speakers to exhibit some difficulties in our stress perception

task, although probably not to the same degree as speakers of a noncontrastive stress language like French.

2. If English speakers have no difficulty with Spanish stress perception, perceptual training dedicated to stress should make no difference in their performance on a stress identification task. On the other hand, if factors other than the mere existence of contrastive stress influence stress perception, such as the salience of stress in Spanish where it signals highly productive inflectional contrasts, we may find not only that English speakers fail to perceive Spanish stress as well as Spanish native speakers, but also that focused training on stress perception can improve their performance on our stress identification task.

2. Method

2.1 The experiment

Fifteen English speakers were exposed to 90 hours of Spanish lessons during a three-week immersion program in Mar del Plata, Argentina. A subgroup of eight learners received nine 10-minute sessions of perceptual training on vowel and stress contrasts over the three weeks. The other seven speakers served as non-native controls and received no special perceptual training. Participants' perception was assessed at pretest and posttest, both consisting of identification tasks with nonce words: learners were to identify the target vowel and stress against two other possibilities. The pretest was also administered to seven Spanish speakers who served as the native control group. The experimental design is laid out in detail in Figure 1.

2.2 Participants

The 15 English speakers (4 male, 11 female) were American students from several colleges located in New York City, enrolled in a three–week study abroad program in Mar del Plata, Argentina. It is a fairly intensive program, as the students must comply in three weeks with the requirements of two regular courses, which would usually take two academic terms to fulfill.

A questionnaire was first administered to all the participants in the Program (57 learners) to collect basic sociolinguistic information. Participants were selected based on the information on the questionnaire and the results of placement tests. To be selected for the experiment, participants had to be L1 English speakers and speak only English at home. Moreover, they had to have been placed in the low intermediate class. The number of eligible participants then narrowed down to 15 learners. It is worth mentioning that as we wanted to test the viability of training, working with intermediate learners, unlike advanced or low level learners, was the logical choice. For advanced students there might not be much more for them to learn in terms of stress perception, so there would be a ceiling effect even if the intervention is effective for other learners. And for low level students there may not have been much awareness of how stress works in the verb system, so they might have been working on general perceptual abilities. We suggest that this is the reason Saalfeld (2012) failed to find a stress training effect with her participants, who were in only their second semester of studying Spanish.

The 15 learners were all born in the United States, 12 in New York City, and the remaining three in Illinois, New Jersey and Los Angeles. They were all late learners of Spanish: all began to learn Spanish either in high school or college, and all were placed in the low intermediate course in Mar del Plata. Seven learners had prior knowledge of a third language (French, Italian, Portuguese or Polish).[2]

The learners were randomly split into two groups. Eight English speakers were assigned to the group that received perceptual training (henceforth the trained group), and seven speakers to the English control group. The trained group was 22.9 years old on average, while the English control group's average age was 23.9 years. The placement of the students into classes was our main determinant of L2 Spanish proficiency. The placement test scores of the experimental and control groups did not differ significantly $t(13) = 1.37$, $p = .195$. We also examined years of study, but there was no significant difference between these groups, $t(13) = 1.029$, $p = 0.322$. Moreover, these two variables were not significantly correlated with one another, $R = .172$, $p = .539$.

Seven Spanish speakers (two male, five female) served as the Spanish-speaking control group. They were all university students born in Mar del Plata, Argentina, with River Plate Spanish as the L1, and were on average 27.4 years old at the time of testing. None of the speakers in this study reported any speech or hearing problems in the questionnaire they filled out.

2. Although we have a relatively small sample size because of our stringent inclusion criteria (and in particular because we conducted the study in Argentina), it is no smaller than in other published studies on the effect of training on L2 perception (Nishi & Kewley-Port, 2007, 2008; Lord, 2010). Moreover our sample has the advantage of being linguistically more homogeneous. At any rate, if statistical significance on the crucial experimental variables can be achieved with samples of this size, this speaks to the robustness of our hypothesis tests regarding both the existence of stress perception difficulties and the effects of training.

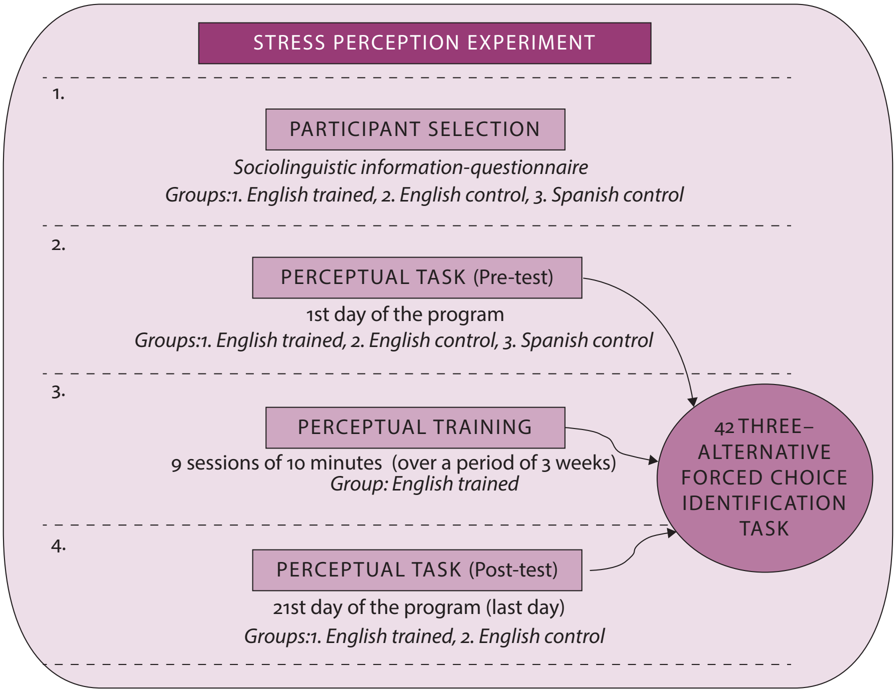

Figure 1. Design of the Study

2.3 Procedure

The general design of the present study was adapted from Bradlow et al. (1997) and is broadly similar to that of Saalfeld (2012): it included a pretest phase, a perceptual training phase for one subgroup of learners, and a posttest phase. The English and Spanish speakers performed the same test on day 1 (their first day at the University, although not their first day in Argentina) and on day 21 (the last day of the program), hereafter "pretest" and "posttest", respectively. Figure 1 provides an outline of the experimental method and design.

The pretest phase consisted of an identification task with naturally produced Spanish vowel and stress contrasts produced by a female Argentinian speaker. The training phase involved nine sessions of 10 minutes each (over a period of three weeks, no more than one session per day) of perceptual identification with feedback. Training focused on both vowel quality and stress contrasts. The posttest phase included a perceptual identification task identical to the pretest. Thus both the trained and control groups were familiar with the test method since both groups performed the pretest and posttest. While the trained group received targeted training on both vowel quality and stress contrasts, as is described in the tasks below, the control group received task oriented training in the classroom — not in the lab — focusing on Spanish consonant sounds /x g s ʃ ɾ r/. Control group tasks included listening to songs and watching short videos in order to fill in the blanks with words containing the target consonants, or choosing the word containing the target consonant against two other options, the latter being identical to the method used with the stress training group. Thus these classroom tasks included some, but not all, of the task demands of the pre and posttests (especially discrimination). The native Spanish group completed the perception test once.

All perception testing and training was carried out in the Language Laboratory at Universidad Nacional de Mar del Plata, Argentina. For both testing and training the same perceptual identification format was used: 42 sets of three–alternative, forced-choice items. However, the 42 sets of items used at pretest/posttest were different from the stimuli used throughout training; moreover, each training session used different stimuli of the same type. Participants were tested and trained in a sound attenuated room where they sat in individual cubicles equipped with headphones (Tandberg Educational, Total Impedance 2000hm) and a workstation (Tandberg TLC 1000). Testing and training stimuli were played by the first author of this article. A Dell computer was connected to the teacher's console through which the stimuli were played. The spoken target word was presented at a comfortable listening level through the subjects' headphones. There was no practice session before the perception test. Each task, either for testing or for training, lasted less than three minutes.

Testing and training tasks followed the same procedure. Participants heard a target stimulus pronounced by the same female native speaker of River Plate Spanish and they had to select from three options on an answer sheet which one was the word that they had just heard. They repeated this procedure for each of the 42 stimuli. Options were presented orthographically on the answer sheet; one option was the target stress stimulus (final or penultimate), another was the target with the opposite stress pattern, and the third was the target stress with the final vowel altered. The following triplet exemplifies the listeners' options in the perception test (target word in bold): (a) **semapa** [se'mapa], (b) semapá [sema'pa], (c) semapo [se'mapo] (See Appendix A for the complete perception test). If option (c) was chosen, i.e. the target stress with a different word-final vowel, it was analyzed as correct identification of stress, even though the vowel was incorrect (the response options with the altered vowel were used for a different study of the perception of vowel quality, Romanelli (2015)). Only 2.2% of responses involved the option with the wrong vowel quality. Although there were three options per trial, the fact that participants rarely chose the stimulus with the changed vowel means that there were effectively two options per trial, with the changed vowel functioning as a distractor. Thus chance on these trials is in reality very close to 50%.

Each of the nine training sessions consisted of one or two perceptual tasks, depending on the time available, and lasted an average of 2 minutes and 45 seconds, plus feedback. When two tasks were carried out in one session, feedback on the second task was given in the following session, as otherwise, sessions would have lasted more than 10 minutes. After the training tasks, visual and auditory feedback was provided by the trainer (the first author of this paper): she would write the target word on the blackboard and repeat it orally. Thus, learners were exposed to auditory stimuli produced by the same speaker, along with the written forms, in the course of training. There was no feedback in the pretest or posttest.

Our study used low speaker variability but high test word variability: the trained participants heard a total of 546 different items across the sessions (42 stimuli x 13 tasks) (see Appendix B for a complete list of training stimuli), but all were pronounced by the same talker. Since the effects of speaker and item variability are often confounded, it was not possible to predict how strong the training effect (if any) might be. But perhaps more importantly, because of the study-abroad immersion context, all participants had a large amount of exposure to different voices outside of the classroom, either in the hotel where they were staying at, in their community-based projects, or simply interacting with people in Mar del Plata on a day to day basis. It is interesting to consider whether this study abroad situation has the same function as varying the voices within the training and test phases, as is done in non-immersion studies. However, isolating and testing this proposal would require a followup study in which our training and testing stimuli are recorded by a variety of different speakers.

Nonce or non-existent words were used in the testing and training tasks (as in several other perception studies such as Altmann, 2006; Bullock & Lord, 2003; Dupoux et al., 2001; Peperkamp & Dupoux, 2002; Peperkamp, Vandelin & Dupoux, 2010) to avoid a possible effect of familiarity with a real word, or of previously learned information regarding stress location in a lexical item. The nonexistent items did not violate the phonotactic constraints of Spanish, and therefore could be novel Spanish words.

2.4 Stimuli

Sound files for the perception test and training were recorded with Audacity 2.0.0 (Audacity Team, 2012) and downsampled (22050 Hz). In order to minimize memory effects, the testing and training stimuli were different: training stimuli were not used in testing and vice versa. The stimuli, both in the test and training, were recorded by the same Argentinian speaker.

Thirty six $CVCVC_1V_1$ nonsense words contrasting final and penultimate stress were used in the testing and training tasks. In the testing task, the consonants for C_1 were /p, t, k, s, f, ɾ/ while in the training tasks they were /p, t, k/. The vowels for V_1 were /a, e, o/ in both testing and training stimuli. In addition, there were six distractors ending in /p, t, k, s, f, r/ and /i, u/ in both testing and training tasks. It is worth mentioning that final /a, e, o/ were selected for the experiment because they are the ones on which stress distinguishes Spanish verb inflections (person, tense and mood features) creating contrasts on otherwise identical forms.

In each testing and training task, participants responded to 36 target stimuli and 6 distractors. The experimental items had either final or penultimate stress, and were evenly distributed across trials in either first, second, or third position on the answer sheet, for a total of 6 basic conditions. These were fully crossed with the three final vowels, bringing the number of different conditions to 18, all of which were presented twice, with different nonce words, for a total of 36 experimental items. On each trial, the participants first heard two repetitions of the target item, 1000ms apart. They then had 1500ms to respond before the next trial.

2.5 Language classes

During their time in Mar del Plata the learners were expected to fulfill the requirements of two 45-hour intermediate Spanish courses (SPAN 201 and 202) of a major New York university. They were all exposed to 60 hours of regular language lessons conducted in Spanish by a native teacher (English was not allowed in class), and up to 30 hours of 'real world' project work outside the classroom, including natural interactions with native speakers, following the method developed by the Universidad Nacional de Mar del Plata (Menegotto, 1999, 2005b, 2007, Cortés & Menegotto, 2000; Menegotto & Cortés, 2014).[3] Foreign learners are grouped in teams of three to five people, and each group is assigned a native Spanish teaching assistant (TA) to help them develop weekly projects that result in natural interactions in Spanish, such as interviewing local people to gather information. Thus learners were immersed in a Spanish speaking country for three weeks, and exposed to Spanish lessons and projects for at least 90 hours, in addition to

3. The Program's syllabus is project based. Each project is a learning and cultural experience carried out partially outside the classroom, while the regular morning classes given by experienced teachers offer the communicative and grammatical content needed to carry out the projects.

significant but variable amounts of exposure outside of the course time, one to four hours a day.[4,5]

By contrast, the training sessions lasted only 90 minutes out of the 90 hours (1.7%) of course time, and this does not take into account the many more hours of daily use of Spanish in natural settings. This is in stark contrast to the situation described by Saalfeld (2012), where the students were in regular university courses in an English environment, rather than in an intensive course within an immersion context.

2.6 Data analysis

To score the perceptual tests, it was first determined if a participant responded correctly or incorrectly to each word, i.e. whether stress was indicated on the syllable that was stressed in the stimulus.

Quasi-logit transformed percentage correct identification scores were analyzed with a mixed ANOVA (see Agresti, 2002; Jaeger, 2008). A significance level of 0.05 was used for all inferential statistics. The quasi-logit transformation was used in order to correct for the nonhomogeneity of variance that often accompanies analyses of proportion or percentage data. It also solves the problem of resulting confidence intervals for mean proportions that can otherwise extend above 1.0 or below 0.0, as well as transforming the observations into a non-bounded continuum, as opposed to the restricted range of proportion scores. Thus we have eliminated the potential problem of spurious significance among conditions with higher mean proportions correct, where variances are necessarily lower in the untransformed data. Graphics in this article are presented in percentages for ease of reading, but error bars are not provided because the standard errors in percentages are transformed in a nonlinear fashion for the purposes of data analysis, and thus would be erroneous and misleading. At any rate, error bars are merely descriptive statistics and cannot be used to determine whether two conditions are significantly different. Because the nonsense words were perfectly matched at the segment level across the stress conditions (see Appendix A), the analysis was conducted by

4. According to the information given by the teaching assistants, most students spent at least three hours a day interacting completely in Spanish outside of the classroom setting, so it might be the case that some of the learners were exposed to more than 150 hours of Spanish during their stay in Argentina.

5. For most students the Spanish they were acquiring in Mar del Plata differed from whatever variety they had previously learned, but not in ways that are relevant to this research. Exposure to River Plate Spanish required noticing the different use of stress in verb morphology, though this was not an issue for the nonsense words used in the experiment.

participants (F1) only (see Clark, 1973; Raaijmakers, Schrijnemakers & Gremmen, 1999).

Since the Spanish native speakers completed the perception task only once, the same results were used as the native Spanish control data for comparison to the learners' pretest and posttest results.

3. Results

A mixed ANOVA with Group (trained, control, Spanish) as the between subjects factor and Time (pre, post), Vowel (word-final /a e o/), and Stress (final, penultimate) as the within subjects factors, yielded a significant Time x Group interaction $F(2, 19) = 10.159$, $p = .001$, $\eta_p^2 = .52$, and significant effects of Time $F(1, 19) = 28.710$, $p = .000$, $\eta_p^2 = .60$, Group $F(2, 19) = 17.569$, $p = .000$, $\eta_p^2 = .65$, and Vowel $F(2, 38) = 4.714$, $p = .015$, $\eta_p^2 = .33$.[6]

To investigate the Time x Group interaction (see Figure 2), followup one-way ANOVAs were carried out on the two tests (pre and post) separately. Overall significant differences were found among the three participant groups in both the pretest $F(2, 19) = 22.491$, $p = .000$, $\eta_p^2 = .70$, and the posttest $F(2, 19) = 9.005$, $p = .002$, $\eta_p^2 = .50$.

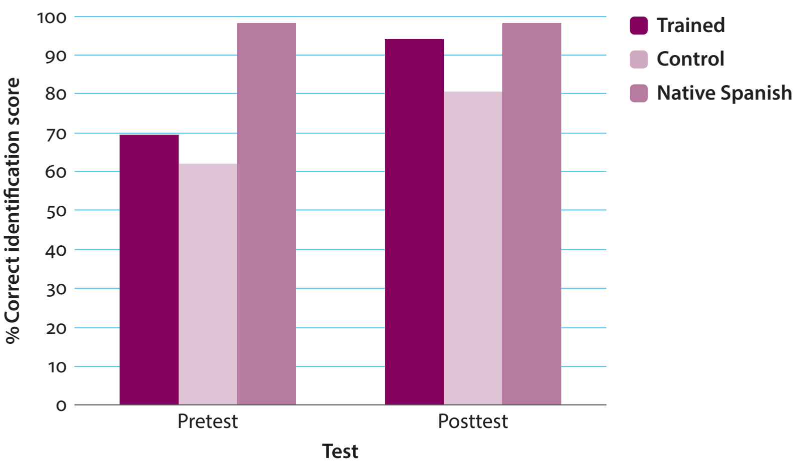

Figure 2. Mean Percentage Correct identification Scores for Spanish Stress at Pretest and Posttest for the English Trained, English Control and Native Spanish Speakers
Note. Because analyses were based on the quasi-logit transformed percentages, error bars for the percentages would be misleading.

6. We apply the following rule of thumb in interpreting η_p^2 values: small, $0.01 \leq \eta_p^2 < 0.06$; medium, $0.06 \leq \eta_p^2 < 0.14$; large, $\eta_p^2 \geq 0.14$ (e.g., Huck, 2009).

Bonferroni-adjusted post hoc multiple comparisons showed that the trained and the English control groups did not differ from each other in the identification of stress in the pretest ($p > .05$), but both of these groups differed from the native Spanish group ($p = .000$ for both, Cohen's $d = 2.68$ and Cohen's $d = 4.48$, respectively) (Figure 2).[7] In the posttest, however, the English trained group scored significantly better than the control group ($p = .015$, Cohen's $d = 1.44$) and did not differ significantly from the native Spanish group ($p = .958$). The control group, on the other hand, performed significantly worse than the native Spanish speakers ($p = .002$, Cohen's $d = 2.09$).

These results indicate that the nonnative groups were comparable at the outset of the experiment, displaying significantly lower scores than the Spanish speakers and thus showing stress perception difficulties.[8] In the posttest, however, the trained group's improvement was sufficient to make it statistically distinguishable from the native English control speakers but not from the native Spanish speakers. This difference in performance between the English groups revealed that perceptual training was effective for the perceptual learning of Spanish stress. After training, this group outperformed the English control group and scored similarly to the Spanish group.

We also observed an effect of exposure to the L2, as both the trained and the control groups significantly improved in the posttest relative to their pretest performance, as demonstrated by paired samples t tests run on the logit values of the trained and control groups (collapsing Vowel and Stress as the Time x Group interaction was significant), $t(7) = 4.470$, $p = .003$, and $t(6) = 3.670$, $p = .010$, respectively. However, even though both groups improved as a result of the three-week language course and language immersion, only the trained group reached native levels of stress perception, in addition to attaining significantly higher scores than the untrained English control group.

In relation to the effect of stress type (final vs. penultimate), no differences were identified among the groups, as shown in the ANOVA results above. Finally,

7. According to Cohen (1988), effect sizes can be classified as either small (0.20), medium (0.50), or large (0.80).

8. A reviewer noted that there is a "numerical" difference between the groups at pretest and asked whether this could account for the superior performance of the training group at posttest. We reject this idea. A sample mean cannot be interpreted without reference to its confidence interval, which contains the range of possible underlying population means that it is drawn from; any means within this range could show up in any given experiment. Thus the nonsignificant population mean difference could be greater or less than what is observed in our sample and could just as easily be in the opposite direction. To demonstrate this empirically we ran independent samples t-tests comparing the two NNS groups on all 6 of the conditions at pretest. All were nonsignificant even without a Bonferroni correction.

to analyze the main effect of word-final Vowel (collapsing across Time, Stress and Group), post hoc paired samples *t*-tests on vowel pairs with a Bonferroni correction revealed a significant difference between vowels /a/ and /e/ $t(21)=3.238$, $p=.004$, Cohen's $d=.44$, but not between /a/ and /o/ or /e/ and /o/. These results reveal that stress on Spanish /e/ was less easily identified than stress on /a/ across groups, 80% and 87%, respectively. Figure 3 presents the correct identification scores for Spanish stress across word-final vowels for the trained and control groups, as well as for the native Spanish group.

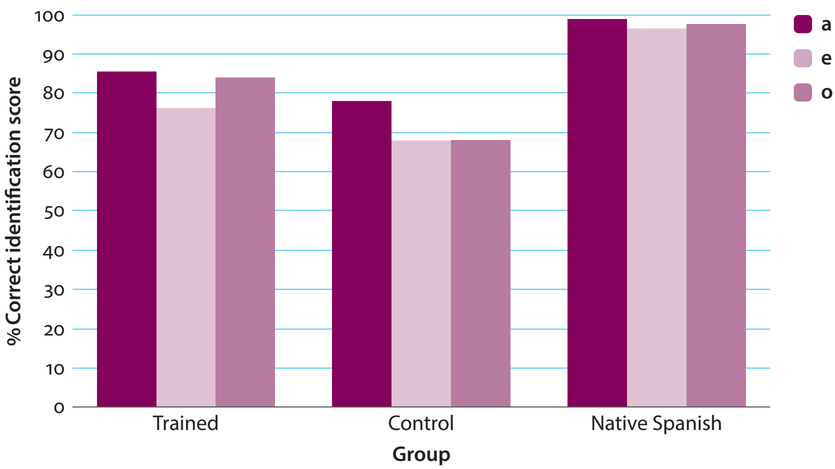

Figure 3. Mean Percentage Correct Identification Scores for Spanish Stress Across Vowels for English Trained and Control Learners of L2 Spanish and Native Spanish Speakers
Note. Because analyses were based on the quasi-logit transformed percentages, error bars for the percentages would be misleading.

4. Discussion

4.1 General discussion

Our first research question asked whether native English speakers experience difficulties with the perception of L2 Spanish stress, or whether they perceive Spanish stress like Spanish native speakers do. Despite the fact that both English and Spanish are contrastive stress languages, and thus speakers of both languages are predicted by the SDM and the STM to experience no difficulties in L2 stress perception, our findings supported previous research and showed that low intermediate English speakers exhibited perceptual difficulties at the beginning of their Spanish immersion program. English speakers' perceptual accuracy scores for Spanish stress were significantly lower than those of the native Spanish speakers at pretest. Moreover, the English control group still performed significantly worse than the native Spanish group at posttest, and also significantly worse than the trained English group.

Given our observations about the low productivity and frequency of contrastive stress in English as compared to Spanish, it would not be surprising to find that L1 English speakers make less use of stress information during lexical access in their own language, compared to speakers of other languages. In fact, experiments by Cutler and Pasveer (2006) with native speakers of English, German, Dutch and Spanish (see also Cooper, Cutler & Wales, 2002; Cutler & Van Donselaar, 2001; Cutler, Norris & Sebastián-Gallés, 2004; Soto-Faraco, Sebastián-Gallés & Cutler, 2001; Van Donselaar, Koster & Cutler, 2005) found that English speakers differed from the others in exactly this way. In Dutch, German and Spanish, stress information reduces considerably the number of candidate words activated in word recognition, while in English it does not. Thus English speakers have far less opportunity to exploit suprasegmental information in lexical access in their L1 (Cooper, Cutler & Wales, 2002) than do speakers of these other languages. Given these findings, and the low functional load of stress in English minimal pairs, we infer that English speakers approach the acquisition of Spanish with lowered sensitivity to stress, and that they could benefit from heightening this sensitivity, either through exposure or through training.

Other language-specific factors that could contribute to English speakers' perceptual difficulties with Spanish stress, despite the predictions of the SDM and the STM, are related to the phonetic cues correlated with English stress. While both English and Spanish speakers use duration and fundamental frequency (F0) as stress cues, English speakers also use vowel reduction as a cue to which syllable is (un)stressed. Because Spanish vowels are given their full quality both when stressed and when unstressed (Tyler & Cutler, 2009), vowel reduction is not a cue to Spanish stress. This means that L1 English speakers cannot rely on this cue when they learn Spanish. There are also differences between English and Spanish in relation to duration and F0 cues, which can make Spanish stress perception even more difficult for English speakers. For example, differences in duration between stressed and unstressed syllables in Spanish are smaller than in English (Delattre, 1966). It is possible that English speakers fail to accurately perceive these duration differences, thus leading them to identify stress on the wrong syllable.

Finally, English and Spanish differ in the way they indicate stress prominence in terms of the frequency of occurrence of pitch accents. Ortega-Llebaria et al. (2013) explain that low-pitched syllables are more frequently associated with stress in Spanish than in English, and thus, English speakers may fail to perceive low-pitched syllables as stressed. They may wrongly perceive a post-tonic F0 peak on an unstressed syllable as an F0 peak on a stressed syllable, misinterpreting for example, present tense *__ha__blo* as past tense *ha__bló__*, as explained by Ortega-Llebaria et al. (2013, p. 189). In their study, cross-language differences in duration and F0 are shown to account for English speakers' difficulties in Spanish stress perception, rather than vowel reduction. In our study, however, the acoustic correlates of stress, i.e. duration, F0 and intensity, were not manipulated.

A number of issues thus arise regarding the influence of the L1 on the perception of the L2. Assuming that stress perception is determined at least in part by the regularity of the L1 system, the cues to perceiving stress in English (and the reason learners show a partial stress deafness effect when learning Spanish) may not be accounted for in strictly phonetic terms. That is, if contrastive stress is unpredictable from acoustic, phonetic, phonological or phonotactic cues, it might be the case that it is predictable from morphosyntactic ones.

As mentioned above, while both English and Spanish make lexical minimal pairs with stress, (*__con__trast/con__trast__*, *__to__mo/to__mó__*), contrastive stress in English is largely derivational and non-productive, while in Spanish it is largely inflectional and productive. In Spanish, stress information plays a crucial role in identifying several contrasting features of verbal inflection, while in English it signals a lexical category difference (e.g. noun vs. verb or adjective). Cutler (1986) considers that due to the limited number of stress contrasts in English and the different grammatical functions that these words fulfill, a word stressed on the wrong syllable is unlikely to create a serious misunderstanding for the listener. For example, if a listener hears "The government must *__im__port* 200,000 tons of black beans", the grammatical function of the word "import" tells the listener that the verb is intended rather than the noun, even though the verb normally has penultimate stress. Thus a mistake in stress perception is easily noticed and resolved by English speakers simply because they cannot assign any proper representation to the sentence if stress indicates that a word is a noun but grammatical features and context indicate that it is a verb. Thus English stress carries less information, because it can be overridden by grammatical information.

In Spanish, stress operates functionally on the final vowels a, e, o, to differentiate person, tense and mood features in otherwise identical verbal forms (stressed syllables are indicated in bold). The stress contrasts affect every regular verb from the first conjugation (i.e. verbs in –AR), in present, future and past tense, indicative, subjunctive and imperative mood, 1st, 2nd and 3rd person: *__to__ma* (3rd p-s-present) vs. *to__má__* (2nd p-s-imperative);[9] *to__ma__ra* (1st and 3rd p-s-imperfect subjunctive) vs. *toma__rá__* (3rd p-s-future indicative); *__to__me* (1st and 3rd p-s-present subjunctive) vs. *to__mé__* (1st p-s-preterite indicative); *to__ma__re* (1st and 3rd p-s-future subjunctive) vs.

9. 2ndp-s-imperative is a verbal form characteristic of River Plate inflectional system related to the pronoun *vos*. All the other forms do not differ from other dialectal varieties of Spanish.

tomaré (1st p-s-future indicative); and ***to**mo* (1st p-s-present indicative) vs. *to**mó*** (3rd p-s-preterite). Since Spanish is a pro-drop language (Zagona, 1988), i.e. a language that preserves the optionality of subject pronouns (Green, 1990, p. 245), native speakers rely more on verb endings and less on subject pronouns as cues for sentence structure recognition, so that if stress is wrongly perceived the misunderstanding may even go unnoticed at the sentence level. "***To**mo* café todos los días", 'I have coffee every day', and "*To**mó*** café todos los días", 'He had coffee every day', are two different and possible sentences in Spanish, with different meanings. This type of misunderstanding can have important effects on communication and lead to confusion between speakers and listeners. If the speakers do not perceive stress appropriately, only the discourse and situational context can help them to choose the right underlying structure, and as in the example just given, there may be no such cues available. It seems reasonable to infer that Spanish stress carries a higher functional load within the grammatical system than does English stress, and that one component of learning Spanish involves acquiring greater sensitivity to word stress than is necessary in English.

We should also reiterate the vast difference in the frequency of production and perception of words with inflectional contrasts in Spanish, compared to the low frequency of encountering English words that participate in derivational contrasts. Verbs ending in –AR are the most frequent in Spanish and are also the ones that most often exploit stress as the sole differentiator between inflectional morphemes. According to data from Federico Plager (personal communication, January 13, 2014), from a total of 4956 verbs in the Diccionario Integral del Español de la Argentina (2008), 4242 belong to the first conjugation (86%).

Regarding the effect of training on the perception of L2 Spanish stress contrasts, our posttest results showed that after only a very brief period of perceptual training on stress contrasts (less than 2% of the time spent in the program, and an even smaller percentage of the total immersion time in Spanish), trained English speakers learned to perceive Spanish stress like native Spanish speakers, and significantly better than the English control speakers. Even though the control group significantly improved from pretest to posttest, as a result of the language immersion and Spanish lessons, it differed from both the native Spanish group and the trained group in the posttest. These findings then provide evidence for a remarkable effect of training on L2 perception; brief periods of this type of "focus on stress" perceptual training speed up the acquisition of Spanish stress, over and above the significant effects of immersion.

It is worth mentioning that while the trained group received perceptual training focused on vowels and stress, the control group carried out different tasks focused on Spanish consonants, including multiple choice tasks like those used in the stress training. While tasks carried out in both groups involved choosing from different options, the tasks implemented in the classroom focused not only on form (consonants) but also on meaning (i.e. understanding what the song and video were about, the relationship between speakers, etc.), while the ones used in testing and training focused solely on form (i.e. vowel and stress contrasts). Thus we cannot attribute the superior performance of the stress-trained group merely to familiarity with the test format. Moreover, we cannot attribute their performance to the fact that they were trained and later tested on nonsense words, while the untrained group was not: Romanelli (2015) has replicated this finding with real words as well as nonsense words. That is, the Group x Time interaction was significant, with the same training effects as in the present study, but the three-way interaction with Word Status (real vs. nonce) was not significant ($F(2,43) = 1.270$, $p = .291$).

4.2 Limitations of the present study and future research directions

As learners were on a three-week study abroad program, we wanted to assess if a rather simple and brief intervention would have an effect on stress acquisition. We counted on the fact that learners would be immersed in the L2 and exposed to multiple speakers as a rather strong test of our intervention, which could have been overwhelmed by the effects of regular Spanish teaching, special projects, and immersion in the language and culture. Even though both nonnative groups benefited from the language immersion and the language course, only the trained group reached native-like stress perception. Our results show that stress perception responded well to the intervention. This is a novel line of applied research, which seems very promising.

The training procedure implemented here could be criticized for not using high phonetic variability, which is taken to mean the use of multiple talkers and multiple phonetic environments. However, we propose that the study abroad context may have provided the requisite talker variation, and the use of 546 different training stimuli may have provided sufficient phonetic variation to meet the criteria for a high-variability training procedure. Thus it would be interesting to observe in the future whether training sessions with a more careful selection of a range of phonetic contexts, or the use of multiple talkers, would or would not lead to even stronger training effects.

It is also necessary to examine whether these effects are only temporary, e.g. limited to the time in which the students are receiving both language training and the special stress training, or whether the differences we observed between the trained and untrained groups would persist well beyond the end of the language course. Though retention and generalization tests would be somewhat difficult to implement with our particular language program, since the learners stay in Mar del Plata for a very short time and do not return, it is important to continue this line of research including retention and generalization tests.

Future research could also examine whether training that is strictly perceptual (i.e. with nonce words) or also meaningful (i.e. with verbal contrasts) have the same effect on stress perception. If Spanish and English really share the same value of the stress parameter, and morphosyntactic differences are one of the causes of the stress 'deafness' effects observed, brief but meaningful training on verb ending perception should make a significantly greater difference than purely phonetic training with nonce words when teaching Spanish to English speakers. But if Spanish and English differ in the stress parameter, the focus on form training would be justified: strictly perceptual training with nonce words would be the key to unlocking an important part of Spanish grammar for English speakers. We would then be very close to finding a microparameter, in the sense of Baker (2008).

5. Conclusions

Even though English and Spanish belong to the same typological category of contrastive stress languages, gross typological similarities between them appear to be unreliable predictors of the stress perception behavior of English late learners of Spanish. In contrast to the predictions made by the typological models, English speakers did not perceive Spanish stress as well as native Spanish speakers, unless they were given a surprisingly small amount of special stress straining.

Given the simplicity and brevity of the stress training that we provided, especially in relation to its positive outcomes, we suggest that similar interventions might be a valuable addition to the language training of all learners whose L1 and L2 are mismatched on the properties of the linguistic systems that determine the accuracy of stress identification. Adding real words (verb contrasts) to nonce words during the training sessions would guarantee that, no matter whether the parameter is phonological or morphosyntactic, the effect on learning will be noticeable.

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Appendix A. Perception Test

		X		X		X
1.	semapa	*X	Semapá		semapo	
2.	guirará		Guirare		guiraré	X
3.	dufofó		dufofe		dufofo	X
4.	miduque	X	miduqué		miducó	
5.	maropi	X	maropo		maropó	
6.	yurite		yuritá		yurita	X
7.	garipe		garipé	X	garipo	
8.	jibosá		jiboso	X	jibosó	
9.	robica		robiqué		robicá	X
10.	tulire		tuliré		tuliri	X
11.	vabaró	X	vabaro		vabara	
12.	querisá		querisa	X	querisó	
13.	meripo		meripé		meripó	X
14.	zosera		zosere	X	zoseré	

		X		X		X
15.	rugisá		rugisa		rugicí	X
16.	gotefú	X	gotefo		gotefó	
17.	cobute		cobuté	X	cobuto	
18.	caquiro	X	caquiró		caquirá	
19.	copupe		copupá	X	copupa	
20.	birosé		birosá		birose	X
21.	serife		serifó	X	serifo	
22.	moñará	X	moñara		moñaro	
23.	tiñusó	X	tiñusé		tiñuso	
24.	fulata		fulatu	X	fulatá	
25.	rechipé		rechipe	X	rechipa	
26.	linusa		linusó		linusá	X
27.	chilofó		chilofe		chilofé	X
28.	capeco	X	capecó		capeca	
29.	racoré		racora	X	racorá	
30.	quesufu	X	quesufé		quesufe	
31.	valetá	X	valeta		valeto	
32.	nucató		nucaté		nucato	X
33.	pameco		pamequé	X	pameque	
34.	legucá		leguco		legucó	X
35.	purrote	X	purrotá		purroté	
36.	gagufá		gagufé		gagufa	X
37.	quicote		quicotó	X	quicoto	
38.	janifa		janifá	X	janife	
39.	folipa		folipo	X	folipó	
40.	dilusé	X	dilusó		diluse	
41.	llucifé		llucife	X	llucifa	
42.	toruca	X	torucá		torucó	

*X indicates the target word presented before the triplet of potential responses.

Appendix B. Training Stimuli

Stress		Task 1 a	Task 1 e	Task 1 o	Task 2 a	Task 2 e	Task 2 o	Task 3 a	Task 3 e	Task 3 o
Final	/p/	zamipá	necupé	lagapó	modupá	danopé	birepó	pinepá	ñalapé	ponopó
		soripá	llanepé	potopó	chifopá	dinopé	rumepó	chapopá	runopé	logapó
	/t/	ñomatá	piroté	vedetó	figotá	fetuté	gulitó	fichatá	quinaté	nucató
		fetatá	pajoté	luretó	morratá	cibaté	poretó	ñomatá	lochité	tirretó
	/k/	lafecá	pirequé	nachucó	bulicá	bubiqué	nosocó	fidecá	duloqué	gilacó
		nebocá	menaqué	chuticó	chitecá	gituqué	bagocó	lludicá	cajiqué	quedecó
Penultimate	/p/	fanepa	burope	tinepo	terupa	telipe	julipo	monipa	danope	limopo
		bachapa	tilupe	dalepo	colapa	malope	carapo	midupa	leguipe	sidupo
	/t/	cusata	goñete	fulato	leguita	ligote	didito	vesita	rigute	nebito
		guneta	chivate	ganato	mañeta	sogate	bitato	talata	birrete	guineto
	/k/	julaca	poloque	quidoco	gasoca	renaque	derrico	mibeca	filique	binuco
		dinoca	zumaque	banuco	colica	llomoque	liquico	ñiseca	todique	jamoco
Distractors		mesaru	chirifí	pirapi	tirepi	nosarí	bolesú	sodapu	norofi	dadatú
		romatú	bilicí	ñodusú	lisetu	gomefí	didocú	fadarí	gilasú	cofiquí

Stress		Task 4 a	Task 4 e	Task 4 o	Task 5 a	Task 5 e	Task 5 o	Task 6 a	Task 6 e	Task 6 o
Final	/p/	chulepá	padopé	derripó	lechipá	cebopé	necupó	tufapá	sillapé	damapó
		bolopá	sonopé	pamapó	ventapá	pamepé	futipó	cazopá	velapé	felepó
	/t/	teletá	goloté	bomató	judatá	gitaté	turató	bochetá	cotité	pototó
		guilletá	sereté	lupitó	vitotá	repeté	curotó	repitá	ciruté	lavató
	/k/	gumicá	yuyoqué	natacó	limocá	bolaqué	peracó	cepicá	coraqué	jotacó
		pipocá	gomiqué	midocó	filecá	damaqué	chupecó	capocá	penaqué	totucó
Penultimate	/p/	foripa	jugape	panapo	zanepa	curape	pomepo	fumepa	lepape	pisopo
		dodipa	cufipe	risopo	repopa	tomape	difapo	parepa	sofape	cudapo
	/t/	tepeta	ramote	faroto	lunata	tisate	fayeto	cofita	renute	ladeto
		susata	vanite	chorito	yuteta	lomete	matito	terrata	vodete	duchato
	/k/	lodeca	motique	fulaco	quiloca	chocoque	salaco	nodoca	vejaque	pumaco
		cucica	danoque	quiseco	zapaca	guizaque	meloco	miloca	bochaque	patuco
Distractors		pesafí	vacatu	lorasú	lupiru	salapi	sinasu	firosí	sonafú	modoqui
		decopí	securi	nacicu	bolefu	cavatí	timocú	chilepi	beloru	pilotu

		Task 7			*Task 8*			*Task 9*		
Stress		**a**	**e**	**o**	**a**	**e**	**o**	**a**	**e**	**o**
Final	/p/	misipá	milopé	petapó	catopá	rinepé	mecupó	libapá	dodipé	barapó
		solepá	jujupé	laropó	satupá	solepé	correpó	rumepá	chufepé	bolipó
	/t/	magatá	valeté	necotó	badotá	tagaté	tequitó	litetá	limaté	gelitó
		maratá	yucaté	porrotó	vinotá	revité	pechotó	polotá	boseté	guisotó
	/k/	rosacá	taliqué	chutecó	vitocá	yavequé	cobacó	fatocá	taguequé	lunecó
		samicá	pidoqué	canacó	garecá	lodoqué	tejacó	modecá	miloqué	cudecó
Penultimate	/p/	lunepa	tellape	fomapo	jupipa	ralape	matepo	mesapa	catupe	folopo
		satapa	tucupe	catapo	molipa	venupe	maripo	pitepa	tenepe	cenipo
	/t/	peneta	polite	vasato	dometa	nipete	vocato	baseta	potete	revito
		gaseta	papate	jomato	tecata	sodate	dirato	bulita	metate	cameto
	/k/	copuca	bunoque	vetaco	pereca	tojaque	copuco	camica	tuneque	vurreco
		suyaca	macoque	suzaco	jegueca	banaque	capeco	deneca	celuque	balaco
Distractors		domocu	julifí	nasocú	binorú	mañasú	solaquí	cholofú	temari	timoqui
		casori	salapu	lotusí	mosatu	fumopí	lonafi	nobisu	simotu	penupí

		Task 10			*Task 11*			*Task 12*		
Stress		**a**	**e**	**o**	**a**	**e**	**o**	**a**	**e**	**o**
Final	/p/	catepá	lafapé	palapó	tovapá	fulopé	fofopó	cosapá	conepé	cobipó
		ferupá	verapé	zocapó	genopá	jarapé	ficipó	badopá	sonapé	palipó
	/t/	jinetá	pilité	bolató	fometá	bobaté	gucotó	geguitá	tifité	lopetó
		cacutá	dolaté	bunetó	potatá	domaté	rogetó	sevitá	chinoté	gasotó
	/k/	bibicá	medaqué	milocó	lorocá	titoqué	bodacó	pimecá	recoqué	bonocó
		tarecá	lipoqué	samecó	pelicá	tiloqué	betocó	fogacá	fugoqué	vacocó
Penultimate	/p/	divipa	chacepe	genipo	falipa	nitope	fitopo	potapa	midape	matipo
		samopa	fitape	bolapo	cipopa	vacipe	cabopo	cafepa	videpe	porropo
	/t/	chafata	ladute	yurito	mogeta	ganete	lumito	ladota	banote	secoto
		reveta	jumite	direto	calita	palate	coceto	medata	visate	gacoto
	/k/	renaca	filaque	peñuco	piroca	sesoque	lucaco	chuqueca	pitique	cizaco
		papeca	techique	nipaco	cateca	sufeque	quillaco	fitaca	dadique	poteco
Distractors		mesafi	resapu	lalocí	gusarú	pomoti	sorafu	topisu	galiquí	corofi
		nosaru	falaqui	botesú	tejocu	macepi	sosocí	semari	golopú	mopotu

		Task 13		
Stress		**a**	**e**	**o**
Final	/p/	rapipá	limopé	licupó
		bibipá	calepé	gafopó
	/t/	puritá	sunaté	durató
		comitá	teroté	pebetó
	/k/	segacá	nadoqué	panecó
		nirocá	peciqué	jamocó
Penultimate	/p/	fenepa	patope	pocipo
		gamipa	lechepe	ladepo
	/t/	sucota	tatate	ricoto
		coceta	pechute	cañeto
	/k/	comoca	lamaque	calico
		rajaca	fitaque	folaco
Distractors		chatacú	peneti	goloru
		binofi	timosú	camipí