1 Introduction

The study of speech learning and pronunciation instruction both in a native language (NL) and a second language (L2) involves the distinction between production and perception. This basic division of two elements that cannot be understood separately turns out to be more complex than would be expected (Listerri, 1995). Although some of the studies propose that perception and production can be independent of each other (Fujisaki, 1983, Paliwal, Lindsay & Ainsworth, 1983), the existence of interrelations between them has been widely discussed (Ladefoged, 1967). This relationship may be seen as a facilitating one: studies such as those of Leather (1990) and Mathews (1997) suggest that training learners in either of the skills results in improvements in the other.

Another issue arising from their interrelation is the question of precedence: whether perception or production emerges first in the L2 learning process. The idea that perception precedes production has dominated for many years (Flege, 1987, Rochet, 1995). However, studies such as Sheldom & Strange (1982) suggest that production can precede perception.

The current study explores the relationship between perception and production in a group of students learning English as a foreign language with native exposure in a formal learning context. Not having received any specific pronunciation training, it might be expected that the subjects’ perception will be shown to precede their production.

Sound weakening (lenition) is often due to an ease of articulation tendency and is influenced by coarticulation and frequency of occurrence, amongst other factors. Vowel weakening is also directly related to rhythm and stress. English is a stressed-timed language, and accordingly it displays important syllable weakening processes such as vowel reduction or deletion in weak syllables. The tendency to reduce vowels in unstressed syllables is one of the most important characteristics in English. According to Kondo (1997) there are 3 types of vowel weakening: (i) vowel reduction, which is the centralization of the vowel quality with a reduction in intensity and duration as in Upton (ii) vowel devoicing or a phonatory change from voiced to voiceless, which happens in languages such as Japanese; and finally (iii) vowel deletion, which implies the disappearance of the vowel acoustically and auditorily. In English, vowel reduction usually follows route (i), although deletion is also a possibility.

For speakers of languages such as Spanish, in which vowel lenition is very slight, English vowel weakening can present difficulties. The purpose of this study is to investigate the degree of perception and production of vowel reduction on the part of the group of Spanish learners of English. Do these students, without native language vowel reduction but with exposure to native English, weaken unstressed syllables? If
they do so, do they weaken in the right contexts? What degree of weakening do they achieve?

2 Perception and production studies

2.1. Methodology

The subjects engaged in this study were 44 teenagers (mean age: 15.8) learning English as a foreign language in a formal context. Their NL was Spanish, which is a syllable timed language with no central vowels and very limited vowel changes in unstressed syllables. They attended extra English classes (3 hours a week) at a private language school in addition to English lessons at school. Their motivation towards English was measured by means of a questionnaire: the mean results for two motivation questionnaires were 5.7 in a 1-7 point scale and 4.1 in a 1-5 point scale respectively; they had been studying at a private academy for 4’1 years (mean). The latter was an important factor as it involved exposure to native English accents, which they did not have at school.

111 English words were selected for analysis. 79 of these were minimal syllable pairs (‘sylls’) with the contrast ‘full vowel’ versus ‘schwa’ in the unstressed syllable (e.g. bypass-compass) and 32 minimal word pairs (‘mins’) with the same contrast (e.g. starlight-starlet). Stimuli were presented and recorded by a specifically designed Matlab program. For the production test, subjects were presented with both the orthography and an image representing each word. A two alternative forced-choice design was used for the perception test. Stimuli were spliced unstressed syllables for the minimal syllable pairs and full words for the minimal word pair test. The set of words were subdivided into 50 ‘weak words’ (i.e. those with lexical vowel reduction, e.g. compass, starlet) and 61 ‘strong words’ (those without lexical vowel reduction, i.e. words which should not be produced/perceived as containing a reduced syllable, e.g. bypass, starlight).

2.2. Data analysis and results

Students’ productions and perceptions were analysed auditorily by the first author. Productions were coded for ‘presence of reduction’ and ‘absence of reduction’. The data coded as presenting reduction included schwa productions, vowel elisions and also those with some degree of reduction.

<table>
<thead>
<tr>
<th>Production (n=111)</th>
<th>Perception (n=111)</th>
</tr>
</thead>
<tbody>
<tr>
<td>total reductions:17.1</td>
<td>total reductions:68.9</td>
</tr>
<tr>
<td>15.4%</td>
<td>62%</td>
</tr>
<tr>
<td>weak words (n=50)</td>
<td>strong words (n=61)</td>
</tr>
<tr>
<td>t.r:10.6</td>
<td>t.r:6.5</td>
</tr>
<tr>
<td>21.2%</td>
<td>10.6%</td>
</tr>
<tr>
<td>syll (n=34)</td>
<td>min (n=16)</td>
</tr>
<tr>
<td>7.4</td>
<td>21.7%</td>
</tr>
<tr>
<td>20%</td>
<td>1.3</td>
</tr>
</tbody>
</table>

Table 1: totals and percentages of vowel reduction in production and perception.

Table 1 suggests that students produce vowel reduction to a lesser extent than they perceive it. As far as production is concerned, it can be seen that students produce reduction in weak words (21.2%) more often than in strong words (10.6%). Subjects tend to produce reduction in minimal syllable words and in minimal word pairs to similar extents (21.7% vs 20% and 11.3% vs 8.1%).
In terms of perception and bearing in mind the nature of the task (binary forced choice between perception of reduced or full vowel), overall results show above chance (62%) perception of reduction. However, students perceive reduction in strong words (66.7%) more often than in weak words (56.4%). Students perceive more reduction in word minimal pairs (65.6% and 85%) than in syllable pairs (51.5% and 60%).

A correlation analysis involving the variables described in table 1 (production and perception of weak words vs. strong words in the minimal syllable and minimal word pair tasks) demonstrated that the four production results are correlated (p < 0.000). With regards to weakening perception, in both the minimal syllables and the minimal word pair task, weak and strong words reduction perceptions are significantly correlated (p=.003). Further, perception of reduction in strong words in the syllable pair discrimination task is correlated with perception of reduction of strong words in the minimal pair discrimination task (p=.001).

There is little correlation between the production and perception tasks. Somewhat unexpectedly, perception of weakening in the weak words minimal pair task is correlated with production of weakening in the strong words of the minimal words task.

Degree of weakening was also measured by means of a scale 1 to 3 in which 1 represents some degree of centralization, 2 is schwa and 3 is elision. In words classified as 'reduced' in the production tasks the students mean performance reached 1'67 degree of weakening.

Discussion

At first sight, results appear to support the idea that perception precedes production. However, chance performance in the perception task is at 50%, so at around 62% correct, perception of weakening is not as impressive as it seems. Furthermore, a closer examination of the perceptual results suggests that listeners report the presence of weakening more often in words which do not have weakened vowels ('strong words') than in words with reduced vowels ('weak words'), which indicates lack of a real discrimination of weakening.

In terms of production students seem to reduce more often in the right context, that is, weak words. Students tend to perform slightly better in the minimal pair discrimination task, which might be due to the fact that the task is simpler. Discriminating syllables in the syllable pairs task implies having to, first, discriminate the sound, then create a mental phonetic representation of the words given as possible options and finally assign the sound heard to one of those two representations.

Correlation results offer some interesting insights. First, the fact that all production task results are correlated suggests that those students who tend to do some kind of reduction do it across the board, regardless of whether the word should actually have weakening or not. Secondly, the correlation shown amongst perception tasks in which students perceive reduction in both weak and strong words for syllable pairs and minimal pairs, suggests that students are far from discriminating in their perception, assigning weakening to both strong and weak syllables. Thus, they are not able to recognize vowel reduction adequately.

The correlation between perception and production is rather small, but suggests that those students who produce reduction in strong words tend to perform better in the
minimal pair perception task as they perceive reduction in the weak words. These results could be interpreted as an overgeneralization of a feature which is in the first stages of acquisition. Students may be internalising vowel reduction as a characteristic of the target language and are applying it to more contexts than they should (strong words).

As for degree of weakening, those students who produce some weakening do not reduce the vowel to the quality expected in the target language (schwa) but only achieve some reduction.

**Conclusions**

One of the aims of this study was to analyze the relationship between perception and production in English FL vowel weakening. Our results indicate that the relationship between perception and production is very weak. Additionally, the precedence of perception over production is not robustly supported by our data.

Another aim was to explore the level of acquisition of vowel weakening by students with an intermediate competence in English as a FL, native exposure and a high degree of motivation. Results show that in a formal instruction context, simple exposure to the L2 does not guarantee acquisition neither at the perceptual nor at the production level, as students are not able to discriminate nor produce vowel reduction in the right contexts. The implication is that specific training should be introduced in these FL contexts. In this spirit, the present study is part of a pre/post-test design including different types of training.

**References**


