



## Producing Sounds in Contact by Raising Awareness of Final -ed Consonant Clusters in English

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### Abstract

This research work studies the production of final consonant clusters in English regular verbs past forms and their link with initial vowel sounds of following words. The study was carried out in Tarragona, Spain, with 20 Spanish-Catalan native speakers of first year of Bachillerato. The aim was to provide instruction on splitting the final consonant cluster of a word and linking it to the following initial sound by raising awareness of the pronunciation of -ed endings in past verbs.

The investigation responds to two main questions 1) To what extent does pronunciation awareness of final consonant clusters have an impact on producing -ed endings in past regular verbs?, and 2) What is the impact of providing instruction on splitting the final consonant cluster and linking it to the following initial vowel sound? The data was gathered by recording participants while reading 10 sentences and 10 verbs, before and after a treatment, and analyze with PRAAT.

Results show a noticeable improvement in the correct production of the past forms of regular verbs by the control and experimental groups, as well as a more native-like pronunciation when linking consonant clusters in -ed endings and initial vowels sounds in the experimental group.

**Keywords:** consonant clusters, -ed endings, sounds in contact

### 1. Introduction

Given the influence of pronunciation on the perceived speaking proficiency of a foreign learner's speech, it is important to give special consideration to pronunciation awareness in the EFL classroom as a means to maximize the acquisition of this crucial aspect of language learning [1]. One way to achieve this goal is through explicit teaching of any given pronunciation issue. In order to raise awareness, students are expected to recognize details of L2 articulation, so that they will be able to “feel” and distinguish pronunciation features [2]. In the case of

this study, the target features were voiced and voiceless consonants, specifically the voiced/voiceless distinction in -ed consonant clusters. Regarding explicit pronunciation teaching, two approaches are commonly used: one with supplementary materials, and one with an integrated focus [3]. Because of the nature of the present study, a bottom up instruction approach with supplementary materials was applied.

Most learners are not able to recognize mispronunciations or whether or not their pronunciation is native-like. This is evidenced in the case of the English regular past -ed morpheme. The mispronunciation of this inflectional suffix might cause communication failure given that the correct message, i.e., verbal tense, might not be accurately conveyed. For that reason, explicit English language instruction should include the pronunciation of the regular past -ed morpheme. Students should be able to identify the correct use of the sounds /t/, /d/, /ɪd/, based on the rules for their pronunciation. This should be done by enhancing learners' awareness and production of the -ed morpheme. The simple instruction of recognizing the voiced and voiceless sounds by touching one's throat to feel the vibration of the vocal cords can help learners choose the correct sound to pronounce the past form of regular verbs. It is true that not all learners react or respond the same way to particular stimuli and that some students are able to acquire a high degree of pronunciation accuracy without receiving specific instruction [4]. However, for a majority of learners simply listening to an accurate model is not sufficient and intensive practice is needed to acquire problematic sounds [5].

In addition to the pronunciation of past -ed morphemes in isolation, this study also takes into consideration connected speech, in this case between the final consonant in the -ed ending and the initial vowel sound of a following word. This introduces an additional level of difficulty but, at the same time, an opportunity to focus on the -ed morpheme by raising awareness of the need to link the consonant sound

and the vowel smoothly, without interruption and with the correct voicing specification. This would significantly improve learners' speech so that they might avoid being misunderstood while, at the same time, sounding more native-like.

## 2. Methodology

### 2.1. Design

In order to investigate this issue, an experimental study was carried out with two groups of subjects, a control group and an experimental group. These two groups were evaluated before and after a treatment. The assessment criteria were the same in the pre- and post-tests, in which the subjects were recorded individually while reading ten sentences that included an -ed ending word, followed by an initial vowel sound, and ten regular verbs in their past form in isolation. Following the pre-test, each group received instruction on the correct pronunciation of the past forms of regular verbs, in context and in isolation. However, only the experimental group was instructed on linking the final consonant sound, /t/ or /d/, to the following vowel sound. After this treatment, the subjects were recorded one more time during the post-test with similar grammatical structures but different verbs from the instruction stage.

### 2.2. Treatment

The treatment was based on explicit instruction using a presentation-practice-production methodology for a total of twenty hours of practice. The goal was to provide students with explicit phonetic recognition instruction as well as guided practice, both leading to communicative interaction [6]. First, both groups were taught the correct pronunciation of the -ed morpheme in past tense regular verbs. The instructor explained how to recognize voiced and voiceless sounds by asking students to feel the vibration, or lack of vibration, of their vocal cords when pronouncing the last sound of the word (*presentation stage*).

Then, students were given a set of sentences using past regular verbs to practice the recognition of the sounds presented (*practice stage*). During this stage, linking the final sound /d/ or /t/ with the initial vowel sound of the next word was introduced just in the experimental group. Initially, learners were taught to split the final consonant cluster and link it to the next vowel sound, by drawing a line to separate the consonant cluster and another line to link it with the next vowel. This was done in order to make this feature a somewhat tangible characteristic. After practicing it, students were encouraged not to draw a line any longer but to try to produce the

sounds in contact in a more natural manner. In this way, they started producing a new, and more accurate, sound in connected speech.

Finally, in the last stage, *production*, both groups were asked to interact in small groups on a topic given by the instructor. However, lack of sufficient time for a significant amount of interaction prevented a thorough evaluation of the treatment based on communicative production; instead, results are evaluated solely on the basis of accuracy.

### 2.3. Data analysis

The recordings of students' pronunciation were analyzed acoustically using PRAAT. This software was helpful owing to the fact that it shows the spectrograms, a visual representation of the acoustic spectrum of frequencies of sound. The analysis was more accurate since the researchers could not only listen to the sound but also check if the spectrogram was correct. The spectrogram shows greater energy at low frequencies for voiced sounds since the vocal cords vibrate. On the contrary, if the sound is voiceless, the spectrogram showed weaker energy at low frequencies.

This analysis was divided into three categories for the sentences and two for the verbs pronounced individually. The data was tabulated using Excel. First of all, all the recordings were analyzed, focusing only on a final sound in each verb, whether it was a /t/, /d/ or /ɪd/ sound. If any of these sounds were heard, the participant received a mark, if not, the participant got an x.

Figure 1 is an example of what these sounds looked like, in this case it was a /t/ sound, which, in fact, was not correct for the word *travelled*. The sound can be seen at the end of the word: after an increased intraoral pressure generated during the occlusion phase, there is a sudden release of the air stream.

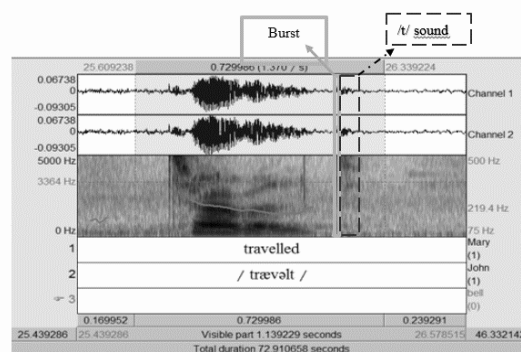
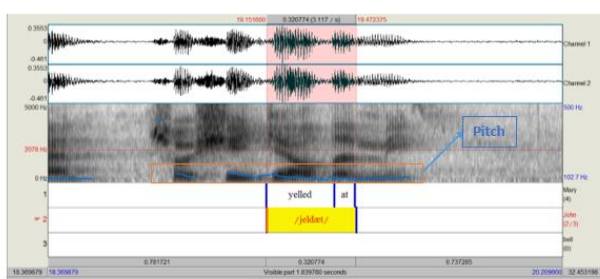


Figure 1: Example of Final /t/ sound

The second category was about correctness. The students were marked according to their pronunciation of the /t/, /d/ or /ɪd/ after a voiced or

voiceless sound. Once again, if the sound was correct, the participant received a mark, if not, the participant got an x.

The third category was about the linking itself. Here the students received a mark if they linked the final consonant cluster with the following vowel sound, portraying a native-like pronunciation. Besides the final sound, PRAAT allowed to conclude if the final sound was linked to the next vowel sound, as it is shown in Figure 2. This spectrogram shows how the pronunciation of the verb and a preposition fulfilled the three categories that have been described previously because there is a final sound, it is correct, and it is linked to the next vowel sound.



**Figure 2:** Link of final consonant cluster and vowel

Another indicator that the pronunciation is as in connected speech is the lack of noticeable pauses between words. The overall pitch of the utterance, illustrated with the blue lines in the spectrogram, reveals the intonation of the sentence. This pitch helped the researcher determine if there were pauses in the speech. For instance, in Figure 2, the blue line is not continuous at the beginning of the sentences, indicating that there are short pauses in the speech; however, in the section of the verb and preposition, the line is continuous, as in connected speech.

**Figure 2:** Link of final consonant cluster and vowel sound

For the analysis of the pronunciation of the isolated verbs, the same procedure was applied. First, each of the ten verbs were analyzed. The key point was to recognize if the past forms of the verbs were pronounced with a final sound, /t/, /d/ or /ɪd/. After that, the correctness of the pronunciation was analyzed, using the same criteria as with the verbs used in context. The spectrograms that PRAAT showed were interpreted similarly to the figures showed above. Finally, the same procedure was used during the pre- and post-tests for the sentences and the verbs.

## 2.4. Statistical analysis

For the statistical analysis, the results were treated using ANOVA to determine if there were significant differences between the control and experimental groups before and after the treatment. Once the data was gathered, each student was analyzed by counting the number of marks s/he got for the pronunciation in their recordings. This operation was repeated for each of the categories described above for the sentences and the verbs isolated regarding the pre- and post-tests.

Then, five different ANOVA tests were used, the performance of the subjects for each of the five categories were analyzed taking into consideration two levels (pre- and post-test) within both groups (control and experimental). This analysis was done using the data analysis option in Excel, considering a two-way ANOVA with replication and keeping an alpha value ( $\alpha$ ) of .05.

## 3. Results

Table 1 shows the results for the ANOVA test based on the first category, is there a sound? They show that in terms of both group ( $F = 11.11$ ,  $p < .05$ ) and time ( $F = 5.92$ ,  $p < .05$ ) there is a significant difference, which suggests that because of the treatment conducted, both groups performed the category differently during the pre- and post-test. The group\*time interaction is non-significant.

**Table 1:** Is there a sound?

Item 1: Is there a sound?						
Source of Variation	SS	df	MS	F	P-value	F crit
Group	34.225	1	34.225	11.110009	0.001997	4.1131653
Time	18.225	1	18.225	5.91614067	0.0201034	4.1131653
Interaction	5.625	1	5.625	1.82596934	0.1850357	4.1131653
Within	110.9	36	3.080556			
Total	168.975	39				

Table 2 displays the results for the ANOVA test based on the second category, is the sound correct? They show that in terms of group ( $F = 1.61$ ,  $p > .05$ ) there is no significant difference. However, regarding time ( $F = 28.16$ ,  $p < .05$ ) there is a significant difference. The group\*time interaction is also non-significant in this case. These results suggest that the subjects of study improved their performance in the post-test regardless of the group because they were both instructed in the differentiation of the sounds for past regular verbs.

**Table 2:** Is the sound correct?

Item 2: Is the sound correct?						
Source of Variation	SS	df	MS	F	P-value	F crit
Group	7.225	1	7.225	1.614525	0.2120071	4.1131653
Time	126.025	1	126.025	28.16201	5.867E-06	4.1131653
Interaction	9.025	1	9.025	2.01676	0.1641737	4.1131653
Within	161.1	36	4.475			
Total	303.375	39				

Table 3 portrays the results for the ANOVA test based on the third category, is the sound linked to the following sound? They show that in terms of group ( $F = 26.24$ ,  $p < .05$ ) and time ( $F = 9.45$ ,  $p < .05$ ) there is a significant difference which suggests that because of the treatment conducted, both groups performed differently this category during the pre- and post-test. What is important to highlight is that the core of this research relies on this category, since both groups were instructed on the -ed sound for regular verbs in past but only the experimental group had an explicit approach for linking. That is the reason why in this category the interaction is also significant ( $F = 17.45$ ,  $p < .05$ ). This particular result shows that the experimental group performed better during the post-test when linking the final -ed sound to the next one, which could be attributed to the explicit approach used.

**Table 3:** Is the sound linked to the following sound?

Item 3: Is the sound linked to the following sound?						
Source of Variation	SS	df	MS	F	P-value	F crit
Group	105.625	1	105.625	26.242236	1.0321E-05	4.11316528
Time	38.025	1	38.025	9.44720497	0.00401785	4.11316528
Interaction	70.225	1	70.225	17.447205	0.00017929	4.11316528
Within	144.9	36	4.025			
Total	358.775	39				

Table 4 shows the results for the ANOVA test based on the fourth category, is there a sound? The particular aspect from this analysis is that it was conducted in isolated items. It shows that in terms of group ( $F = 7.73$ ,  $p < .05$ ) there is a significant difference. However, when it comes to time ( $F = 1.09$ ,  $p > 0.05$ ) there is no significant difference. The interaction is also non-significant in this case. Thus, it could be implied that both groups produced a sound in the pre- and post-test.

**Table 4:** Is there a sound? (isolated verbs)

Item 4: Is there a sound? (isolated verbs)						
Source of Variation	SS	df	MS	F	P-value	F crit
Group	6.4	1	6.4	7.731544	0.00858	4.113165
Time	0.9	1	0.9	1.087248	0.30403	4.113165
Interaction	0.9	1	0.9	1.087248	0.30403	4.113165
Within	29.8	36	0.827778			
Total	38	39				

Table 5 shows the results for the ANOVA test based on the fifth category, is the sound correct? In terms of group ( $F = 0.18$ ,  $p < .05$ ) there is no significant difference, while, in terms of time ( $F = 9.96$ ,  $p > .05$ ), there is a significant difference. This may indicate an effect of raising awareness of the -ed sound for regular past verbs. The interaction is again non-significant.

**Table 5:** Is the sound correct? (isolated verbs)

Item 5: Is the sound correct? (isolated verbs)						
Source of Variation	SS	df	MS	F	P-value	F crit
Group	0.625	1	0.625	0.18189	0.672292	4.113165
Time	34.225	1	34.225	9.96039	0.003227	4.113165
Interaction	0.225	1	0.225	0.06548	0.79949	4.113165
Within	123.7	36	3.4361111			
Total	158.78	39				

## 4. Discussion

The statistical results analyzed provided information to support the hypotheses of the current research. On one hand, the first hypothesis concerned pronunciation awareness of final consonant clusters, which was expected to benefit students' spoken performance on -ed ending in past regular verbs. First, the results show that students had an improvement when producing a final sound in the past forms of the verbs. Second, these results show that the treatment had a positive effect on students and that they were not only aware of pronouncing the morpheme -ed but also they pronounced it more accurately than in the pre-test. Therefore, the treatment raised awareness about the pronunciation of -ed endings in regular verbs.

First of all, awareness helps students comprehend in an empirical way that English native speakers tend to reduce or to restructure affixes but that does not mean they are not producing their sounds [7]. As a result of the awareness created, common pronunciation errors including the dropping of the final consonant sound of words or the mispronunciation of consonants and consonant clusters could be reduced [8]. In that way, students will interact without interfering with the meaning they want to convey. Thus, they will avoid communication failure.

In addition, this awareness will lead to an improvement in grammar. The omission or mispronunciation of -ed endings constitutes a serious problem because those consonants perform specific grammatical functions [9]. Nevertheless, students may be able to recognize this grammar patterns in daily life interactions and they will pay attention to its use not only in speech production but also when writing. What is more, the awareness of

final consonant clusters might improve listening comprehension. Students might expect to hear –ed endings when interacting with other English speakers so language becomes more intelligible. As [10] mention, instead of trying to hear a mythical one-to-one correspondence between written and spoken forms, learners begin to listen for the actual cues that native speakers use in processing speech. For instance, students' expectations might change so they will be ready to recognize final consonant cluster sounds and relationships between words will become clearer. Despite that, students will need time, practice and confidence to make these forms their own and use them outside the classroom.

The second hypothesis was about providing instruction on splitting the final consonant cluster and linking it to the following initial vowel sound, which should improve the production of past regular verb endings. It is clear that the experimental group linked words in a greater number than the control group. From linking sounds in only 2 sentences in average in the pre-test, participants linked words in more than six sentences in the post-test. As stated before, the treatment helped students in their oral production to sound in a more native-like way. As hypothesis 2 is linked to hypothesis 1, raising awareness on the production of the -ed morpheme contributed to its linking to the next vowel sound. Surprisingly, the control group had the opposite effect. As mentioned before, this group was instructed only in the correct production of the morpheme -ed, not in the linking; however, it was expected that they would have a similar or better production of the morpheme than in the pre-test. This was not the case, since the control group linked fewer words in the post-test. This could be because these students were over-focused on pronouncing the correct form of the verb and thus introduced short pauses, preventing them from sounding native-like.

[11] showed that Brazilian EFL learners give preference to the CVC syllable structure over the CVCC syllable structure, since Brazilian Portuguese does not allow consonant clusters in syllable final position. This could be also the case of the subjects in this study. Since Catalan and Spanish are Romance languages just like Portuguese, students might not be used to a CVCC syllable structure in the final position. In effect, linking may contribute to restructure the syllables, which will enhance their accurate production. Equally important, linking simplifies the syllable structure and students will become more intelligible.

In addition, by linking the final consonant to the following sound, students will be provided a learning strategy that tends to foster independent

learning. Students will learn a strategy which does not require high levels of thinking and language manipulation [12]. Because of that, they will be aware that native English speakers link sounds. As a result, they will be able to recognize those patterns and to use them in real context interactions.

By the same token, this learning strategy will become part of the students' input, which is essential for second language acquisition. By using it, students will be able to improve their speaking and listening skills as well as their communicative competence [13]. Hence, students may improve the overall rhythm of English and they might realize that, because of this strategy, they will be able to better cope with consonant cluster pronunciation in the final position and not only at the beginning of words, as they were used to. Therefore, they will be one step closer towards achieving native-like pronunciation.

Regardless of the benefits found, some limitations were evidenced in this study, since input is an essential factor in second language acquisition. The teachers play an important role in that input and they provide a great deal of input to students. The problem is that most of the time teachers are non-native English speakers who might not have developed complete awareness of restructured syllables in English (i.e. linking the last consonant to the following sound). Because of that, students might transfer the L1 phonological system, which might prevent them from perceiving some sounds of the language being acquired. [14]. As a consequence, students might not build mental representations of those types of sounds and they might not be able to create new categories of sound different from their L1. Therefore, it might be interesting to work on future research on teachers' awareness of this phenomenon and how their perception affects the way their classes are taught.

Additionally, throughout this research, it could be evidenced that, regardless of the fact that pronunciation is a factor of great interest, it has been out of fashion for some decades [1]. Once again, to tackle this, teachers could provide insight about how pronunciation is being dealt with in the classroom, which might help to foster interest in the topic. As a result, more pronunciation instruction will hopefully be included in the EFL classroom [15].

Last but not least, a study on how linking and awareness of final consonant clusters of –ed endings in past regular verbs contribute to students' perception of this factor in communicative activities could be done in order to support the relationship between speaking and listening.

## 5. References

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