THE ACQUISITION OF ENGLISH "-ED" COMPLEX CODAS BY BRAZILIAN PORTUGUESE SPEAKERS: MORE THAN JUST A MATTER OF CONSTRAINT DEMOTION

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Abstract

This study aims to verify the acquisition, by Brazilian Portuguese speakers, of the final consonant clusters of the English verbs which contain the "-ed" morpheme. The analysis, which was carried out under the framework of Optimality Theory, revealed that the acquisition of these target forms implies a double task for the learners. Not only do the learners have to demote constraints so as to reach a hierarchy which might lead them to the production of the complex codas, but they also have to abandon an inappropriate underlying representation /ɪd/, originated from orthography, and acquire the accurate input form (/d/) so that the consonant clusters can be produced appropriately. In this sense, our analysis has shown that, although it is undoubtedly fundamental, the constraint demotion process, alone, might not be able to lead to the production of complex codas when such consonant sequences are not shown explicitly in orthography.

1. Introduction

With regard to L2 acquisition, as we base ourselves on the Learning Algorithm proposed by Tesar & Smolensky (1996, 2000) for L1 acquisition, we can infer that acquiring a second language might imply the sole task of demoting constraints from the L1 hierarchic system (starting point), until the learners reach a ranking which proves able to lead to the production of outputs which are similar to the L2 target forms.

This paper aims to show, through English L2 acquisition data, that acquiring a second language syllabic system may imply more than just the demotion process described above. In fact, the acquisition of the target forms investigated by the present paper implies not only the abandonment of an input form characterized as unable to lead to L2-target-forms, but also the acquisition of a new underlying structure, able to lead to the production of the L2 patterns. In order to show what has just been stated, this paper will make use of the data which were analyzed in Alves (2004), concerning the acquisition of the English complex

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codas which characterize the morpheme "-ed", whose written form shows the letter "-e". It is worth reminding that, though present in ortography, the vowel "-e" is not produced in speech by English speakers (such as in lived [lɪvd] and missed [mɪst]). In this sense, the present article aims to show that the acquisition of such target forms implies, besides the demotion of constraints, the abandonment of the underlying form containing the vowel originated from the written form, such as in /lɪv+ɪd/, and the acquisition of an input form which does not contain such a vowel, as in /lɪv+d/.

2. The target forms

As it has been previously said, the target forms are final consonant clusters ended by a coronal plosive segment, which characterizes the English morpheme "-ed". The complex codas in question are illicit in the Brazilian Portuguese syllabic system, once Brazilian Portuguese allows only [N], [S], [r] and [l] in one-consonant codas, and only the sequence [rS] as a licit complex coda. (01) shows the consonant sequences whose acquisition process is being analyzed.

(01)[2]

[pt]	stopped	[stɑ:pt]	**[nd]**	banned	[bæ:nd]
[kt]	picked	[pɪkt]	**[md]**	bloomed	[blu:md]
[ft]	laughed	[læ:ft]	**[st]**	missed	[mɪst]
[ʃt]	finished	[fɪnɪʃt]	**[ld]**	called	[kɑ:ld]
[tʃt]	watched	[wɑ:tʃt]	**[rd]**	remembered	[rɪmembərd]
[bd]	robbed	[rɑ:bd]	**[jd]**	played[3]	[plejd]
[gd]	unplugged	[ʌnplʌgd]	**[wd]**	narrowed	[nærowd]
[dʒd]	judged	[dʒʌdʒd]			
[vd]	believed	[bɪli:vd]			

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[2] The production of the target forms by Brazilian Portuguese speakers implies two distinct sources of difficulties: one refers to the acquisition of complex codas which are not allowed by the L1 syllabic pattern, which constitutes the issue we propose to discuss in the present paper. The other source of difficulties concerns the production of voiced final obstruents, once, as Alves (2004) has shown, there is a tendency to produce such final segments as voiceless. The present paper, however, does not aim to discuss this second source of difficulties. More details on the acquisition of the [+voi] feature in coda obstruents can be found in the OT analysis developed in Alves (2004).

[3] Although many authors see the vowels that constitute the English diphthongs [aɪ], [eɪ] e [oʊ] as components of a complex nucleus, the present study assumes that the subjects of this study, who are Brazilian Portuguese native speakers, have the semivowel of the diphthong occupying the coda position, following Colischonn (1997) and Bisol (1999), as these authors refer to the Brazilian Portuguese syllabic system.

3. Methodology

Seven undergraduate English Language students participated in the study. All the students were taking a special course on Portuguese and English Phonology. In this course, the subjects received explicit instruction concerning the phonological systems and phonetic properties of both languages, as well as information on the main difficulties, concerning English L2 syllabic acquisition, shown by Brazilian Portuguese students.

As we proposed a longitudinal study, we made arrangements so that data were obtained in three different occasions, one prior to, and two following, the explicit teaching of how to produce the target "-ed" forms. The collection of data in three distinct phases intended, thus, not only to show the students' level of interlanguage before the explicit instruction concerning the target forms, but also to analyze the possible long-term effects of the teaching of these structures. The data collection tasks counted not only on reading tests, but also on free-speech activities, so that the structures could be produced in different monitoring environments.

4. The Output Forms

In order to facilitate the analysis which follows, this study categorizes the target forms in two groups, namely Groups A and B, as we can see in (02).

(02)

Group A – Verbs containing a complex coda whose penultimate consonant is not allowed in coda position by Brazilian Portuguese. Ex: *lived* [lɪvd]*, watched* [wɑtʃt], *stopped* [stɔːpt]*, laughed* [læːft].

Group B – Verbs containing a complex coda whose penultimate consonant is allowed in a single coda position by the L1 (as we have already mentioned, Brazilian Portuguese allows [N], [S], [r] and [l] and semivowels in single codas).Ex: *missed* [mɪst], *passed* [pæst], *traveled* [trævəld], *remembered* [rɪmembərd], *discovered* [dɪskʌvərd].

Table 01, which utilizes the categorization presented in (02) above, shows all the output patterns which were produced by the learners, in each of the data collection phases. In the tables and tableaux that follow, we will use the verb *lived* [lɪvd] to symbolize all Group A verbs produced by the learners, and *missed* [mɪst] to represent all Group B verbs.

TABLE 01 – Output patterns produced by the learners[4]

Data Collection Phases	Outputs (Group A)	Outputs (Group B)
Pre-Instruction **(Nov/2002)**	[lɪvɪd] --------	[mɪsɪd] [mɪst]
Post-Instruction 1 e 2 **(Jan and Mar/2003)**	[lɪvɪd] [lɪvd] [lɪv]	[mɪsɪd] [mɪst] [mɪs]

It is worth mentioning that all the output patterns presented in Table 01 were produced by each one of the students, in both reading and free-speech tasks. Significant differences concerning the kind of data collection tasks were not found. The data in Table 01 show that, as for the verbs belonging to Group A, output forms containing a final consonant cluster started to be produced only after the explicit teaching of the target forms, therefore being found only in the second phase of data collection (jan/2003). Given this fact, it is assumed that, at least concerning the verbs in Group A, the explicit instruction which was provided to the students played an important role in leading them to the production of the target forms, which had not been produced until then.

As for the data obtained in the third phase of collection (mar/2003), the same output patterns verified at the previous collection moment were found. This confirms the long-term effects of the explicit instruction provided to the group of students. It is important to observe that non-target-like structures are still produced, even after the provision of the instruction regarding the L2 forms. Thus, although the explicit instruction has contributed

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[4] As we consider the data presented in Table 01, we must note once again that the sonority of the coda consonants is not being discussed by the present paper. Therefore, we represent these coda segments as voiced in most of the cases, although we recognize the existence of variability in the sonority of the final obstruents ([d ~t]) produced by the students.

to the production of the L2 structures, it was not able to fully eradicate the productions of syllable patterns which were different form the target. It must be mentioned, however, that a comparison between the two last data obtainment phases has show a significant increase in the production of the complex codas, suggesting that the L2 forms might constitute the sole pattern produced by the students in the future.

5. An OT Account of the Acquisition of the Complex Codas

5.1 The output forms and their corresponding rankings

The analytical procedures which will be shown below make use of the distinction of the verbs into groups as presented in (02). Once the L2 learners have the L1 hierarchy as their initial hierarchy (H_0), the Brazilian Portuguese syllabic constraint ranking is presented in (03) below, following Lee (1999) and Collischonn (2000).

(03)

    Sonor, Dep^{Onset}, Nuc, Max >> CodaCond >> Dep^{Nuc} >> Contig >> Onset >> NoCoda, NoComplex

The constraints shown in (03) which will be useful for the development of the following analysis are characterized in (04).

(04)
Onset: Syllables must have onsets
NoCodas: Codas are forbidden
CodaCond: the Brazilian Portuguese coda may only contain [-voc, +son] or [-son, +cont, +cor].
NoComplex: More than a consonant or a vowel may not be associated to a single syllable position
DEP I/O: All input segments/features have an identical output correspondent.
MAX I/O: All output segments/features have an identical input correspondent.
Contig: the output is contiguous to the input.

The L1 constraint ranking and the optimal output obtained from such a hierarchy are shown in the tableau in (05), which refers to Group A verbs. The present analysis considers, firstly, an input form characterized by a single coronal plosive (/d/) as the "–ed" marker.

(05)⁵

/lɪv+d/	Max	CodaCond	Dep	Contig	NoCoda	NoComp
a) ☞ lɪ.vɪ.dɪ			**	*		
b) lɪ.vɪ	*!		*			
c) lɪv.dɪ		*!	*		*	
d) lɪ.vɪd		*!	*	*	*	
e) lɪv	*!	*			*	
f) lɪvd		*!*			*	*

As it can be seen in (05)⁶, the student, when applying the L1 constraint ranking, instead of producing the target complex codas composed of segments which are forbidden in Brazilian Portuguese coda position, produces two CV syllables as output. The same ranking is shown once again in (06), this time having Group B verbs as input, whose penultimate consonant is allowed in coda position by Brazilian Portuguese. These verbs, as we consider the Brazilian Portuguese constraint ranking, show only one epenthetic vowel in the output forms, due to the fact that the penultimate consonant does not violate Coda Condition.

(06)

/mɪs+d/	Max	CodaCond	Dep	Contig	NoCoda	NoComp
a) ☞ mɪs.dɪ			*		*	
b) mɪ.sɪ.dɪ			**!	*		
c) mɪs	*!				*	
d) mɪ.sɪ	*!		*			
e) mɪ.sɪd		*!	*	*	*	
f) mɪst		*!			*	*

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⁵ In the *tableaux* that follow, only those constraints from (03) that are relevant to the present analysis are going to be shown. As we will show later, Son plays no decisive role in the analysis, despite the fact it militates against disallowed Portuguese consonant sequences. This provides a reason why such a constraint is not being shown in the following tableaux, as we will discuss later on.

⁶ It is important to mention that the present study considers the output epenthetic vowels as the result of the interaction of constraints referring solely to the syllabic structure. Therefore, no role is attributed to Alignment constraints in the emergence of such epenthetic segments, once this analysis opted to disregard the possible effects these constraints may have on the output forms.

By considering the data presented in Table 01 once again, it is clear that output forms such as [lɪvɪdɪ] and [mɪsdɪ], the two optimal candidates in the *tableaux* above, were not produced by the participants, not even in the first phase of data collection, which was prior to the explicit instruction regarding the L2 forms. This fact makes us conclude that the students had already demoted constraints before the first data collection test. In other words, when the students started having their oral productions analyzed by the present study, they no longer presented the L1 hierarchy.

After the presentation of the outputs which emerged from the L1 ranking, we move on to the task of showing those output forms emerging from hierarchies which are different from the one that characterizes the L1 system. The acquisition sequence of such hierarchies will be discussed later on.

As we aim to show the correct constraint ranking for each one of the output forms described in Table 01, we start by showing that the hierarchy which is able to lead to the production of the target forms is the one in which Faithfulness outranks Markedness, as we consider /d/ as the underlying representation of the " –ed" marker.

(07)

/lɪv+d/	Max	Dep	CodaCond	Contig	NoCoda	NoComp
a) lɪ.vɪ.dɪ		*!*		*		
b) lɪv.dɪ		*!	*		*	
c) lɪ.vɪd		*!	*	*	*	
d) lɪv	*!		*		*	
e) ☞lɪvd			**		*	*

(08)

/mɪs+d/	Max	Dep	CodaCond	Contig	NoCoda	NoComp
a) mɪs.dɪ		*!			*	
b) mɪ.sɪ.dɪ		*!*		*		
c) mɪ.sɪd		*!	*	*	*	
d) mɪs	*!				*	
e) mɪ.sɪ	*!	*				
f) ☞mɪst			*		*	*

The tableaux in (07) and (08) show that, so that we can have a complex coda as output, the Faithfulness constraint must occupy a higher position in the hierarchy than the Markedness constraint. With this ranking in question, the output form is the one which is the most faithful to the input.

We also present, in (09) and (10), the tableaux containing the constraint rankings which are able to lead to the production of output forms characterized by the deletion of the '-ed" marker, such as in *lived* [lɪv] and *missed* [mɪs].

(09)[7]

/lɪv+d/	Dep	CodaCond	Max	Contig	NoCoda	NoComp
a) lɪ.vɪ.dɪ	*!*			*		
b) lɪv.dɪ	*!	*			*	
c) lɪ.vɪd	*!	*		*	*	
d) ☞lɪv		*	*		*	
e) lɪvd		**!			*	*

(10)

/mɪs+d/	Dep	CodaCond	Max	Contig	NoCoda	NoComp
a) mɪs.dɪ	*!				*	
b) mɪ.sɪ.dɪ	*!*			*		
c) ☞mɪs			*		*	
d) mɪ.sɪd	*!	*		*	*	
e) mɪst		*!			*	*

In the tableaux which have been presented so far, we can see that underlying forms such as /lɪv+d/ and /mɪs+d/ are responsible for the emergence of not only the target syllables, but also those structures showing deletion of the final coronal plosive. We will

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[7] We recognize that the candidate [lɪ], characterized by the deletion of both coda consonants, would be the optimal output if it were considered among the candidates shown in (09). The possibility of having [lɪ] as one of the candidates in the tableau above, however, was not taken into consideration, once no output forms following this syllabic pattern were found in our data. A possible explanation for the absence of outputs such as [lɪ] in the students' production may lie in the fact that all English syllables must be bimoraic (Hammond 1999), which would prevent the deletion of both vowels. We also believe that the perceptual salience of the consonant codas may also be relevant. The present paper does not aim to find a precise explanation for the

show, from this point on, that output forms such as [lɪvɪd] and [mɪsɪd], however, cannot be obtained as we consider the input forms shown above.

5.2 The coexistence of input forms

As for our task of accounting for output patterns such as the ones in [lɪvɪd] and [mɪsɪd], which can be regarded as the most frequent syllable template found in the first data collection phase, we can start with an attempt to achieve such output forms by considering inputs such as /lɪv+d/ and /mɪs+d/. However, we will show that this attempt is not successful, once such output forms cannot become optimal as we consider the underlying representation /d/.

One possible analytical procedure which could account for our learners' data would consist in maintaining, in our analysis, the input form /d/, and trying to solve the problem by working solely on the constraint ranking, a task which could probably cause us to bring other constraints into action. As a possible solution, we could, for example, consider Son[8], proposed by Lee (1999) to deal with the Brazilian Portuguese syllable ranking, or even any other constraint which would militate against the consonant sequences which are not allowed in the L1 system. By doing so, we would say that sequences such as [lɪvɪd] and [mɪsɪd] would show such an epenthetic vowel so as to prevent the target consonant cluster from being produced, satisfying thus the constraint which militates against these illegal consonant sequences in the L1 system, even if such segments could already be produced individually, in single codas, by the learners. In this sense, even if CodaCond were low ranked, Son, which would still be occupying a high position, would account for the output forms which were produced.

In case the possibility shown above were, in fact, the real explanation for what happens in the production of outputs such as [lɪvɪd] and [mɪsɪd], it would be necessary to

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absence of such output forms, but it does, indeed, aim to mention some of the many possible reasons which allow us to exclude [lɪ] from the list of possible output candidates, as we have done in the tableau in (09).

[8] This constraint says that two segments which compose complex onsets or codas in Brazilian Portuguese should be distanced in at least two positions, as we consider the Sonority Scale.

consider the position of the single epenthetic segment which emerges to satisfy Son. Due to the position of Contig in the L1 ranking shown in (03), we would expect the epenthetic vowel to be produced in final position, such as in [lɪvdɪ] and [mɪsdɪ], once these forms violate neither Contig nor Son. However, these output forms have not been found in our data: Table (01) shows that forms showing a final epenthetic vowel were not produced in any of the data collection tasks. Once forms such as [lɪvɪd] and [mɪsɪd] were the ones which were effectively produced, if we still keep on considering Son as responsible for the emergence of the interconsonantal vowel, it is thus necessary to rely on a constraint which would oppose Contig, which in this case would be outranked by such a hypothetical constraint. By doing so, we would have output forms such as [lɪvɪd] and [mɪsɪd], showing an interconsonantal epenthetic vowel, which, despite violating Contig, should satisfy Son without necessarily having to obey CodaCond.

The hypothetical constraint which would outrank Contig will not be presented here, given the fact that the possibility described above does not seem to reflect what really happens in the students' interlanguage systems. This is justified by the fact that, in non-suffixed forms containing complex codas, ended by a segment other than S (which may be allowed as the second element of a consonant cluster in the L1), forms showing only one epenthetic vowel between the two consonants, such as in *act* [ækɪt] and *past* [pæsɪt], were never produced. For instance, as we consider the production of a word such as *lift*, outputs such as [lɪfɪt] tend not to be produced by Brazilian Portuguese speakers learning English. In words as pa*st*, with the first consonant being allowed in coda position by the L1, the epenthetic vowel in interconsonantal position is not necessary, which explains why outputs such as [pæsɪt] have not been found in non-suffixed forms, though the very same pattern has been found in "-ed" consonant clusters. In fact, as for Group A, an output which is likely to emerge is one showing two epenthetic vowels, such as in [lɪfɪtɪ], though it was not the case of our learners either, once non-suffixed clusters were already successfully produced. As for Group B verbs, whose penultimate consonant is allowed in coda position by the L1, only one epenthetic vowel might be found, not between the two consonants, but in final position, as we can see in [pæsɪt].

These things considered, we can ask ourselves how to explain output forms such as [lɪvɪd] and [mɪsɪd], showing only one epenthetic vowel. Outputs showing such an interconsonantal vowel, as we could see in Table 01, are indeed the most common syllabic template produced in the first data collection phase, prior to the explicit teaching of the target forms.

The arguments which were presented in the paragraph above lead us to assume that output forms containing a single epenthetic vowel, between the two consonants which would compose the final cluster, are originated from another input form, maintained by the learners, characterized as distinct from the underlying representation the present analysis has been working with so far. Indeed, we assume that such an underlying representation can be seen as a consequence of the spelling of the "-ed" marker, due to the presence of the letter "e" in written form. This seems to be clear once we consider the fact that output forms such as [lɪvɪd] and [mɪsɪd] only emerged in the students' attempts to produce verbs containing the "-ed" marker, not in attempts to produce complex codas whose consonant sequences were also clear in spelling (such as in the words a**ct** [ækt] and pa**st** [pæst].

We believe, therefore, that the production of the output forms in question can be explained as we face the possibility that the students keep, as input forms regarding these verbs containing the "-ed" markers, underlying representations such as /lɪv+ɪd/ and /mɪs+ɪd/, with the vowel belonging to the input itself. Thus, output forms such as [mɪsɪd], which were seen to show an unnecessary epenthetic vowel as we considered an input form as /mɪs+d/, once /s/ is allowed in coda position, can be easily accounted for as we state that /mɪs+ɪd/ is the underlying representation that the students held.

So as to provide evidence for what has been said, the tableaux below aim to show the constraint ranking which can lead to optimal outputs such as [lɪvɪd] and [mɪsɪd], as we consider input forms containing a vowel which prevents the production of complex codas as outputs. It is important to mention, once again, that such input forms are maintained by the learners due to the spelling of the "-ed" morpheme.

(11)

/lɪv+ɪd/	Max	Dep	CodaCond	Contig	NoCoda	NoComp
a) lɪ.vɪ.dɪ		*!				
b) lɪv.dɪ	*!	*	*	*	*	
c) ☞lɪ.vɪd			*		*	
d) lɪv	*!*		*		*	
e) lɪvd	*!		**	*	*	*

(12)

/mɪs+ɪd/	Max	Dep	CodaCond	Contig	NoCoda	NoComp
a) mɪs.dɪ	*!	*		*	*	
b) mɪ.sɪ.dɪ		*!				
c) mɪ.sɪ	*!					
d) ☞mɪ.sɪd			*		*	
e) mɪs	*!*				*	
f) mɪsd	*!		*	*	*	*

As we can see in (11), we have the optimal output [lɪvɪd] as we consider the input form /lɪv+ɪd/ and a hierarchy which differs from H_0 only in regard to the position of CodaCond, which is low-ranked compared to Dep. As we have already said, the assumption of an underlying representation containing the vowel which emerges in interconsonantal position provides a better explanation for what happens in output patterns such as the one found in [mɪsɪd], whose [s] would not need to be followed by an epenthetic vowel, once it is allowed in codas by Brazilian Portuguese.

These things considered, it is therefore necessary to have a final word on the pertinence of the use of a constraint such as Son, which would oppose to consonant sequences which are not allowed in Brazilian Portuguese. Due to the fact that forms showing only one epenthetic vowel located in final position, such as [lɪvdɪ], have not been found in our data, and once we assume that forms such as [lɪvɪd] and [mɪsɪd] are originated form inputs such as /lɪv+ɪd/ and /mɪs+ɪd/, we believe that such a constraint plays no decisive role in accounting for the output forms which were found in the learners' production. The present study, therefore, sees CodaCond as the sole constraint that is responsible for the possibility of simplification strategies such as deletion and epenthesis.

In other words, as far as our data are considered, the use of Son is regarded as unnecessary. We believe that Son would undoubtedly play an important role if we found output forms such as [lɪvdɪ] even when the coronal consonant were already produced accurately in single-consonant codas by the learners. In this hypothetical case, we would be able to prove that such final vowels were not the result of CodaCond, which in this case would be low ranked, but instead the consequence of a constraint such as Son, which, being highly ranked, would oppose to consonant sequences, even if the consonants which constitute such a sequence were already produced accurately in single codas. However, as examples like this have not been found by the present study, we see the discussion on the pertinence of Son as unfinished, as we wait for data exemplars.

We have shown that the output forms which were produced by the students originate from two distinct input forms concerning the "-ed" morpheme (/ɪd/ and /d/). Output forms such as [lɪvɪd] and [mɪsɪd], as we have show, are the result of input forms originated from orthography (/lɪv+ɪd/ and /mɪs+ɪd/). However, when the students produced the target outputs, or output forms characterized by the deletion of the final coronal plosive segment, such optimal outputs resulted from underlying representations such as /lɪv+d/ and /mɪs+d/. It is thus clear that, so as to produce the target consonant sequences, the learners need to abandon that input representation which is originated from orthography (/ɪd/), and consequently acquire /d/ as the input form. This, in our view, was facilitated by the provision of explicit teaching concerning the target forms.

5.3 The Acquisition Sequence

Having determined not only the hierarchies, but also the input forms which are responsible for each one of the output patterns found in our data, we move on to the task of verifying the learners' syllable acquisition sequence, based on Tesar & Smolensky's (1996, 2000) Learning Algorithm.

The observation of the pre-instruction data shown in Table 01 allows us to conclude that the students no longer exhibited the L1 (Brazilian Portuguese) hierarchy in the first period of data collection. As for Group A verbs, once output forms containing the interconsonantal vowel were produced unanimously before the explicit instruction on the L2 forms, we assume that CodaCond had already been demoted by the learners, and the students, consequently, exhibited Max>>Dep>>CodaCond as their constraint ranking. The underlying representation held by the students is /ɪd/, originated from orthography. Still regarding Group A verbs, we can observe in Table 01 that output forms resulting from /d/ were produced only after the teaching of the target forms. With regard to Group B verbs, variation between output forms such as [mɪsɪd] and [mɪst] could be seen even in the pre-instruction data. These variable forms cannot be explained by the constraint ranking, once the hierarchy held by the students is the same one which has been mentioned previously: Max>>Dep>>CodaCond. In fact, the varying output forms are a consequence of a variation in the underlyingrepresenation, once, depending on the input, we can have outputs with or without the interconsonantal vowel.

We present, in (13), the hierarchy which characterizes the students' interlanguage system before the explicit instruction regarding the target structures. It is worth noting that, as for Group B verbs, the varying output forms are a consequence of a variation in the input (/ɪd/ ~ /d/).

(13)
Pre-instructional constraint ranking (nov/2002)
Max>>Dep>>CodaCond[9]

After having determined the pre-instructional hierarchy, we begin to analyze the learners' acquisition stage in our second phase of data collection, the first one after the provision of explicit instruction. The first post-instructional data indicate the coexistence of input forms regarding both Group A and B verbs. Based on this observation, we suggest that the teaching provided to the students contributed to the development of a new

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[9] It is important to mention that the low-ranked constraints which have shown no difference, in terms of hierarchic relation, from the ranking presented in (03), have not been mentioned here.

underlying representation. Besides the coexistence of input forms, which leads to the production of outputs containing the interconsonantal vowel and characterized by a complex coda, the observation of Table 01 also shows the production of output forms containing a once-consonant coda, characterized by the deletion of the final coronal plosive segment.

In order to explain the variation between these structures presenting deletion of the final [t]/[d] and the target forms, as we consider the fact that both templates are originated form the same underlying structure /d/, we made use of the proposal of ranked strata by Bonilha & Matzenauer (2003). According to these authors, there is a hierarchic relationship between the constraints which constitute a stratum. This assumption explains the variation in the output forms found in the learners' data, as we consider the possibility that the constraints which share a ranked stratum may show a "floating" ranking status between each other.

Thus, when, inside the stratum, the ranking between Max and CodaCond is {Max >> CodaCond}, the target forms surface as outputs (tableaux in (14) and (16)), and when {CodaCond >> Max}, the optimal output is the one showing a one-consonant coda, in view of the deletion of the final [t]/[d] (tableaux in (15) and (17)).

Group 'A'

(14)

/lɪv+d/	Dep	Max	CodaCond	Contig	NoCoda	NoComp
lɪ.vɪ.dɪ	*!*			*		
lɪ.vɪ	*!	*				
lɪvɪd	*!		*	*	*	
lɪv		*!	*		*	
☞lɪvd			**		*	*

(15)

/lɪv+d/	Dep	CodaCond	Max	Contig	NoCoda	NoComp
a) lɪ.vɪ.dɪ	*!*			*		
b) lɪ.vɪ	*!		*			
c) lɪ.vɪd	*!	*		*	*	
d) ☞lɪv		*	*		*	
e) lɪvd		**!			*	*

Group 'B'

(16)

/mɪs+d/	Dep	Max	CodaCond	Contig	NoCoda	NoComp
a) mɪs.dɪ	*!				*	
b) mɪ.sɪ.dɪ	*!*			*		
c) mɪs		*!			*	
d) mɪ.sɪ	*!	*				
e) mɪ.sɪd	*!		*	*	*	
f) ☞mɪst			*		*	*

(17)

/mɪs+d/	Dep	CodaCond	Max	Contig	NoCoda	NoComp
a) mɪs.dɪ	*!				*	
b) mɪ.sɪ.dɪ	*!*			*		
c) ☞mɪs			*		*	
d) mɪ.sɪ	*!		*			
e) mɪ.sɪd	*!	*		*	*	
f) mɪst		*!			*	*

It is also important to mention that output forms containing the interconsonantal vowel, which are derived from /lɪv+ɪd/ and /mɪs+ɪd/ as input forms, can be obtained as we make use of the same constraint ranking, provided that Max outranks CodaCond. We show, in (18), the constraint ranking which represents the students' grammar systems after the formal teaching of the target forms. It is important to say that the hierarchy shown below represents both data collection phases which took place after the provision of explicit instruction, once the data collected in these two post-instruction moments show the same syllable patterns, as was already seen in Table 01.

(18)
Post-instructional constraint rankings
Dep>>Max,CodaCond[10]

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[10] We opted for the representation of the stratum with the internal hierarchy Max>>CodaCond, once our data characterize this as the predominant ranking of this stratum.

To sum up, Table 02 presents not only the constraint rankings which represent each one of the three acquisition moments analyzed, but also the input forms which are responsible for the output patterns verified in each one of these three moments.

TABLE 02 – The learners' acquisition sequence[11]

Hierarchy	Input (A)	Output (A)	Input (B)	Output (B)
Pre-Instruction Max >> Dep >> CodaCond	/lɪv+ɪd/ --------	[lɪvɪd] --------	/mɪs+ɪd/ /mɪs+d/	[mɪsɪd] [mɪst]
Post-Instruction 1 (Jan) Dep >> Max,CodaCond	/lɪv+ɪd/ /lɪv+d/	[lɪvɪd] [lɪvd]	/mɪs+ɪd/ /mɪs+d/	[mɪsɪd] [mɪst]
Dep >> CodaCond,Max	-------- /lɪv+d/	-------- [lɪv]	-------- /mɪs+d/	-------- [mɪs]
Post-Instruction 2 (Mar) Dep >> Max,CodaCond	/lɪv+ɪd/ /lɪv+d/	[lɪvɪd] [lɪvd]	/mɪs+ɪd/ /mɪs+d/	[mɪsɪd] [mɪst]
Dep >> CodaCond,Max	-------- /lɪvd/	-------- [lɪv]	-------- /mɪsd/	-------- [mɪs]

As we observe Table 02, we must consider the possibility of "floatation" concerning the ranking status of the constraints that constitute a stratum, once this possibility is able to account for the output variation found in the students' data in forms like [lɪvd] and [lɪv]. The data presented in Table 02 allow us to see the role played by the explicit instruction in contributing to the development of a new underlying representation, concerning the "-ed" morpheme. This new input form, as has already been said, is able to lead to the production

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[11] As we have already done concerning the data in Table 01, we reinforce once again that the sonority of the coda consonants is not being discussed by the present paper. Therefore, we represent these coda segments as voiced in most of the cases, although we recognize the existence of variability in the sonority of the final obstruents ([d ~t], for instance) produced by the students.

of the native-like forms, and coexists with the underlying representation which leads the learner to the production of forms such as [lɪvɪd] and [mɪsɪd]. Once outputs showing this interconsonantal vowel are becoming less and less frequent in the students' productions, we believe that, in the future, the underlying representation /d/ will become the only input form maintained by the students, since /ɪd/ might be eradicated.

Through the analytical steps taken above, we believe we have shown that, as for the acquisition, by Brazilian Portuguese speakers, of the syllabic structure of the English verbs containing the "-ed" morpheme, more than just the constraint demotion process is necessary. It is necessary, in fact, that the learners acquire a new underlying representation, and abandon the input which comes from orthography.

6. Conclusion

The analysis which was developed by this study has proved the efficiency of Optimality Theory when dealing with the task of explaining the various interlanguage stages the L2 learners go through. This can be shown through a longitudinal study of the constraint rankings which represent each of the phases of the students' acquisition process. This task was made possible by considering Tesar & Smolensky's Learning Algorithm, based on which we can infer that acquiring a second language implies demoting constraints from the L1 constraint ranking as the departure point (H_0). Besides, the present study has also demonstrated that the production of L2 forms might require not only the process of constraint demotion, but also the abandonment of a certain underlying representation so that it gives place to the acquisition of a new input form, which leads to the production of the target structures.

The present study made it possible for us to see that, although the constraint demotion process is undoubtedly necessary for the acquisition of the L2 forms, the language learners also had to abandon the /ɪd/ input form, originated form the spelling of the "-ed" morpheme, and acquire /d/ as their underlying representation. As we have shown, this latter input form was the only one, as could be seen in the tableaux presented throughout this paper, which could lead to the production of the final consonant clusters.

As we consider the subjects of this study, we believe that their acquisition of the accurate input form was facilitated by the provision of explicit instruction regarding the production of the complex codas which characterize the verbs containing the "-ed" morpheme, in a sense that the teaching of these structures caused the learners to notice, in a more attentive manner, the target forms which were present in the oral speech samples they were exposed to. It is worth mentioning that, even before the provision of explicit instruction, the students had already demoted constraints in a sense that they already showed a constraint ranking which was able to lead to the production of the L2 forms: what they lacked, as a matter of fact, was the accurate input form which would make it possible for the final consonant clusters to be produced. This could be seen especially as we consider the data regarding the verbs which belonged to Group A.

We must emphasize, as we observe our data, that the variable output forms were explained not only based on the possibility of floatation of those constraints which made up a ranked stratum, but also as we recognized the coexistence of input forms maintained by the group of students. Such variability was present throughout the three different phases of data collection, which prevents us from stating that the explicit instruction achieved immediate effects in the sense of demoting constraints until ranked strata no longer existed, or even in the sense of contributing to a complete settlement of the input form which had just been acquired. Even so, as we have already mentioned, a longitudinal increase in the production of the target forms has been observed, which causes us to believe that, in the future, not only constraints might keep on being demoted so that ranked strata no longer exist, but also the input form (/d/) might become the only one maintained by the students.

As we consider the L2 acquisition research field, this study has tackled issues that might play an important contribution to future investigations. Our study has indicated that interconsonantal vowels were produced, in the pre-instruction test, not because the students' hierarchies were not developmentally ready so as to lead to the production of the consonant clusters, but, actually, due to a lack of the accurate input form. Thus, the conclusions obtained from this study reveal the need to distinguish between those syllable structures which have not been acquired because of an inaccurate underlying structure, and those target L2 syllable which are not properly produced because the learners have not yet demoted enough constraints so as to reach a ranking whose optimal output is similar to the

L2 forms. We see that the studies which are only concerned about determining the students' ranking systems must be careful enough, with regard to the data collection task, to consider only word exemplars whose spelling also shows a consonant sequence. This, we believe, will prevent inappropriate underlying representations from being originated from orthography.

Therefore, we end this paper by restating that the present study has confirmed the adequacy of Optimality Theory when dealing with both the issues of variability in L2 acquisition and the longitudinal progress of the students' grammar through constraint demotions. Besides, and most importantly, our analysis has brought an important finding into discussion: in L2 acquisition, variable output forms may be the result of coexistent underlying representations concerning the same word, held by the very same learner.

REFERENCES

ARCHANGELI, D. Optimality Theory: an introduction to linguistics in the 1990s. In: ARCHANGELI, D. & LANGENDOEN. *Optimality Theory: an overview*. Oxford: Blackwell, 1997.

BISOL, Leda. A sílaba e seus constituintes. In: NEVES, Maria Helena de Moura (org.). *Gramática do Português Falado – Volume VII: Novos estudos.* Campinas, Editora da Unicamp, 1999, p. 701-742.

BONILHA, Giovana F. G. Construindo hierarquias: algoritmo de aprendizagem. In: MATZENAUER, Carmen Lúcia B. & BONILHA, Giovana F. G. *Aquisição da fonologia e teoria da otimidade.* Pelotas: EDUCAT, 2003, p. 25-38.

_____. Teoria da Otimidade. In: MATZENAUER, Carmen Lúcia B. & BONILHA, Giovana F. G. *Aquisição da fonologia e teoria da otimidade.* Pelotas: EDUCAT, 2003, p. 13-24.

_____ & MATZENAUER, Carmen Lúcia B. Teoria da Otimidade e construção de hierarquias. In: MATZENAUER, Carmen Lúcia B. & BONILHA, Giovana F. G. *Aquisição da fonologia e teoria da otimidade.* Pelotas: EDUCAT, 2003, p. 167-182.

BOROWSKY, Toni. Word-faithfulness and the direction of assimilations. *The Linguistic Review 1*7, 2000, p. 1-28.

CLEMENTS, G. N. The role of the sonority cycle in core syllabification. IN: KIGSTON, J. & BECKMAN, M. (Orgs.) *Papers in laboratory phonology 1.* Cambridge: CUP, 1990, p. 283-333.

COLLISCHONN, Gisela. Um estudo da epêntese à luz da teoria da sílaba de Junko Ito (1986). *Letras de Hoje.* Porto Alevre, v. 31, n.2, 1996, p.149-158.

_____. *Análise Prosódica da Sílaba em Português.* Tese de Doutorado, PUCRS, 1997.

_____. A epêntese vocálica no português do sul do Brasil: análise variacionista e tratamento pela Teoria da Otimidade. *Letras de Hoje,* Porto Alegre, v. 35, n. 1, 2000, p. 285-318.

_____. A Sílaba em Português. In: BISOL, Leda. *Introdução a estudos de fonologia do português brasileiro.* Porto Alegre: EDIPUCRS, 3ª ed., 2001, p. 91-123.

_____. Fonologia lexical e pós-lexical e TO. *Letras de Hoje,* Porto Alegre, v. 37, n.1, 2002, p. 163-187.

_____ & SCHWINDT, Luiz Carlos. Teoria da Otimidade em Fonologia: Rediscutindo Conceitos. In: HORA, Dermeval da & COLLISCHONN, Gisela. *Teoria Lingüística – Fonologia e Outros Temas.* João Pessoa: Editora Universitária/UFPB, 2003, p. 17-50.

DE MARCO, Magliane. *A Fonologia na Aquisição Precoce de uma "LE".* Pelotas: Dissertação de Mestrado – UCPel, 2003.

ELLIS, Nick. _____.Implicit and Explicit Language learning – An Overview. In: ELLIs, Nick (Ed.). *Implicit and Explicit Learning of Languages.* San Diego, CA: Academic Press, 1994 b, p. 1-32.

ELLIS, Rod. The structural syllabus and second language acquisition. *TESOL Quarterly*, v. 24, n. 1, 1993, p. 91-113.

_____. A theory of instructed second language acquisition. In: ELLIs, Nick (Ed.). *Implicit and Explicit Learning of Languages.* San Diego, CA: Academic Press, 1994, p. 79-114.

_____. *The study of second language acquisition.* Oxford University Press, 1994 (b).

_____. Teaching and Research: Options in Grammar Teaching. *TESOL Quarterly,* v. 32, n. 1, 1998, p. 39-60.

FERNANDES, Paulo. *A Epêntese Vocálica na Interfonologia Português-Inglês.* Pelotas: Dissertação de Mestrado. - UCPel, 1997.

_____. A epêntese nas formas oral e escrita na Interfonologia Português/Inglês. In: MATZENAUER, Carmen Lúcia. *Aquisição de Língua Materna e de Língua Estrangeira – Aspectos fonéticos-fonológicos.* EDUCAT, 2001, p. 235-260.

GUSSENHOVEN, Carlos & JACOBS, Haike. *Understanding Phonology.* London: Arnold, 1998.

HAMMOND, Michael. *The Phonology of English: A prosodic-optimality theoretic approach.* Oxford University Press, 1999.

HANCIN-BHATT, Barbara & BHATT, Rakesh M. Optimal L2 syllables – interactions of transfer and developmental effects. *Studies in Second Language Acquisition,* v. 19, 1997, p.331-378.

KAGER, Rene. *Optimality Theory.* Cambridge University Press, 1999.

LEE, Seung-Hwa. Teoria da Otimalidade e Silabificação do PB. In: IBLER, V. B., MENDES, E. A. M., OLIVEIRA, P. (eds.). *Revisitações: Edição Comemorativa dos 30 anos da FALE/UFMG,* Belo Horizonte, 1999, p. 143-156.

LOMBARDI, Linda. Restrictions on direction of voicing assimilations: an OT account. *University of Maryland Working Papers in Linguistics 4,* Linguistics Department, University of Maryland, 1997 (Downloaded from Rutgers Optimality Archive, on Dec 20 2003).

_____. Positional faithfulness and voicing assimilation in Optimality Theory. *Natural Language and Linguistic Theory* 17, 1999, p. 267-302.

_____. Why Place and Voice are different: Constraint-specific alternations in Optimality Theory. In: LOMBARDI, L. (ed.). *Segmental Phonology in Optimality Theory: Constraints and Representations,* 2001 (Downloaded from Rutgers Optimality Archive, on December 20 2003).

LOPEZ, Barbara Strod. *The Sound Pattern of Brazilian Portuguese (Cariocan Dialect).* Microfilms International, England, 1979.

McCARTHY, John. *A Thematic Guide to Optimality Theory.* Cambridge University Press, 2002.

MATZENAUER, Carmen Lúcia Barreto. Aquisição da linguagem e Otimidade: uma abordagem com base na sílaba. In: MATZENAUER, Carmen Lúcia B. & BONILHA, Giovana F. G. *Aquisição da fonologia e teoria da otimidade.* Pelotas: EDUCAT, 2003, p. 55-66.

_____, NOBRE-OLIVEIRA, Denize, DE MARCO, Magliane. O comportamento da coda na aquisição do inglês como LE: um estudo com base na Teoria da Otimidade. In: *III Seminário Internacional de Fonologia*, Porto Alegre, 2002.

PRINCE, Alan & SMOLENSKY, Paul. *Optimality Theory: Constraint Interaction in Generative Grammar.* Technical Report 2, 1993. ROA Version 8/2002 (http://roa.rutgers.edu). Downloaded on June 7 2003.

SELKIRK, E. The syllable. HULST, H. V. D., SMITH. *The structure of phonological representations* (part II). Foris, Dordrecht, 1982, p. 337-383

SCHMIDT, Richard. The role of consciousness in second language learning. *Applied Linguistics* 11, 1990, p. 129-158.

_____. Deconstructing consciousness in search of useful definitions for Applied Linguistics. In: Consciousness in Second Language Learning. *AILA Review*, n. 11, 1994, p. 11-23.

_____. Consciousness and foreign language learning: A tutorial on the role of attention and awareness in learning. In: SCHIMIDT, Richard (ed.). *Attention and Awareness in Foreign Language Learning.* Honolulu, Hawaii: University of Hawaii, 1995, p. 01-63.

TESAR, Bruce & SMOLENSKY, Paul. *Learnability in Optimality Theory (long version).* ROA – 156, 1996 (Downloaded on Dec 20 2003).

_____. *Learnability in Optimality Theory.* Cambridge, MA: MIT Press, 2000.