Universidade Federal de Santa Catarina

BRAZILIAN EFL LEARNERS' PRODUCTION OF VOWEL EPENTHESIS IN WORDS ENDING IN *-ed*

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BRAZILIAN EFL LEARNERS' PRODUCTION OF VOWEL EPENTHESIS IN WORDS ENDING IN *-ed*

por

Fernanda Delatorre

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To
my parents
Leonel and *Maria,*
my sisters
Patrícia and *Alice Maria*,
with love and gratitude

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ABSTRACT

BRAZILIAN EFL LEARNERS' PRODUCTION OF
VOWEL EPENTHESIS IN WORDS ENDING IN *–ed*

FERNANDA DELATORRE

UNIVERSIDADE FEDERAL DE SANTA CATARINA

2006

Supervising Professor: Rosana Denise Koerich

This study investigated the influence of markedness in terms of the MDH and the influence of the preceding phonological environment as well as the possible influence of orthography and tasks on the process of medial vowel epenthesis production in words ending in *-ed.* Twenty-six participants read ten paragraphs and described four pictures using verbs in the past tense. The activities were audio recorded at the language laboratory at UFSC and the target words phonetically transcribed. The results that followed the expected tendencies were related to the influence of (a) the preceding consonantal context, which induced more epenthesis than the preceding vocalic context; (b) manner of articulation, in which obstruents induced more epenthesis than sonorants, which induced more epenthesis then vowels and nasals, which induced more epenthesis than liquids; (c) length in which the more marked three-member clusters induced more epenthesis than the less marked two-member clusters; and, (d) orthography, which influenced epenthesis in *-ed* ending words and no epenthesis in *contrastive words*.

Results that did not follow the predictions were related to the influence of (a) voicing, in which voiced obstruents induced less epenthesis production than voiceless obstruents; (b) manner of articulation, in which affricates induced more epenthesis than stops and fricatives, but stops induced more epenthesis than fricatives; (c) place of place of articulation, in which the voiced velar stop caused less epenthesis production than the voiced bilabial; and, (d) the free speech test, in which vowel epenthesis production was less frequent than in the reading test. Markedness in terms of preceding context and cluster length and sonority/consonant strength in terms of voicing and manner of articulation seem to influence epenthesis production in *-ed* endings as, well as orthography, which is reinforced by the lower rate of epenthesis production in the free speech test, whereas place of articulation seems not to influence this process.

109 pages (excluding appendix)
28,733 words (excluding appendix)

RESUMO

A PRODUÇÃO DE EPÊNTESE VOCÁLICA EM PALAVRAS COM *-ed* FINAL POR BRASILEIROS FALANTES DE INGLÊS COMO LE

FERNANDA DELATORRE

UNIVERSIDADE FEDERAL DE SANTA CATARINA

2006

Professor orientador: Rosana Denise Koerich

Este estudo investigou a produção de epêntese vocálica em palavras que terminam com *-ed*, considerando a influência da marcação, do contexto fonológico, da ortografia e da tarefa. Vinte e seis participantes leram dez parágrafos e descreveram, no passado, seqüências de eventos apresentados em quatro figuras. As atividades foram gravadas no laboratório de línguas da UFSC. Os resultados que seguiram as tendências esperadas são referentes à influência: (a) do contexto fonológico antecedente, onde as consoantes induziram maior produção de epêntese do que as vogais; (b) das obstruintes que induziram maior produção de epêntese do que as soantes que induziram maior produção de epêntese do que as vogais; (c) das nasais que induziram maior produção de epêntese do que as líquidas; (d) do tamanho da seqüência de consoante, onde as seqüências compostas por três consoantes induziram maior produção de epêntese do que as seqüências com duas consoantes; (e) da ortografia do *-ed*, uma vez que as *palavras de contraste* não tiveram produção de epêntese na coda. Os resultados que não seguiram as

expectativas se referem à influência: (a) das obstruintes não-vozeadas que induziram maior produção de epêntese do que seus pares vozeados; (b) das africadas que induziram maior produção de epêntese do que as plosivas e as fricativas, mas as plosivas induziram maior produção de epêntese do que as fricativas; (c) da plosiva vozeada /g/ que induziu menor produção de epêntese do que a plosiva vozeada /b/; (d) da tarefa, uma vez que na fala espontânea produziu-se menos epêntese do que na leitura. Marcação em termos de contexto antecedente e do tamanho da seqüência de consoantes e sonoridade em termos de vozeamento e modo de articulação parecem influenciar a produção de epêntese vocálica no *-ed*, assim como também a ortografia do *-ed*, evidenciada pela baixa produção de epêntese na fala espontânea, enquanto que o ponto de articulação parece não influenciar no processo.

Número de páginas: 109 (excluindo apêndices)
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CHAPTER 1

INTRODUCTION

Studies involving speakers from different first languages (L1) that do not allow single consonant codas learning English as a second/foreign language (ESL/EFL) have shown that whereas German, Dutch and Polish speakers tend to devoice English stops in single consonant codas (Yavas, 1994), Brazilian Portuguese (BP) speakers tend to add a vowel to those consonants, generating a new syllable (Baptista & Silva Filho, 1997; Koerich, 2002; Silveira, 2004; Delatorre, 2004). The difficulty of ESL/EFL speakers to deal with syllable structures that do not belong to the L1 repertoire is also attested in studies of initial /s/-clusters (Carlisle, 1991, 1992, 1994, 1998; Rebello, 1997; Rauber, 2002; Silveira, 2002; Cornelian Jr., 2003; Delatorre, 2004), and in studies of final consonant clusters (Eckman, 1987a; Baptista, 2001; Pereira, 1994; Alves, 2004; Delatorre, 2004, 2005).

Among these six studies, Eckman (1987a) is the only study that discussed the production of clusters by speakers of languages other than BP. He studied the reduction of final clusters by two participants of each language – Japanese, Cantonese and Korean – in a word list reading test containing 264 words. The results showed that in two-member clusters participants tended to delete either the first or second consonant and in three-member clusters they deleted one of the consonants, with a tendency to preserve the less marked fricative-stop and stop-fricative clusters, and to modify the more marked stop-stop and fricative-fricative clusters. Eckman concluded that cluster reduction is an interlanguage (IL) rule used in the process of dealing with difficult sequences of sounds, which leads second language (L2) speakers to produce less

marked clusters conforming to typological markedness and to Greenberg's (1978) universal principles.

Baptista (2001) is a review of the most frequent pronunciation errors made by Brazilian EFL learners, which, among others, includes problems with the pronunciation of initial /s/- clusters and final clusters found in the past tense of regular verbs, initial and final single consonants, such as /tʃ/, /dʒ/, /θ/ and /ð/, as well as vowels.

Greenberg (1978) points out that simplifications applied to clusters reduce cluster length as well as the number of long and more difficult clusters, at the same time that they increase the number of short and less difficult clusters.

Four studies have dealt with the production of final clusters formed by the addition of the past tense *-ed* by Brazilians. Pereira (1994) investigated the production of final *-s* found in the plural of nouns and in the third person singular of verbs in the present tense, as well as the production of final clusters formed by the addition of *-ed* endings to the base form of regular verbs by beginning and advanced EFL. The author observed that the twenty beginning EFL participants produced vowel epenthesis as a strategy to deal with final clusters formed by the addition of *-ed* endings, which she attributed to the interference of the L1 orthography-pronunciation association, whereas her advanced participants tended to produce little vowel epenthesis.

Alves (2004) studied beginning EFL learners' production of vowel epenthesis in regular verbs in the past using three types of tasks, in a longitudinal study in which the objective was to test whether instruction on the production of these verbs would help his participants to improve their pronunciation on a long term basis. The author analyzed the production of 184 verbs in a free speech task, and of 568 verbs in a text reading task and in a sentence reading task.

Delatorre (2004, 2005) investigated the production of final clusters formed with the addition of *-ed* endings to the base form of regular verbs. In the first study, participants were six advanced Brazilian EFL speakers – teachers of EFL. Since the data were collected using a free speech task, the number of verbs was very small (238 in approximately eight hours of recordings).

Delatorre (2005) is the pilot study for this thesis. Nine participants read ten paragraphs containing 819 English words ending in *-ed* and 53 words with homophonic endings. The data were collected using a paragraph reading task and a free speech task (see Section 2.2 for detailed information about Pereira's, Alves's and Delatorre's studies).

English words ending in *-ed* include the regular past tense and the regular past participle inflections (occurring in the perfect tenses and in the passive voice), and some adjectives (Celce-Murcia, Brinton & Goodwin, 1996).

In Delatorre (2005) and in this study, words with homophonic endings include words in which final clusters or the rhyme have the same pronunciation of words ending in *-ed*. They were included in this study in order to enable investigating the influence of orthography. They are irregular verbs in the present and past tenses, adjectives, nouns, and ordinal numbers which allow the following contrasts: *stopped* vs. s*lept; laughed* vs. *lift; planned* vs. *hand; stored* vs. *third; mixed* vs. *text,* and *played* vs. *made*. Owing to the fact that the words with homophonic endings were used in order to provide contrasts with the pronunciation of words ending in *-ed*, these words will be called *contrastive words* from now on.

By the process of vowel epenthesis, the cluster of the past-tense *-ed* in a word such as *stopped* may be pronounced as [stɔpid], [stɔped] or even [stɔpidi] or [stɔpedi]. As the transcriptions of the verb *stopped* demonstrate, the

process of vowel epenthesis in -*ed* endings can result in the insertion of one vowel inside the final cluster and one vowel following the final consonant. Alves (2004) calls the vowel inserted within the cluster medial epenthesis (*epêntese medial*) and the vowel inserted following the final consonant final epenthesis (*epêntese final*).

According to Trask (1996), concerning the insertion of vowels, the term epenthesis is used by some linguists to name word-medial insertion, whereas, initial and final insertions are called prothesis and paragoge, respectively. The present study follows Alves's suggestion in differentiating the production of the two types of epentheses – medial and final – avoiding the use of more technical terms. The term medial epenthesis is used for vowels that split the final cluster in the pronunciation of -*ed* endings, which is the focus of the study.

The literature on the pronunciation of -*ed* endings says, basically, that by the process of assimilation, -*ed* is pronounced as /t/ in words that end in voiceless obstruents, as for example, *liked, stopped, laughed* and *watched*, and as /d/ in words that end in voiced obstruents, sonorants or vowels, as *robbed, loved, screamed, judged, tried, slowed,* and *played*. In words ending in /t/ and /d/, the -*ed* ending is pronounced with the addition of a syllable as /ɪd/ or /əd/. Examples of these words are *wanted* and *needed* (Prator & Robinett, 1985; Hagen & Grogan, 1992; Lane, 1993; Celce-Murcia, Brinton & Goodwin, 1996; Hancock, 2003).

Prator and Robinett (1985) list the most frequent errors in the pronunciation of -*ed* as (a) its pronunciation as in a separate syllable, as in *robbed* [rɔbɪd] and *thanked* [θæŋkɪd]; (b) its pronunciation as /t/ after approximants and vowels, as in *dared*

[dært] and *killed* [kɪlt]; and (c) the apparent omission of the -*ed* ending, as in *answered* [ænsər].

The tendency of BP learners of English to simplify consonant clusters in words ending in -*ed* is a frequent matter of discussion and complaints by teachers; however, the only studies focusing on the issue are the ones mentioned above. This study set out to add to the field investigating the influence of different variables on the production of English words ending in -*ed* by intermediate Brazilian students of EFL.

Following the line of research of Baptista and Silva Filho (1997) and Koerich (2002), who dealt with epenthesis after final-single consonants, and Rebello (1997) and Rauber (2002), who dealt with epenthesis in initial /s/-clusters, this study investigated the influence of markedness based on the Markedness Differential Hypothesis (MDH), and the influence of the preceding phonological environment on the process of vowel insertion in words ending in -*ed*. In addition, owing to the possible interference of the orthography of these words in the processes of reading and/or speaking, the study investigated its influence on the production of vowel epenthesis. Finally, it investigated the influence of the level of formality of the language in terms of reading versus free speech tasks used to collect the data.

By indicating which types of codas and phonological contexts trigger more mispronunciations of the -*ed* morpheme, this study aimed at helping teachers to apply pedagogical measures to promote their students' improvement in the pronunciation of -*ed* endings. It was also hoped that this research would contribute to investigations in the field of epenthesis production in general.

This thesis is organized in five chapters. Chapter 2 presents the Review of the Literature. It describes the syllable in phonological theory paying especial attention to

Hooper's (1976) Consonantal Strength Hierarchy and to Selkirk's (1984) Sonority Sequencing Generalization (SSG). Then it describes the American English (AE) and Brazilian Portuguese (BP) syllable structures, with special attention to final clusters, organized according to Greenberg's (1978) hypotheses. This chapter also conceptualizes the most important variables in this study, such as markedness and phonological environment, and reviews the most recent studies on initial and final clusters, paying special attention to those involving markedness and phonological environment relations in final clusters. Finally, Chapter 2 also reports on the most recent research discussing the influence of orthography and task style, which are relevant to the present thesis. Chapter 3 presents the Method, the hypotheses tested, the material and participants, and the procedures adopted to collect and analyze the data. Chapter 4 reports and discusses the results according to the hypotheses tested and relates them to previous studies reviewed in Chapter 2. Finally, Chapter 5 presents the conclusions and final remarks concerning theoretical and pedagogical implications as well as limitations of the present study and suggestions for further research.

CHAPTER 2

REVIEW OF THE LITERATURE

One constant comment in the literature is that although the syllable is intuitively recognized by native speakers of a language, it is difficult to find a consistent definition of the syllable, even going back to Latin and Greek grammarians (Jensen, 1993; Brinton, 2000).

Jensen, who defines the syllable as "the basic unit of pronunciation" (p. 47), mentions that native speakers always know how many syllables occur in words of their languages; and Brinton says that native speakers know what types of final clusters can or cannot occur in their languages.

As Koerich (2002) points out, "the problem seems to be to find a definition that would be equally valid at a phonetic and phonological level" (p. 12). Summarizing what the literature presents about the issue, she comments that whereas in phonetic terms, the syllable has been defined with relation to respiratory movements and peaks of resonance, phonologically it has been seen in terms of degree of opening and degree of sonority.

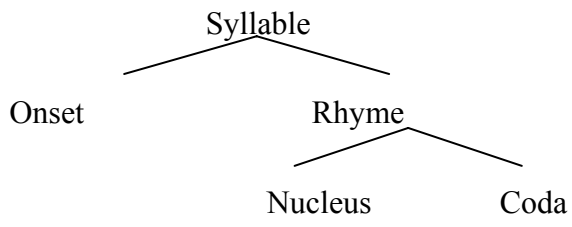
Hooper's (1976) description of the syllable, based on the consonantal strength relations of its constituents, was based on Saussure's (1915, cited in Hooper 1976) definition in terms of degrees of opening of the sounds. Saussure considers that the open sounds are represented by the vowels, which appear at the nucleus of the syllable, and that the least open sounds are represented by the stop consonants that occur at the margins. Hooper's description of the syllable will be discussed in section 2.1.

2.1 Syllable structure

According to Hooper (1976) and Jensen (1993), there is a universal preference for simpler syllables, specifically consonant-vowel (CV) syllables. The authors say that this preference is due to the Onset Principle. The principle avoids syllables beginning with vowels, consequently making the CV syllable the most frequent structure found in the world's languages, since all languages allow this type of syllable, and in many it is the only type allowed.

Laver (1994) and Roca and Johnson (1999) state that the vowel (V), the consonant-vowel (CV), the vowel-consonant (VC), and the consonant-vowel-consonant (CVC) are the most common syllable-types found among languages, and Hammond (1997) observes that no language has the vowel-consonant (C)VC as an obligatory structure.

In the line of Saussure's definition of the syllable, Jensen (1993) and Hammond (1997) consider that the syllable consists of a peak of sonority occupied by the vowels and valleys occupied by the consonants. According to Metrical Theory, the syllable presents two phonological parts: the onset and the rhyme, and the latter is divided into a nucleus or peak, and a coda. The syllable structure is frequently represented by the following diagram:



Selkirk (1984) highlights that syllables conform to the Sonority Sequencing Generalization (SSG), which proposes that "in any syllable, there is a segment constituting a sonority peak that is preceded and/or followed by a sequence of segments with progressing deceasing sonority values" (p. 116). Selkirk (1984) advocates that the SSG can be the basis for the sonority-hierarchy approach formalized in terms of sonority indices governing the syllable structure of each language. Whereas Selkirk takes into account the sonority sequence to formalize a hierarchy of the internal constituents of the syllable, Hooper (1976) considers the consonantal strength. Hooper represents the structure of the syllable in the following way:

MARGIN	NUCLEUS	MARGIN
obstruents, nasals liquids	glides vowels glides	liquids nasals obstruents
Least vowel-like	Most vowel-like	Least vowel-like
STRONG	WEAK	WEAK

(p. 199)

Applying this representation to the tree diagram proposed by Metrical Theory, it can be seen that the onset and the coda, the non-obligatory elements of the syllable, may be constituted by obstruents, nasals and liquids alone or in combination whereas the nucleus, the obligatory element of each syllable, may be constituted by vowels or glides and vowels. Hooper (1976) explains that clusters that occur at the onset are stronger than clusters that occur at the coda because these clusters undergo weakening processes, such as deletion or unreleasing of the final consonant, assimilation of the features of the following consonant or aspiration of initial consonant. English voiceless stops, which are aspirated in initial position, as a strengthening process, are unreleased in final position, as a weakening process, for instance. In the rhyme the sonority tends to decrease from the peak to the last consonant of the coda, as in *danced* [dænst].

However, in some instances this sequence is not followed, in *mixed* [mɪkst] and in *changed* [tʃeɪndʒd] where the sonority increases and then decreases, according to Hooper's (1976) Hierarchy of Strength. Since the focus of this study is on the pronunciation of the *-ed* endings, which are realized as single, two-member and three-member codas, the following section describes the types of codas most frequently found in languages around the world.

2.1.1 Possible final clusters

Hooper (1976) presents the following hierarchy for optimal syllable initial and final positions, in which it can be seen that the sequence for initial position is exactly the opposite of that for final position:

Optimal syllable-initial		obstruents	↑
	|	nasals	|
	|	liquids	|
	|	glides	|
	↓	vowels	Optimal syllable-final

(p. 196)

The author observes that if obstruents are allowed after vocalic environments in syllable final position, non-obstruents have to be accepted in the same environment. In the same line, Greenberg (1978) states that (a) particular classes of consonants are preferred to occur close the nucleus of the syllable, such as liquids and glides, whereas other classes of consonants are preferred to occur next to the margin of the syllable; (b) sonorants and voiced consonants and/or sequences of voiced consonants tend to occur

close the nucleus forming the voiced center of the syllable; (c) voiced and voiceless obstruents must be followed by a voiced or a voiceless obstruent, respectively, forming homogeneous clusters in terms of voicing; and (d) sonorants, which occur close to the nucleus, can be followed by a voiced obstruent or unvoiced obstruent, since the obstruents are homogeneous in regard to voicing or assimilation.

Greenberg's (1978) text is a revised version of his 1965 article about possible initial and final consonants and clusters found among 104 languages whose results demonstrate that in any language there is always type of consonant or cluster which is preferred over other types of consonants or clusters. The author says that shorter clusters are preferred over longer clusters, and that long clusters that are analyzable in their smaller clusters are preferred over short clusters that are not analyzable in their smaller clusters. He also concludes that homorganic clusters both in terms of assimilation and voicing are preferred over heterorganic clusters. Concerning voicing, the author considers that a combination of voiceless obstruents is preferred over a combination of voiced obstruents and that the dominance of voiceless obstruents over voiced obstruents is observable in combinations not only with obstruents but also with sonorants.

Taking into consideration Greenberg's conclusions, and Hooper's and Selkirk's claims about the internal structure of the syllable, it is possible to say that final clusters are likely to have the following constituency: (a) nasal plus homorganic obstruent over nasal plus heterorganic obstruents; (b) fricative plus stop over stop plus stop or fricative plus fricative; (c) liquid plus stop over stop plus liquid; (d) liquid plus nasal over nasal plus liquid or nasal plus nasal or liquid plus liquid; (e) two voiceless consonants over two voiced consonants; (f) sonorant plus voiced obstruent over sonorant plus voiceless obstruent; (g) liquid plus obstruent over obstruent plus liquid; and (h) nasal plus obstruent over nasal plus nasal. Concerning the affricates, Greenberg (1978) classifies

them as sounds that consist of an articulation of stop plus fricative. Regarding place of articulation, he mentions that there is some evidence that the dental-alveolar region is dominant over the bilabial and the velar regions which implies that every language that has at least one final cluster consequently has a cluster with a final obstruent in dental-alveolar region and, one of these dental-alveolar consonants is voiceless, as demonstrated by universals 27, 30 and 38 described by Greenberg (1978). Furthermore, the author also comments about possible combinations found in final systems where /r/ can only be followed and not preceded by /l/; impossible combinations such as sibilants occurring together; and a strong tendency for liquids and sibilants not to occur together.

Since the focus of this study is the production of vowel epenthesis in the pronunciation of English words ending in *-ed* by Brazilians, the rhymes occurring in the AE and in the BP systems are described in the following sections.

2.1.2 The structure of the American English rhyme

Prator and Robinett (1985) and Giegerich (1992) explain that the English syllable is formed by the onset and the rhyme. They also mention that the rhyme is formed by the peak and the coda, where the former is the obligatory element of the syllable and latter is the optional element of the syllable. Almost all English consonants occur in final position. However, there are few exceptions, such as the /h, j, w/ that occur only in syllable initial position and /ʒ/ that appears in the middle of the word and in syllable initial or final position of borrowed words, such as in *pleasure, genre* and *garage* (Giegerich, 1992; Brinton, 2000). Some examples of English rhymes found in words ending *-ed* are *died* – CVC; *missed* and j*udged* – CVCC; and *jumped* and *mixed* – **CVCCC.**

Regarding final clusters, Hooper (1976) and Brinton (2000) consider that final clusters are freer and more complex than initial clusters and, Prator and Robinett (1985) mention that final clusters are more numerous than initial clusters. Prator and Robinett, Giegerich (1992) and, Brinton explain that English allows up to four consonants in the coda.

Giegerich (1992) considers that the core rhyme can have up to three "X-positions" (places filled by a sound in a syllable), which are occupied by one lax vowel and two consonants, or one tense vowel or diphthong followed by a single consonant. These sequences can be illustrated by the words *best*, and *beat* and *bite*, respectively.

In his view, clusters are sequences of consonants with or without the presence of an appendix as the extra element, or in Giegerich's words, an appendix is seen as a "further X position" (p. 149). These clusters are formed with the addition of extra elements such as the coronal obstruents /s, z/ of the singular third person of verbs in the present tense and in the plural of nouns, /t, d/ found in the past tense and past participle of regular verbs, and /θ, ð/ found in ordinal numbers and the /dʒ/ found in word as *strange*.

As Prator and Robinett (1985) and Jensen (1993) observe, this addition creates two- and three-member clusters, and, as Selkirk (1984) points out, the addition of a coronal to previous existing consonants must obey the phonotactics of the language in question. Examples of words used in this study that have final three-member clusters are *jumped* [dʒʌmpt] and *learne*d [lərnd] which, according to Giegerich, have /t/ and /d/ as appendices to the syllable final in each word besides the three X-positions of the rhyme.

Prator and Robinett state that final two-member clusters are more frequently found than three-member and four-member clusters. Jensen (1993) points out that the enlarging of cluster size transforms codas into more complex and more problematic structures. Brinton (2000) remarks that owing to this complexity the list of possible final clusters which can be found in the coda of English syllables, becomes very long. Such a list is presented in Prator and Robinett (1985).

The following list of final clusters is based on Prator and Robinett's and on Brinton's lists and on the researcher's observations during the process of putting together the material for this study. Final two-member and three-member clusters found in English monosyllabic words ending in *-ed* and in *contrastive words* (see Chapter 1 to check the definition of *contrastive words*) studied in this research are presented and organized according to their internal components. The last element of these clusters is always the alveolar stop /t/ or /d/, depending on voicing of the preceding element. The examples listed here are words used in this research. Categories 3, 8, 9, 10, 11, 12, 13, and 14 do not have *contrastive words.*

Two-member clusters:

1 stop + stop, as in *slept*, *skipped, act, liked*;

2 fricative + stops, as in *lift*, *laughed, best, missed*;

3 affricate + stop, as in *watched, judged;*

4 nasal + stop, as in *hand*, *joined, screamed*;

5 liquid + stop, as in *child, called, third, stored*;

Three-member clusters:

6 stop + fricative + stop, as in *next, fixed*;

7 fricative + stop + stop, as in *asked, risked*;

8 nasal + stop + stop, as in *jumped, linked*;

9 nasal + fricative + stop, as in *danced*;

10 nasal + affricate + stop, as in *changed*;

11 liquid +stop + stop, as in *helped, worked;*

12 liquid + fricative + stop, as in *solved, surfed;*

13 liquid + affricate + stop, as in *searched*;

14 liquid + nasal + stop, as in *filmed*, *learned*.

Some regular verbs used in this study have open syllables which, as mentioned by Prator and Robinett (1985), add /d/ to form the past tense or past participle.

In order to conform to the pronunciation of the rhymes of words ending in *-ed* with the pronunciation of the rhymes of *contrastive words*, the rhymes compared in this study had either a tense vowel followed by /d/ or a diphthong followed by /d/, as in *played* and *cried*, respectively. As well as for the final clusters just described, the rhymes /aɪd/ and /oʊd/ do not have *contrastive words* in this study. The words ending in *-ed* and the *contrastive words* are grouped according to their internal constituents as follows:

Vowel/Diphthong + /d/:

1 front vowel /eɪ/ + voiced stop /d/, in *made, played, ,stayed;*

2 back vowel /oʊ/ + voiced stop /d/, in *slowed, snowed, rowed;*

3 diphthong /aɪ/ + voiced stop /d/, in *cried, died, tried.*

2.1.3 The structure of the Brazilian Portuguese rhyme

In terms of syllabic patterns, Brazilian Portuguese is characterized as a language in which the basic pattern is the open syllable – CV, such as in *fé* [ˈfɛ] – ‘faith’, and in which in closed syllables, the number of consonants in the coda varies between one and two, as in the examples: *cor* [ˈkoR] – ‘color’ and ***ins****tante* [ĩNStɑNti] – ‘instant’ (Cristófaro Silva, 1998; Collischonn, 1999; Monaretto, Quednau & Hora, 1999).

As Koerich (2002) puts it, the syllable final consonants are restricted phonologically to /l/, /r/, /m/, /n/, /s/ and /z/ or, as in Cristófaro Silva’s proposal: /l/, /R/, /N/ and /S/. The originally velarized alveolar (or dental) lateral [ɬ] in syllable final is increasingly being vocalized as in *sol* [ˈsɔʊ̯] – ‘sun’, and the pronunciation of the final /N/ is in general accepted as realized as a nasal vowel with the deletion of the nasal consonant. However, the underlying representation of the final /N/ is controversial.

Baptista (1987), Cristófaro-Silva (1998), Collischom (1999) and Monaretto et al (1999) explain that the final /S/ and /R/ vary according to dialect. Whereas /S/ may be produced as /s, z, ʃ, ʒ/, /R/ may be realized as a fricative [xɣ], the retroflex [ɹ], the trill [ř], and even the flap /ɾ/, in all dialects, when followed by a word beginning with a vowel (see Koerich (2002) for a more detailed description).

In word-medial position, the single consonant coda can also be one of the stops /p, b, t, d, k. g/; the fricative /f/ and the nasal /m/. These are found in the words *apto* [ˈap.tʊ] – ‘able’, *objeto* [obˈʒɛ.tu] – ‘object’, *adjetivo* [adˈʒe.ti.vu] – ‘adjective’, *ritmo* [ˈRit.mu] – ‘rhythm’, *pacto* [ˈpak.tu] – ‘pact’, *digno* [ˈdig.nu] – ‘dign’, *afta* [ˈaf.tə] –

'thrush', and *amnésia* [a.mˈnɛ.zɪa] – 'amnesia', respectively. These uncomfortable consonantal sequences induce the speaker to produce an epenthetic vowel and, consequently, a new syllable (CV) conforming to the phonotactics of the language is added to the word as in the pronunciation of *objeto* as [obiˈʒɛ.tu] (Collischonn, 2002).

Final two-member coda clusters occur in word medial position in a very limited number of words where the first element is /r/ or /n/ and the second element is /s/, such as in *perspectiva* [peRS.pek ˈti.və] – 'perspective' and *transporte* [trɑNSˈpɔR.ti] – 'transportation' (Cristófaro Silva, 1998).

In word-final position, the stop-fricative clusters [ps] and [ks] occur in Latin words such as *fórceps* [ˈfɔR.sɛpS] 'forceps' and in the pronunciation of words such as *xerox* [ʃɛˈrɔkS] – 'xerox', *látex* [laˈtɛkS] – 'latex' , and even in *lápis* [ˈlapS] – 'pencil, where, according to Major (1994a) there is a 'devoicing or deletion' of unstressed [i].

This brief description of the syllable structure of BP and English shows that the two languages differ substantially in terms of the coda. BP syllables tend to be less marked than English syllables. Thus, BP learners of English often have difficulty in dealing with English codas (Baptista, 2001).

The following section summarizes the most recent studies investigating the production of final single consonants and final clusters by Brazilian EFL students.

2.2 Production of English codas by Brazilians

In the last decade, a number of studies conducted in Brazil have investigated Brazilian EFL learners' production of final single consonants and consonant clusters.

Concerning single word-final consonants, Baptista and Silva Filho (1997), Koerich (2002), Silveira (2004) and Delatorre (2004) investigated epenthesis production in final single consonants whereas Kluge (2004) and Bettoni-Techio (2005) investigated the production of final nasals and final alveolar stops, respectively. Concerning the production of final clusters, Pereira (1994) studied the production of *-ed* in the past tense of regular verbs, and the production of *-s* in the third person singular of verbs in the present tense and in the plural of nouns, whereas Alves (2004) and Delatorre (2004, 2005) studied the production of epenthesis in codas formed by the addition of the *-ed* ending to the base form of regular verbs. As mentioned in Chapter 1, Delatorre (2005) is the pilot study of the present thesis.

In general terms, Baptista and Silva Filho (1997), investigating the influence of markedness and following phonological context on the production of English final consonants, found that their group of four beginners and two advanced undergraduate students of English produced a low rate of epenthesis (15.2%) on final single consonants. Koerich (2002), studying perception and production of word-final vowel epenthesis, found a higher rate of epenthesis (44.55%) for her twenty beginning undergraduate students of English. Delatorre (2004), investigating epenthesis production in initial /s/ clusters, codas formed by the *-ed* endings, and in final single consonants by six advanced participants – teachers of English, found the lowest rate of epenthesis production (7.05%) after final single consonants among these three studies. Thus, taken together, these results suggest that proficiency in the target language (TL) induces the reduction of epenthesis production after single consonants by Brazilian learners.

Silveira (2004) studied the effect of pronunciation instruction on the perception and production of final consonants by twenty-two beginning learners of EFL. She found

that the control group had 18.00% of epenthesis production in the pretest and 21.00% in the posttest, whereas the experimental group presented 45% and 30% of epenthesis in the same tests. Despite the low rate of epenthesis production by the control group, she concluded that instruction played a role on the production of these single codas since (a) the reliance on epenthesis production to deal with final consonants was strongly reduced in the experimental group, as attested by the statistical tests, and (b) there was just a slight difference in rates of epenthesis production in the pretest and the posttest by the control group.

In relation to the production of English final nasals, Baptista and Silva Filho (1997) mentioned that Brazilians use the strategy of transferring the nasal feature of final nasals to the preceding vowel with deletion of the nasal consonant or the strategy of vowel epenthesis to deal with these consonants in the coda. Kluge (2004), found that her twenty pre-intermediate participants had 38.66% inaccurate pronunciation of final nasals /m, n/. In terms of the strategies the participants used in these inaccurate productions, the author found that 91.96% of the instances of mispronunciation consisted of deletion of the final nasal with vowel nasalization, whereas deletion of the nasal consonant without vowel nasalization accounted for 8.75%, and only 0.18% consisted of epenthesis.

In the line of Baptista and Silva Filho's (1997) and Koerich's (2002) studies, Bettoni-Techio (2005) conducted a study on the production of final alveolar stops by thirty pre-intermediate Brazilian learners of English, and found 42.10% mispronunciations of the final /t/ and /d/. She found that the strategies her participants most frequently used to deal with final alveolar stops were (a) aspiration (18.90%); (b) palatalization (10.70%); and (c) vowel epenthesis (6.60%) whereas aspiration with

vowel epenthesis, palatalization with vowel epenthesis and other strategies had frequency of 5.90%.

In relation to the production of final clusters by Brazilian EFL learners, as mentioned above, Pereira (1994) carried out a study about the production of *-ed* in the past tense and *-s* in the third person singular and plural of nouns. Forty subjects divided into one group of twenty beginners and a second group of twenty advanced learners were involved in the study. The analysis of the data demonstrated that the advanced group had much more accurate productions than the beginner group, especially in relation to the pronunciation of the past tense. In the case of the past tense, the author mentioned that her participants, especially beginners, tended either to split the final clusters by inserting an epenthetic vowel /ɪ/ or /ə/ producing new syllables or to palatalize the final alveolar stops /t/ and /d/ inserting a following /i/. The author concluded that her data showed that (a) there is a great interference of L1 in the production of clusters formed with the pronunciation of *-s* and *-ed* endings; (b) greater experience in the foreign language seems to diminish L1 interference; and (c) the orthographic input and/or insufficient instruction have an effect especially on the production of the past tense.

Regarding the pronunciation of the *-ed* endings, Alves (2004) and Delatorre (2004, 2005) conducted studies on the production of medial vowel epenthesis (see definition in Chapter 1) in these codas. Alves (2004) carried out a study focusing on the influence of instruction in which the participants were seven beginning undergraduate students of English at Universidade Federal de Pelotas.

The production of clusters was investigated in verbs such as *lived* and *missed* and simple codas found in verbs such as *needed* and *started* in a pretest before instruction and in two posttests after instruction. Alves taught the participants two

academic subjects. In Portuguese/English Interphonology he provided instructions about (a) the concepts of phonetics and phonology and of phoneme; (b) the International Phonetic Alphabet (IPA); (c) differences between the consonantal and vocalic systems of BP and AE, and (d) the strategies Brazilian EFL learners use more frequently to deal with English syllables, paying especial attention to epenthesis. In the subject Portuguese/English II, he observed his participants' oral production of the target words. The instruction session for the words ending in *-ed* consisted of two parts in which he explained the concept of assimilation in the first part of the class and, in the second half of the class, asked the students to organize a list of verbs in three columns, for the three pronunciations of *-ed* endings. He, then, gave corrective feedback on the pronunciation of the verbs, and set the students to practice the verbs using specialized material on pronunciation.

Since the focus of the study was the effect of instruction on pronunciation, participants took three tests: a pretest in the beginning of the semester, a month before the instruction session; a first posttest in the middle of the semester right after the instruction session, and a second posttest at the end of the semester, two months after the first, to check whether instruction had a long-lasting effect. The data were collected through reading and free-speaking activities. In the pretest participants read a short version of chapters 18 to 23 of "Moby Dick" and participated in class activities recorded by the researcher. In both posttests, participants read a longer version of the same text and an additional sequence of sentences containing verbs in the past participle, since the author's first intention was to compare the results of a text reading test and a sentence reading test. However, as the results showed no significant differences between the tests, the data from the reading test (pooling together the data from the paragraph reading and the sentence reading tests) were included in the reading text to carry out the

analysis. The data from the free speech test in both posttests were collected through interviews and recordings of class activities.

In the analysis, the verbs were organized according to types of coda. The verbs with simple codas, that is, those in which the coda of the base form is /d/ or /t/, and add a vowel in words ending in -*ed*, forming a single coda /ɪd/, such as *wanted* and *needed*, were included in Group C, and the verbs ending in clusters were set in Groups A and B. Group A was composed of verbs in which the penultimate segment of the coda does not occur in BP codas, such as /tʃ, v, p, f/ in *watched, lived, stopped,* and *laughed*, and Group B was composed of verbs in which the penultimate segment of the coda is /l, R, N, S/, the codas allowed in this position in BP found in verbs such as *traveled*, *remembered, missed* and *passed*. It is important to note that Alves did not seem to take into account the phonological processes that occur in such codas of BP (see section 2.1.3).

In regard to the production of single codas in verbs of Group C, Alves found that accurate production of these verbs, such as *wanted* [wantɪd] and *needed* [nidɪd], was high in the pretest, and that the rates of correct performance decreased from the first-posttest to the second-posttest. The author explained the results of the pretest could be expected since his participants produced the verbs of Groups A and B with single codas, as in *lived* [lɪvɪd] and missed [mɪssɪd], in the pretest. The decrease in accurate production of single codas was considered to be caused by the production of verbs in which (a) the vowel and the consonant were deleted as in *need* [nid]; (b) the final consonant was deleted, as in *need* [nidɪ]; or (c) the epenthetic vowel was deleted, producing a final cluster composed of two alveolar stops, as in *needed* [nidd].

Nevertheless, Alves mentions that it is possible that these results mean that participants started overcorrecting themselves with reference to the instruction on pronunciation of verbs of group A and B, which might suggest that the instruction was not clear enough to account for those possibilities of mispronunciations.

Concerning the production of verbs of Groups A and B, Alves expected that his participants produced medial and final vowel epenthesis in verbs of Group A (verbs such as *lived* [lɪvɪdʒɪ] in the pretest). However, he found that the strategy most frequently used in the pretest was the insertion of a medial vowel, such as in the pronunciation of *lived* as [lɪvɪd]. Alves also called attention to the fact that participants produced epenthesis in all verbs of Group A and a few productions of final clusters in verbs of Group B in the pretest.

He attributed this discrepancy in the results to the fact that the penultimate element of the coda of verbs of Group A does not occur in BP whereas the penultimate element of the coda of verbs of Group B occurs in BP. In the first posttest, Alves observed a strong improvement in the correct production of final clusters in both groups of verbs, which was attributed to the positive effect of instruction. He also fund that besides the strategy of vowel epenthesis production, deletion of the final consonant, as in *missed* [mɪs] was also used. In the second posttest, he observed that the production of epenthesis in final clusters of Group A continued decreasing whereas it had a slight increase in verbs of Group B. The effect of instruction was considered as having a long-lasting effect. A third strategy was also used – deletion of the epenthetic vowel and of the consonant as in *missed* [mɪsɪ] - in the second posttest.

In relation to the production of single codas in the pretest, it is also possible that the results reflected the tendency Brazilian EFL learners have to insert epenthesis in the

production of the past tense, which in the case of verbs that belong to Group C is totally acceptable since it is obligatory in these verbs. In addition, it is necessary to be careful in analyzing Alves's findings for three reasons. First, he does not apply statistical analysis, which in some cases could clarify whether the results should be taken as indicating a slight tendency; second, the study involved a very small number of participants, seven; and third, the number of tokens was also very small – 568 tokens for reading task and 184 tokens for free speech task in three meetings with his participants.

Delatorre conducted two studies on the production of vowel epenthesis in *-ed* past tense endings. In the first study, Delatorre (2004), the participants were six teachers of English. These teachers had their classes audio-recorded and the target words, those with *-ed* past tense endings, were phonetically transcribed by the researcher. The rate of epenthesis in the teachers' productions was 23.55%, which, considering their level of English, might be interpreted as a high rate. However, it could be noted that this result was strongly influenced by the performance of two teachers – Teacher A and Teacher F – whose rates of vowel epenthesis were 62.90% and 33.30%, respectively. Interestingly, Teacher A produced epenthesis in all contexts studied whereas Teacher F produced epenthesis only with the verb *studied*, that had the vowel /i/ as preceding environment. The other four participants did not produce any vowel epenthesis.

In Delatorre (2005) the participants were nine intermediate students (approximately 225 hours of instruction) of English in the Extracurricular Language Program of Universidade Federal de Santa Catarina (UFSC). These participants read ten paragraphs containing *-ed* past tense ending verbs and reported on a car accident event depicted in a sequence of pictures shown by the researcher for some minutes and then put away for the reporting activity. The rates of epenthesis were 85.16% in the reading test and 68.75% in the accident reporting test.

A comparison between the results of the two studies indicates that level of proficiency in the target language plays a role in the production of epenthesis in English codas by Brazilian speakers, as proposed by Koerich (2002) and Baptista (2002), concerning final single consonants, and by Pereira (1994), concerning final *-s* and final *-ed* productions.

In sum, vowel epenthesis insertion was shown to be the most frequent strategy Brazilian EFL learners use to deal with single consonants (Baptista & Silva Filho, 1997; Koerich, 2002; Silveira, 2004; Delatorre, 2004) and clusters in final position (Pereira, 1994; Alves, 2004; Delatorre, 2004, 2005) despite the low rate of epenthesis production after final alveolar stops (Bettoni-Techio, 2005) and final nasals (Kluge 2004) which are frequently affected by palatalization, aspiration, and assimilation and deletion, respectively.

The following section presents the Markedness Differential Hypothesis, reviewing studies that discuss the influence of (a) voicing; (b) consonantal sonority/strength; (c) manner of articulation within the classes of obstruents and sonorants; (d) place of articulation within the class of stops; and (e) cluster length on the production of English final-single consonants and consonant clusters by speakers of different languages, with special attention to studies conducted with Brazilian EFL learners. In addition, the following section also discusses the influence of the preceding phonological environment on the production of English final-single consonants and consonant clusters.

2.3 Universal markedness relations and phonological environment

Markedness relations are considered in this study in terms of the sounds preceding the past tense *-ed* endings. They are analyzed concerning (a) vowels or consonants preceding *-ed*; (b) voicing of the preceding obstruents; (c) manner of articulation of the preceding obstruents and sonorants; (d) consonantal strength/sonority of preceding obstruents and sonorants; (e) place of articulation of the preceding voiced obstruents; and (f) in terms of cluster length. Thus the review of the literature presented in the following subsections aims to cover all these topics.

2.3.1 The Markedness Differential Hypothesis

The strong version of the Contrastive Analysis Hypothesis (CAH) advocated that the differences between an L1 and an L2 are enough to predict the learners' difficulties in acquiring an L2. However, Major and Faudree (1996) mentioned that "transfer cannot explain order of acquisition and why or whether or not the resulting interlanguage systems behave according to the principles of natural languages" (p.69). Furthermore, Eckman (1987b) pointed out that the CAH cannot correctly predict the area of difficulty or the relative degree of difficulty. The author (1977/1987b) proposed the Markedness Differential Hypothesis (MDH), considering that its starting point was the same as that of the CAH: comparing L1 and L2, but with the difference that this comparison should be seen in terms of relative degrees of difficulty. The author expressed the notion of relative degree of difficulty in terms of typological markedness, language universals and implicational relations.

According to typological markedness, “a phenomenon A in one language is more marked than B if the presence of A in a language implies the presence of B, but the presence of B does not imply the presence of A” (Eckman, 1987b, p. 60). In other words, the MDH claims that learners have more difficulty in acquiring foreign language structures which differ from those of the native language and are more marked than those of the native language. Typological markedness is seen by Eckman and Iverson (1994) as “a reliable predictor of difficulty” (p. 255). Eckman also pointed out that the degree of difficulty should correspond to the notion of typological markedness.

However, Baptista (2006, personal communication) pointed out that markedness is not a synonym of difficulty, rather markedness takes into consideration the frequency in which the target structures occur in the languages in question. Furthermore, as Koerich (2006, personal communication) observed, markedness and difficulty are related to such an extent that the more marked structure is in general the more difficult. But Koerich also mentioned that not all difficulties happen in the more marked contexts. Moreover, Major and Faudree (1996) pointed out that in the field of phonology, markedness has been used to explain order of acquisition.

2.3.2 The influence of voicing

In terms of voicing, Greenberg (1978) pointed out that voiced consonants are less frequent than voiceless consonants in the inventory of the world languages and Eckman and Iverson (1994) suggested that voiced obstruents are more marked than voiceless obstruents.

In a longitudinal study on the acquisition of English as an L2, Hansen (2004) investigated the production of final single consonants (C) and final two-member (CC)

and three-member (CCC) clusters by Vietnamese speakers. Hansen's results suggest that, in terms of voicing, voiceless consonants emerge first in their L2 phonologies and are more frequently accurately produced than their voiced counterparts.

A number of studies dealing with markedness in terms of voicing investigated Brazilian speakers' performance in EFL. These studies suggest different and sometimes conflicting results, depending on the target structure – final single consonant, final alveolar stops and preceding contexts for the *-ed* endings.

Baptista and Silva Filho (1997) studied markedness in terms of voicing of single final consonants and compared epenthesis production after pairs of stops (/p, b/, /t, d/, /k, g/), of fricatives (/f, v/, /s, z/) and of affricates /tʃ, dʒ/. Their results demonstrated that there is a clear tendency for the voiced counterparts to be more frequently epenthesized, despite the low rates for all pairs, and the similar rates of epenthesis for the bilabials.

Koerich (2002) compared the production of epenthesis after voiced and voiceless stops (/p, b/, /t, d/, /k, g/), fricatives (/f, v/) and affricates (/tʃ, dʒ/). The differences in the rates of epenthesis production for the voiced/voiceless counterparts were not statistically significant ($p > .05$). In fact, the rates of epenthesis were highly similar. Koerich suggested that these results seem to indicate that L1 interference is stronger than markedness effects in terms of voicing of the target consonant for students at a low level of proficiency in the foreign language. Koerich's results yielded a low rate of epenthesis for both bilabials, in comparison with the alveolars and velars, as found by Baptista and Silva Filho, indicating that place of articulation may overrule the influence of voicing in this specific case.

Silveira (2004) compared the production of vowel epenthesis after the pairs of stops /p, b/and /t, d/ and the fricatives /f, v/ that occur in single word-final consonants and demonstrated that voiced consonants triggered more epenthesis than voiceless consonants, except for the control group, which presented similar rates of epenthesis production after both voiced and voiceless consonants in the posttest only. According to Silveira, these results suggest that voicing has a minor effect in the production of final consonants.

Bettoni-Techio (2005) studied voicing in the production of final alveolar stops and, contrary to the predictions, found that the voiceless counterpart induced more aspiration and palatalization, with a highly significant statistical difference ($p < .05$). However, vowel epenthesis, the third most frequent strategy used by the participants to deal with final /t/ and /d/, was more frequent after the voiced alveolar, as predicted, also with a highly significant statistical difference ($p < .05$). These results suggest that pre-intermediate Brazilian EFL learners tend to mispronounce the voiceless alveolar stop more frequently than the voiced counterpart.

In the first study that takes into account markedness in terms of voicing in obstruents that precede *-ed* endings, Delatorre (2004) found that her six advanced participants produced a higher rate of vowel epenthesis after voiceless obstruents than after voiced obstruents, contradicting the predictions, although the difference was not statistically significant ($p > .05$). Moreover, Delatorre (2005) studied the production of vowel epenthesis after the stop pairs /p, b/ and /k, g/, the fricative pairs /f, v/and /s, z/ and the affricate pair /tʃ, dʒ/ by nine intermediate Brazilian EFL learners and obtained results very similar to those of the previous study – more frequent production of

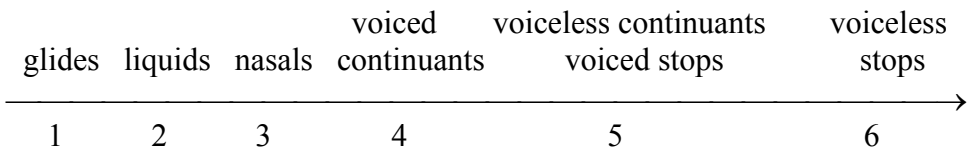
epenthesis after voiceless obstruents than after voiced ones. As in the previous one, the results of this study were not statistically significant ($p > .05$), though.

2.3.3 The influence of consonantal sonority or strength

Markedness relations are studied in terms of sonority as well. According to Eckman and Iverson (1994), in syllable final position obstruents are more marked than sonorants, since there are many languages in which obstruents do not appear in this position, some languages in which just a limited number of obstruents appear, and no language in which only obstruents are allowed.

Hooper's (1976) Hierarchy of Strength attributes values to consonantal sounds corresponding to their degrees of strength, as shown below. Hooper's hierarchy of strength represents the sonority sequence from a backwards point of view. According to this hierarchy, obstruents are the strongest consonants (least sonorous), with strength decreasing from them to glides, which are the weakest (most sonorous) sounds in the sequence. Strength differences are determined in terms of voicing as well: Voiceless stops and continuants are stronger than voiced stops and continuants, respectively. Hooper (1976) further states that "geminate stops are stronger than single stops" (p. 203). Regarding affricates, the author says that there is evidence, at least in some languages, that affricates are stronger than stops. She considers affricates to be the result of the articulation of fricatives and stops in one sound only, and as for stops and continuants the voiceless affricate /tʃ/ is considered stronger (less sonorous) than its voiced counterpart /dʒ/. Consequently, even though affricates were not present in the original hierarchy, they are attributed value 7 in the strength hierarchy. Hooper's hierarchy of strength is presented below.

Hooper's Hierarchy of Strength



(p. 206)

According to Selkirk's (1984) SSG consonants decrease in sonority values from the nucleus to the margin (in the rhyme), which is in conformity with Hooper's (1976) Syllable Structure Condition (SSC), which indicates how consonants can be grouped in codas. Selkirk presents the following hierarchy of sonority indexes for vowels and consonants.

Correspondence between sound and sonority index

Sound	Sonority index
a	10
e, o	9
i, u	8
r	7
l	6
m, n	5
s	4
v, z, ð	3
f, θ	2
b, d, g	1
p, t, k	.5

(Selkirk, 1984, p. 112)

In terms of sonority, Selkirk (1984) states that a minimum sonority difference has to occur between two segments in the rhyme. She complements this statement, pointing out that the difference in sonority between two less sonorous consonants is smaller than the difference between two consonants of high sonority, which varies according to the phonotactics of each language. As to geminates, Selkirk considers geminate sounds, including affricates, as "a single segment" (p. 133).

Considering that, according to Hooper's hierarchy, affricates have strength value of 7 and that stops such as /t, d/ can appear in clusters after affricates, violations to the SSC can occur, as pointed out by Hooper (1976).

2.3.4 The influence of obstruents and sonorants

Eckman and Iverson (1994) studied the production of final obstruents and sonorants by Cantonese, Japanese and Korean speakers. They predicted that the more marked obstruent coda would induce more vowel epenthesis than the less marked sonorant coda. The results confirmed this tendency, despite L1 interference in the production of final /l, r/.

Studies on the production of codas by Brazilian EFL learners have yielded different results in regard to markedness comparing the class of obstruents versus the class of nasals, and within the class of obstruents comparing affricates, fricatives and stops.

In terms of markedness relations between obstruents and nasals, Baptista and Silva Filho (1997) found assimilation/deletion of the nasals and vowel epenthesis after the nasals /m, n, ŋ/ and vowel epenthesis after the obstruents

/p, b, t, d, k, g, f, v, s, z, ʃ,tʃ, dʒ/ and confirmed Eckman and Iverson's (1994) claim that more marked obstruents induce more problems than the less marked nasals, and the evidence of L1 interference also shown in Eckman and Iverson's study.

Following the line of research of Baptista and Silva Filho (1997), Silveira (2004) compared the production of epenthesis between the obstruents /p, b, t, d, k, f, v, dʒ/ and the nasals /m, n/ and found, contrary to Eckman and Iverson's claim, that the less marked and more sonorous final nasals were more frequently modified by vowel epenthesis, suggesting that markedness in terms of sonority was not the most important factor to influence the findings.

Regarding codas formed by the pronunciation of *-ed* endings, following Eckman and Iverson (1994), Delatorre (2004), compared the production of epenthesis after obstruents and sonorants and found that obstruents were more frequently epenthesized than sonorants, with a highly significant statistical difference ($p < .05$) and, consequently, following the predicted tendency that the more marked obstruents induce more vowel epenthesis than the less marked sonorants. Furthermore, Delatorre (2005) studied the comparison of vowel epenthesis production after the obstruents /p, b, k, g, f, v, s, z, ʃ, tʃ, dʒ/ and after the sonorants /m, n, l, r/ and found results conforming to the results of her previous study since the participants produced high epenthesis rates after all obstruents tested and low rates after sonorants, yielding a highly significant statistical difference ($p < .05$).

Analyzing epenthesis production in voiced obstruents /b, g, v, z, dʒ/ and sonorants /m. n, l, r/, Delatorre (2005) found that the results followed the same tendency of the comparison of all obstruents versus sonorants, that is, voiced obstruents

caused more epenthesis production than sonorants, and the difference was also statistically significant ($p < .05$).

2.3.5 The influence of manner of articulation within the classes of obstruents and sonorants

Eckman and Iverson (1994) studied the production of final obstruents and sonorants and suggested that within the class of obstruents, affricates are more marked than fricatives, which are more marked than stops.

Major and Faudree (1996), studying voicing of English initial, medial and final /p, b, t, d, k, g, θ, ð, f, v, s, z, tʃ, dʒ/ by Korean speakers, observed that affricates, fricatives and stops were accurately produced in initial and medial positions, whereas in final position their production was problematic. Including affricates, fricatives and stops produced in text reading and word listing, the authors found that final affricates and fricatives were modified at almost at the same rate, whereas stops were less frequently modified. The authors pointed out that one possible explanation for these results is L1 transfer since stops are acquired before than fricatives and affricates in Korean. Moreover, they also mentioned that obstruents in final position are more marked than obstruents in initial position in natural languages which is followed in interlanguages.

Following Eckman and Iverson's (1994) claim, Baptista and Silva Filho (1997) studied markedness relations within the class of obstruents, comparing vowel epenthesis production after affricates, fricatives and stops by Brazilian EFL learners. The results of their study followed the predicted tendency, with affricates /tʃ, dʒ/ receiving the highest rate of epenthesis and fricatives /f, v, s, z, ʃ/ and stops /p, b, t, d, k, g/ obtaining low

and similar rates of epenthesis. The authors attributed the low rate of epenthesis for fricatives to L1 transfer since /s, z, ʃ/ and also /ʒ/ occur in BP as syllable-final consonants depending on dialect. In addition, the authors also pointed out that the lowest rate of epenthesis production occurred after bilabial stops.

In Koerich (2002), a study following the line of Baptista and Silva Filho's (1997), the differences among the rates of epenthesis for affricates, fricatives and stops were not statistically significant ($p < .05$). However, in this study, the results for stops and fricatives did not follow Eckman and Iverson's (1994) claim that fricatives would induce more epenthesis than stops. On the contrary, they tended to follow Hooper's (1976) hierarchy of strength, as the author mentions, with stops inducing more epenthesis than fricatives.

In Delatorre's (2005) study of final codas formed by the pronunciation of *-ed* endings, the results followed Koerich's results. Affricates induced more epenthesis (100.00%) than stops (96.10%), which induced more epenthesis than fricatives (86.09%). These results are in consonance with Hooper's (1976) strength hierarchy.

Hooper's (1976) and Selkirk's (1984) considerations on consonantal strength and sonority associated with the discussion about markedness within the class of obstruents (Eckman & Iverson, 1994) motivated the investigation of markedness within the class of sonorants. In this line of research, Delatorre (2005) investigated epenthesis production on nasals /m, n/ and liquids /l, r/ preceding *-ed* endings. The results of this study showed that nasals induced statistically significant more epenthesis than liquids within the class of sonorants.

2.3.6 The influence of place of articulation within the class of stops

Yavas (1994), following Eckman's (1987b) MDH, formulated a hypothesis linking markedness and place of articulation. The author considered that the production of devoicing after final consonants increases from the voiced bilabial to the voiced alveolar, and then to the voiced velar. In his 1997 study, the author found that speakers of Chinese, Japanese and Portuguese, languages that do not allow stops in final position, more frequently devoice stops as their place of articulation varies from the front to the back of the mouth. In other words, he found that stops were more frequently modified as their place of articulation varied from bilabial, to alveolar and then to velar.

Hansen's (2004) Vietnamese participants, in a longitudinal study of the acquisition of English syllable codas, produced accurate bilabial /p, b/ and alveolar /t, d/ stops more frequently than velar /k, g/ stops, taken together; however, the author highlights that the voiced bilabial /b/ and the voiced velar /g/ stops were among the most difficult consonants, regardless of coda length, and that the voiceless bilabial stop /p/ emerged before the voiceless alveolar and velar stops /t, k/. The study involved the production of C, CC and CCC, but the author did not specify in which preceding contexts these final stops occurred.

According to Baptista and Silva Filho (1997) and Koerich (2002), Brazilian EFL learners tend to follow the expected tendency since Baptista and Silva Filho found that their mixed group of advanced and beginning Brazilian learners of English produced epenthesis more frequently after the voiced velar /g/, less frequently after the voiced alveolar /d/ and least frequently after the voiced bilabial /b/, and Koerich (2002), investigating the production of final consonants by Brazilian EFL learners found that

her beginning group of participants followed the same tendency of Baptista and Silva Filho's participants, despite the non-statistically significant difference in epenthesis rates found in Koerich's study.

Silveira's (2004) results partially supported Yavas's (1994) claim. Although the results of epenthesis production in the experimental group posttest contradicted it, since bilabial and alveolars yielded similar rates, the results of both the experimental group in the pretest and the control group in the two tests were in agreement with the claim that alveolars would be more difficult than bilabials. Regarding markedness in terms of place of articulation for final codas produced by the pronunciation of *-ed* endings, Delatorre's (2005) participants produced 100% of epenthesis in both the voiced velar stop and the voiced bilabial stop, results which are not consistent with Yavas's (1994) claim that the voiced velar stop induces more epenthesis than the voiced bilabial stop. The author pointed out that possible reasons for this higher rate of epenthesis production are the participants' lack of knowledge of English vowels and consonants demonstrated by the replacement of vowels, such as /ʌ/ by /u/ in *plugged*, for instance, and of consonants, such as /g/ by /dʒ/ in *plugged, jogged*, and *dogged*, by participants. (See Appendix F), as well as unfamiliarity with the words, which could influence the participants to pronounce them based on orthography and L1 knowledge.

2.3.7 The influence of cluster length

In regard to cluster length in initial and final systems, Greenberg (1978) states that "the proportion of possible combinations decreases or remains the same with increasing on length" (p. 249) and that every sequence of length *m* implies the existence of at least one sequence of length *m – 1*, which implies that if there are initial an final

three-member clusters, there are initial and final two-member clusters that contain partial and shorter combinations of the three-member clusters.

The author also states that initial and final systems are distinct systems which contain similar properties, such as length and sonority sequences in violation or not. Comparing initial and final clusters, Eckman (1987a) and Eckman and Iverson (1994) consider that L2 learners have difficulty in dealing with both initial and final clusters in regard to markedness. Single-consonant codas, two-member clusters and three-member clusters present an increase in length, which implies an increasing in markedness. Taking these arguments into account, it seems valid to review the results of epenthesis production on initial and final systems regarding length.

Studies have found different results for the production of epenthesis in relation to cluster length in initial /s/ clusters. Carlisle (1991, 1992, 1994, 1998) observes that, for Spanish L1 speakers, the more marked three-member clusters cause more epenthesis than the less marked two-member clusters. The same tendency was found by Rauber (2002), Cornelian Jr. (2003) and Delatorre (2004) for the production of initial /s/ clusters by Brazilian EFL learners, despite the lack of statistical significance in the results of the last two studies. However, Rebello's (1997) and Silveira's (2002) studies yielded totally different results regarding cluster length on the production of initial /s/ clusters by Brazilians. Rebello found that two-member clusters were more frequently modified by vowel epenthesis than three-member clusters, possibly because participants voiced the /s/ in two-member clusters, forming a more marked /zC/ cluster.

Silveira found that all clusters, independent of cluster length, were modified by vowel epenthesis possibly because of the test applied – translation of sentences in BP into English. The sentences contained words for which the translation resulted in words

with initial /s/-clusters – which possibly induced participants to slow their speech producing pauses before the target words, thus confirming Rebello's claim that a pause as preceding environment for initial /s-clusters induces epenthesis.

Despite these conflicting results of epenthesis production by cluster length in initial /s/ clusters by Brazilians, the results of three of the studies (e.g., Rauber, 2002, Cornelian Jr. 2003; Delatorre, 2004) suggest that three-member /s/ clusters are more frequently modified than two-member /s/ clusters in initial position.

Weinberger (1987), studying the production of English codas formed by single consonant (C), two-member clusters (CC) and three-member clusters (CCC) by four high intermediate Chinese EFL learners, found that there was a clear relationship between markedness and cluster length since his participants produced more vowel epenthesis and deletion in more marked three-member clusters followed by less marked two-member clusters and then in least marked single final consonants. Interestingly, in a free speech test, Weinberger's participants did not produce any three-member clusters possibly because they avoided producing more complex and more difficult codas, but they followed the expected tendency and produced more error in two-member clusters than in single final codas.

Considering the production of C, CC and CCC codas, Hansen (2004) found that the single codas were more frequently accurately produced than the CC codas which were more accurately produced than the CCC codas. Hansen's findings also demonstrated that C codas were more frequently modified by epenthesis production (when they were not accurately produced), whereas CC and CCC codas were modified by the absence of the last member of the coda, which in the cases of plural of nouns, third person singular and past tense implies the absence of the sound marking each of these forms. The author also observes that the more complex CC and CCC codas only

emerged in the participants' L2 phonologies when the C codas had already been established, especially in more complex codas constituted of a combination of simple codas.

In regard to production of final clusters by Brazilians, Delatorre (2004) compares the production of single consonant codas and clusters formed with the addition of the *-ed* ending to the consonant in the base form of the verb, and found that final clusters were more frequently modified by vowel epenthesis than single final codas, and the results were statistically significant ($p < .05$). Taking into account only the production of final clusters formed by the *-ed* ending, Delatorre (2005) observes that three-member clusters were more frequently modified by vowel epenthesis than two-member clusters, and the results were also statistically significant ($p < .05$).

2.3.8 The influence of the preceding phonological environment

The interaction between markedness and phonological environment will be studied in this research. Phonological environment or context was defined by Koerich (2002) as the "the frame in which the sound occurs" (p. 67). Phonological environment can influence phonological processes such as the production of epenthesis, in different languages. In fact, studies have demonstrated that phonological environment plays an important role in the production of epenthesis in both onset and coda.

Concerning the influence of phonological environment on the production of initial /s/ clusters, studies have shown conflicting results. Carlisle (1991, 1992, 1994), studying Spanish speakers learning English, found that they produced more epenthesis when the preceding context was a consonant, whereas Rebello (1997), Rauber (2002) and Cornelian Jr. (2003), dealing with BP speakers learning English, found that vowels

caused more epenthesis than consonants. The null environment (silence) induced conflicting results since it caused the highest rates of epenthesis in Rebello's study and the smallest rates in Rauber's study. Cornelian Jr. did not study the influence of silence.

In regard to the influence of the preceding environment in the production of codas, Bettoni-Techio (2005) mentions that it has been difficult to establish a hypothesis about the influence of preceding environment on coda production due to the lack sufficient data available. In this sense, three of the studies described in this section take into account only vowels as the preceding context, and two of them involve the production of final consonants by Brazilians whereas the other deals with coda production by Vietnamese speakers. Moreover, only Delatorre (2004, 2005) takes into account the influence of the preceding consonantal and vocalic contexts on the production of codas.

Hansen (2004), investigating the production of English L2 codas by two Vietnamese speakers found the environment to be a variable influencing coda production. In terms of the preceding environment, it was found that the diphthongs and the back vowel /ɔ/ disfavored accurate production. This was attributed to L1 transfer since Vietnamese does not allow consonants after diphthongs in syllable-final position. Moreover, the English vowels /i, eɪ, ɔ/ and the diphthongs /aɪ, aʊ/ were probably taken as Vietnamese vowels, inducing absence and epenthesis in open syllables before a pause since the Vietnamese vowels are shorter than the English vowels and occur in closed syllables.

Kluge (2004), investigating the production of syllable-final nasals, observed that the phonological environment played an important role in the production of the nasals /m, n/ in coda position in both monosyllabic and disyllabic words. Her results

showed that the previous vowel which caused the most vowel nasalization and nasal consonant deletion among /æ, i, ɪ, ʌ/ was /ʌ/. The difference between /ʌ/ and /æ, i/ was statistically significant ($p < .05$).

Bettoni-Techio (2005) investigated the influence of the preceding and following phonological environments in the production of English final alveolar stops. In regards to the influence of the preceding environment, she found that /ɪ, aɪ, oʊ/ caused more palatalization than other vowels, whereas the vowels /i, oʊ, ɛ, ɑ, ɔ, ʌ/ caused more aspiration and the vowel /i/ caused more epenthesis.

Considering codas formed with the addition of the *-ed* ending, Delatorre (2004, 2005) studied the influence of the preceding vowel and consonant and found conflicting results. In the first study she found that vowels, as preceding phonological environment, caused more epenthesis than consonants and the difference was statistically significant. However, this unexpected result can be explained by individual differences. One of the participants produced epenthesis only after vowels, another produced high rates of epenthesis in both environments and the other four did not produce epenthesis at all. On the other hand, contrary to the results of Delatorre's (2004) study, Delatorre (2005) found that the consonantal environment had statistically significant higher rates of vowel epenthesis.

This section discussed the possible influences of markedness and phonological environment on the production of codas by Brazilian EFL learners taking into account (a) consonantal/vocalic environments, (b) voicing of the obstruents, (c) sonority of consonants, (d) manner of articulation within the classes of obstruents and sonorants; (e) place of articulation within the class of stops that precedes the *-ed* endings and (f) the influence of cluster length in which the *-ed* endings are inserted.

The following section will discuss the possible influence of orthography on the production of English single final consonant codas and codas formed with the addition of *-ed* endings by Brazilian EFL learners.

2.4 Orthography and task

Besides the influence of markedness and phonological environment, this study also investigates the influence of other variables that are thought to affect the production of English words ending in *-ed*, namely, the variables of orthography and task.

2.4.1 The influence of orthography

In the interactive view of language processing, the orthographic, phonological, syntactic and semantic information co-activate and affect one another (e.g., Van Orden & Goldinger, 1994; Van Orden, Pennington, & Stone, 1990). Dijkstra, Timmermans, and Schriefers (2000) say that in multilingual individuals, this interactive process might happen even between languages.

The relationship between orthography and phonology in language processing has been studied mainly in the area of L1 acquisition, where authors investigate the influence of orthographic cues, that is, spelling of words, on lexical and rhyme judgments (e.g., Ventura, Morais, Pattamadilok, & Kolinsky, 2004; Ziegler, Ferrand, & Montant, 2004).

Ellis (2002) states that there is a consistent relationship among orthography, reading aloud and recognition of sounds. He claims that words with letter-sound correspondence induce to fewer errors than words in which orthography and sound are

discrepant. He also points out that words that have similar spelling and pronunciation in the rhyme induce to fewer pronunciation mistakes and that words with spelling-sound correspondence are acquired before those words in which spelling and sound do not correspond.

Alario, Perre, Castel, and Ziegler (2006) say that the investigation of the influence of orthography on speech has long been dealt with in terms of auditory input in perception tasks; however, investigations of this influence on production have not only have been scarce, but have also provided controversial results (see a review of perception and production studies in Damian & Bowers, 2003). Two studies cited by the authors as leading to contrasting results are Damian and Bowers (2003) and Roelofs (in press). As reviewed by Alario et al, these studies investigated the production of words in three tasks – a word association-generation task, where participants had to generate words from associates, a picture naming task, and a reading task, and the only coinciding result was for the effect of orthography on the task involving reading.

Second language studies dealing with the influence of orthography on speech are even scarcer than L1 studies. One fact in favor of such investigations is that they can provide very interesting data since the relationship between speech and writing varies among languages. For example, it can be easily observed that this relationship is not so clear in English or in French as it is in Spanish, Brazilian Portuguese and Persian. Studies involving participants whose L1 and L2 differ in their spelling-sound correspondence might give valuable insights into the question of the interaction between the two modes.

Four studies investigating this relationship are Derwing and Dow (1987), Gholamain and Geva (1999) Wade-Woolley (1999), and Lessa (1985). Derwing and Dow point out that the orthographic knowledge of at least one language that literate

speakers have acquired can interfere or confound the pronunciation of untrained learners, even in their own language. Wade-Woolley corroborates their claim, commenting that the notion of L1 orthography can interfere with the way learners deal with L2 orthography.

Gholamain and Geva, studying child English L1 speakers learning Persian as an L2 in Canada (the authors used the term L2 for Persian learned in Canada), consider that graphic information is converted into phonological information. In the case of the reading process, they suggest that it is influenced by autonomous subsystems, such as phonology, orthography, word recognition, syntax, and semantics, and that phonological processing skills are a prerequisite for the development of efficient word recognition, and for understanding spoken L1 and L2. In addition, the authors point out that one possible cause for children and adults' reading problems is the inefficient conversion of orthographic information into phonological representation in both L1 and L2. Regarding their study, Gholamain and Geva found that children who had learned all letters of the Persian alphabet and the letter-sound correspondence were able to read unfamiliar words almost as accurately as familiar words, regardless of length. They concluded that the regularity of Persian orthography facilitates the acquisition of reading skills in Persian as an L2.

Wade-Woolley (1999) studied Japanese and Russian L1 speakers learning English as an L2 in Canada and Israel, respectively. She mentioned that poor readers rely on the orthographic system more frequently than on the phonological system. She found that her participants' behavior was according to L1. Japanese participants relied more on orthographic information whereas Russians relied more on phonological information. This difference is possibly explained due to difference in their L1s since, as Wade-Woolley pointed out, Russian is closer to English than Japanese and "L2

learners tend to process L2 syllable and structures according to their L1 knowledge" (p. 452).

Lessa (1985) considers that the lack of correspondence between speech/sound and writing/letter in English works as a barrier for Brazilian foreign language learners. She conducted a study in which orthography was considered a factor of interference in the acquisition of English by Brazilians. The author applied three tests in which her participants read familiar words (Test A) and unfamiliar words (Test B), and translated words from BP into English (Test C). There were 82 words in tests A and B (30 words to test the production of consonants and 52 to test the production of vowels), and 17 words in Test C (3 words for the production of consonants and 14 for the production of vowels). The greater number of vocalic targets was due to the fact that the author considered vowels to be more problematic than consonants for Brazilian EFL learners.

The results lead to the conclusion that there was a strong relationship between sound and spelling. The sound-spelling correspondence was used as a strategy to deal both with unfamiliar and familiar words, for which the correspondence between sequences of sounds and sequences of letters had not been acquired until the collection of the data. The author observes that the participants' performance suggested that they accessed the mental representation of the visual form of the words, and not its auditory form. Based on Lado (1974) and Thoris (1970), she comments that the difficulty of L2 learners to perceive the sounds of the language, as well as the difficulty to produce them is specially caused by adults' internalization of the L1 system, so that the internal representation governing speech is that of the L1 sound-spelling correspondence.

It must be commented here that Flege's (1995) Speech Learning Model (SLM), one of the most influential speech perception and production models of the present

times, is based on this idea. Long experience in the L1 (by adults) is considered as the factor hindering L2 performance at native-like level.

In regard to the results of her study, Lessa (1985) says that advanced learners demonstrated less reliance on spelling, whereas beginning students tended to do the opposite combining the sound system of the L1 with the written forms of the L2. The author believes that the fact that both languages use the same alphabet causes a negative interference on pronunciation since the relationship between written and oral forms in BP and English is different, and errors possibly reflect L1 interference on the pronunciation of the L2.

Concerning the influence of orthography on the production of final consonants by Brazilians, Koerich (2002) speculated that the orthographic representation of the CVCe and CVC target words used in Baptista and Silva Filho's (1997) study might have influenced the production of vowel epenthesis after final single consonants. Koerich (2002) observed that target words with 'se' and 'ze' spellings found in sequences such as, 'voice became' and 'haze got', had high rates of epenthesis (42.00% and 89.00%, respectively), whereas the target words with 's' and 'z' spellings found in sequences such as, 'dress became' and 'Liz got', had low rates of epenthesis (6.20% and 16.70%, respectively). In relation to target words ending in 'm, me' and 'n, ne', Koerich comments that target words ending in 'me' and 'ne' would be more frequently epenthesized by Brazilians learning English than target words ending in 'm' and 'n' because the latter tend to have the final nasals /m, n/ deleted and the nasality assimilated by the preceding vowel, as occurs in BP.

Furthermore, Silveira (2004), taking into account Koerich's observation about Baptista and Silva Filho's study, tested the production of vowel epenthesis in target words ending with consonants /p, b, t, d, k, f/ and target words that end

orthographically corresponding in the graphic consonants followed by ‘e’ and demonstrated that orthography played an important role in the frequency of epenthesis production after final single consonants because both experimental and control groups produced high rate of epenthesis in words that contained ‘e’.

In relation to the influence of orthography on the production of medial vowel epenthesis in codas formed with the addition of *-ed* endings, the results of Pereira (1994), Alves (2004) and of Delatorre (2005) suggest that Brazilian EFL learners tend to rely on orthography or spelling to produce these codas.

Pereira (1994) pointed out that orthography had a strong effect on the production of English *-ed* endings by her Brazilian beginning students. She demonstrated that the written system influenced the production of *-ed* endings on verbs in the simple past tense since her participants produced the *-ed* ending as [ed] in pseudo-verbs, such as *ricked* and *spowed*, which had consonantal and vocalic contexts, respectively, but are not real words.

In Alves’s (2004) study, as in Pereira’s study, orthography was shown to have a strong influence on the way Brazilian EFL learners produced the *-ed* endings. The author believed that his participants were highly influenced by the mental representation of the written forms of the verbs, determining the insertion of a vowel between the final two consonants. In regard to verbs of Group A (see section 2.2), such as *stopped, lived* and *watched,* the author concludes that orthography influenced his participants to produce these verbs with vowel epenthesis probably influenced by the mental representations of the written forms. Nevertheless, the author believed that instruction helped them to diminish reliance on orthography since the production of medial vowel epenthesis on verbs with final clusters that belong to Group A was reduced.

In the case of verbs of Group B, such as *called* and *remembered*, Alves highlighted that his participants were more able to accurately produce the final clusters in these verbs from the pretest to the second posttest. Considering verbs of Group C, such as *wanted* and *needed*, the author found that they were accurately produced even before the period of instruction. He believed that this production seemed to indicate that the mental representations induced the participants to produce single codas.

To test the influence of orthography on codas formed by the addition of *-ed* endings, Delatorre's (2005) participants read paragraphs that contained English words ending in *-ed* and *contrastive words* ending in codas composed of the phonemes of those in the *-ed* ending words, but with different spelling. For example, the verb 'passed' was contrasted to 'last' (see Chapter 1 the definition of *contrastive words* and Appendix G to check all *contrastive words* used). Comparing the results of the pronunciation of words ending in *-ed* and *contrastive words*, Delatorre (2005) found that her participants produced a high rate (84.83%) of medial vowel epenthesis in the former and a very low rate (0.23%) in the latter, thus yielding a statistically significant difference ($p < .05$). These results indicated that participants relied on the orthography and on L1 phonological knowledge since they tended to read the *-ed* as [ed], producing the epenthetic vowel.

2.4.2 The influence of task

Carlisle (1994) mentions that a frequent discussion in interphonology studies focuses on the influence of the data collection task on the results obtained. Based on different studies, he comments that tasks that allow participants to rely more on the form of speech tend to induce a higher frequency of target-like productions than tasks in

which participants pay attention to the content. In a summary of frequently cited studies (e.g. Beebe, 1980; L. Dickerson, 1975; L. Dickerson & J. Dickerson, 1977; Major, 1987; Sato, 1985; Tarone, 1988; Weinberger, 1987), the author presents a decreasing sequence of frequency of target-like productions in three tasks according to the level of formality, in which "the highest frequency of the target variant occurred in the reading of word lists, the next highest in the reading of texts, and the least frequent in free speaking" (p. 224). Carlisle concludes that, being more natural tasks, reading a text and free speech are more appropriate to assess learners' real pronunciation than reading word lists.

Beebe (1988), Sharwood-Smith (1994), and Towell and Hawkins (1994) discuss results obtained through different data collection tasks in relation to the degree of attention involved in each task. Beebe states that L1 transfer induces more errors in conversation, when speakers are not so concerned with language form, as with the content. She adds that this behavior is a natural characteristic of human language since it occurs with native and non-native speakers; however, it is more salient in L2 speech because the shift is between a native and non-native variant. Based on their studies and on studies conducted by Tarone (1988), L. Dickerson (1974, 1975), W. Dickerson (1976) and Dickerson and Dickerson (1977), Beebe, Sharwood-Smith and Towell and Hawkins consider that in more formal tasks such as reading, learners pay more attention to form, and produce more target-like language, whereas in less formal tasks, such as telling stories based on pictures or retelling stories based on previous listenings, learners tend to focus on the attempt to convey meaning using a more spontaneous, and less focused-on-form type of speech, producing more mistakes.

In general, the literature treats the issue of level of formality of the tasks in terms of the relation put by the authors above; that is, degree of formality is related to the

amount of attention to language form involved in the task. Thus, word-list reading is considered to be more formal than sentence reading, which is considered to be more formal than text reading. The more attention is devoted to the content, in contrast with attention to the linguistic form, the less formal the task.

Analyzing different studies comparing reading and speaking, in which the results followed this direction, Major (1994b) mentions that, provided there is no other factor influencing the results, more formal task styles induce more target-like productions than the less formal styles. He comments that, observing their students' oral performance, teachers notice that students tend to produce more target-like productions in word-list reading compared to conversation.

Another study presenting results in this direction is Hansen (2004). The author studied the production of English C, CC and CCC codas by two Vietnamese ESL learners in three data collection sessions during a year. In each session, participants were interviewed and read a list of words. The author found that the percentage of accurate productions was higher in word-list reading than in spontaneous speech (interview). For example, Hansen mentions that some CC and CCC clusters had 100% of accurate productions in a word-list reading task and 0% of accurate productions in a free speaking task. However, the author observed that both participants produced the same types of clusters (nasal + obstruents) as time passed, regardless of length and that similar codas emerged in both tasks at the same time, but with a difference in the accuracy of the production, as mentioned above. Beebe (1987a, b) collected data with adult Asian speaking learners of English as an L2 and found that her participants produced more target-like tokens of initial /r/ in free conversation (48.00%) than in word-listing (9.00%), contrary to the predictions, which were posited in terms of the direction put above. She attributed these unexpected results to L1 interference, since in

the informants' L1 the trill, the substitution made most frequently, is the variant used in formal speech. Beebe explains this type of L1 interference as "transferring of stylistic variation". As Major (1994b) observes, the use of prestige forms in more formal tasks can be attributed to individuals highly monitoring their speech. In the case of the Thai speakers, monitoring led them to use the prestige form, but that of the L1.

Another study contradicting the proposed direction of difficulty was Major and Faudree (1996). Studying the production of English initial, final and medial voiced and voiceless obstruents by five beginning Korean ESL learners in text reading and word listing, the authors found that initial and medial obstruents were correctly produced in both tasks; however, the production of final obstruents varied, resulting in 68% of target-like variants in text reading and 38% in word-list reading. The authors pointed out that these results were possibly influenced by the following context – which was constant (pause) in the word listing task and varied in the text reading task– since the following environment possibly induced resyllabification, linking the codas with the onset of the following word in the text reading task, and thus increasing the accuracy in this type of task. On the other hand, this process of resyllabification did not occur in the word listing task because the following environment was a pause. Another possible reason that Major and Faudree pointed out as responsible for the increasing accuracy in the text reading task was voicing of the target in the cases in which the target voiced consonant was preceded and followed by voiced consonants. The authors considered that participants possibly used a characteristic process of voicing assimilation found in the participants' L1 – Korean – to deal with the voiced target consonant in a reading text task.

In Weinberger (1987) the results indicated that task did not have an influence on the overall rates of vowel epenthesis and deletion, since there was not an important

variation among the three tasks. The author investigated the production of C, CC, and CCC final codas by Mandarin speakers with a high-intermediate level of English. The informants performed three different tasks: word-list reading, text reading and free speech.

Data from Brazilian EFL learners using different types of tasks was collected by Major (1986, 1987, 1994b, 1996, 1999), Koerich (2002), Alves (2004) and Delatorre (2005). In Major (1986) participants read a word list, a sentence list and a text to investigate word-final vowel epenthesis production. The results showed that the frequency of epenthesis increased from word to text reading, which Major attributes that to degrees of attention to speech. Major (1987, 1992, 1994b, 1996) made predictions with reference to his Ontogeny Model (OM) of L2 phonological acquisition, in which he proposes that as style becomes more formal transfer decreases, whereas developmental errors increase and then decrease. Taken together, the results of these four studies showed that the frequency of target-like productions decreased as the task became less formal, as in the 1986 study.

> The results of Major (1999) showed the opposite direction. The study investigated adult Brazilian EFL learners producing initial and final clusters, and found that there were significantly more target-like productions in text reading than in word-list reading, contrary to the predictions that the more formal task would induce more target-like productions. However, Major pointed out that the difference in formality between text reading and word-list reading was possibly not enough to induce large differences. The author suggested that a greater difference could be possibly obtained by comparing word-list reading and free speech conversation.

Koerich (2002) collected data through a sentence reading task and a directed speech task divided into two parts. In the first part, participants talked about themselves

using a list of questions to guide their speech, and in the second part, they were asked to re-tell a story with the aid of pictures after listening to it. The rates of epenthesis in word-final consonants in the reading and in the directed speech task correlated significantly ($p < .05$), showing lack of task effect. Considering individual differences, Koerich comments that participants who produced most vowel epenthesis in one task were those who produced most epenthesis in the other task, as well, which confirms the lack of influence of the task *per se*.

Alves (2004) and Delatorre (2005) investigated the production of codas formed by the pronunciation of *-ed* endings. As reviewed in Section 2.2 in Alves's study, data were collected through reading and free speaking activities in three tests: a pretest in the beginning of the semester, a month before the instruction session; a first posttest in the middle of the semester right after the instruction session, and a second posttest at the end of the semester, two months after the first, to check whether instruction had a long lasting effect.

Regarding the production of final clusters and single codas, Alves (2004) did not find homogenous results in terms of the influence of task-type. Concerning the production of final clusters (verbs of Groups A and B) Alves's results demonstrated that target-like production was higher in free speech (24.00%) than in text reading (16.66%) in the pretest. However, the results of both posttests showed the opposite tendency compared to the pretest with progressively higher target-like productions in text reading (56.87% in the first posttest and 61.14% in the second posttest) than in free speech (50.90 % in the first posttest and 51.28% in the second posttest). Despite this difference in task-type effects from the pretest to the posttests, Alves's results showed that target-like productions of final clusters increased in both tasks from the pretest to the first-posttest, and then to the second posttest.

An analysis of the verbs of Groups A and B independently showed that the number of target-like productions increased from the pretest to the first posttest, however, whereas for Group A the rates kept increasing to the second posttest, for Group B verbs, the rates decreased, regardless of task-type.

In terms of the production of final-single codas (verbs of Group C), Alves found that the rates of target-like productions decreased from the pretest to the first and then the second posttest, regardless of task type. Overall Alves's results showed that instruction had a strong effect on verbs with final clusters that belonged to Group A. Despite the results described above, Alves mentioned that the difference he found between the productions in the text reading task and in the sentence reading task was small (less than 10.00%), allowing him to lump together the data he collected through these two tasks in one set. Concerning the free speech task, Alves mentioned that he had difficulty in collecting data in this mode, despite meeting with the participants a number of times, since they constantly produced verbs using the 'ing' form or in the present tense.

Delatorre (2005) collected data for the study of epenthesis in codas formed by the *-ed* through a text reading task and a free speech task. Delatorre's participants produced 85.16% of epenthesis in the text reading task and 68.75% in the free speech task, and the difference was statistically significant ($p < .05$), contradicting the predictions that more formal styles induce less error than less formal styles.

This section described studies concerning the influence of orthography and task-type on the production of English words by learners from different L1s and on the production of Persian words by English L1 speakers. Special attention was given to the influence of sound-spelling correspondence and task-type on the production of final-

single consonants and final codas formed with the pronunciation of *-ed* endings by Brazilian EFL learners.

CHAPTER 3

METHOD

The production of medial vowel epenthesis in English monosyllabic words ending in codas formed by the addition of *-ed* was investigated according to the influence of the variables of markedness and phonological environment in interaction, the influence of orthography, and the influence of the type of task used in the data collection.. Nine hypotheses were investigated concerning these variables.

3.1 Hypotheses

The first hypothesis, based on Hooper's (1976) consonantal strength hierarchy, on Selkirk's (1984) SSG, and on Eckman's (1987b) MDH predicted that consonants preceding the *-ed* would cause more epenthesis than vowels. The second hypothesis, based on Greenberg's (1978) study and on Eckman's (1987b) MDH, predicted that voiced obstruents would induce more vowel epenthesis than voiceless obstruents. Hooper (1976), Selkirk (1984), Greenberg (1978) and Eckman (1987b) substantiated the third hypothesis, that obstruents would induce more epenthesis than sonorants. The fourth hypothesis, that affricates would induce more vowel epenthesis than fricatives, which would induce more epenthesis than stops, was based on Eckman and Iverson (1994). The fifth hypothesis, based on Hooper (1976), Selkirk (1984), Greenberg (1978) and Eckman (1987b), predicted that nasals would induce more epenthesis than liquids. The sixth hypothesis, based on Yavas (1994, 1997) and on Eckman (1987b), made predictions concerning the influence of place of articulation, proposing that there would

be more epenthesis production after the voiced velar stop than after the voiced bilabial stop. Hypothesis seven, based on Carlisle (1991, 1992, 1994, 1998); Rauber (2002); Cornelian Jr. (2003) and Greenberg's (1978), predicted that three-member clusters would be more frequently modified than two-member clusters. Studies conducted in Brazil by Lessa (1985), Pereira (1994), Alves (2004), and Delatorre (2005) set the field for hypothesis eight, which predicted that an influence of orthography would be identified on the production of English words ending in *-ed* by Brazilians. The last hypothesis, predicating that the type of task employed in the data collection process would have an influence on epenthesis production, was based on Carlisle (1994); Major (1986, 1987, 1994b) and Weinberger (1987).

3.2 Participants

The participants of this research were twenty-six upper-intermediate level Brazilian EFL learners. These students were at level six of the Extracurricular Course at UFSC, which means that they had had 270 hours of instruction previous to the data collection session. This level of proficiency in the foreign language was chosen because a previous study conducted by the researcher (Delatorre, 2004) demonstrated that advanced level learners produced little or even no epenthesis in *-ed* ending words. On the other hand, less proficient BP learners of English tend to produce epenthesis in this context, as it has been personally observed by the researcher in her long experience as an EFL student, and indicated by Baptista (2001) as one of the aspects of the AE system which are most difficult to BP learners.

Participants were 15 female and 11 male. Participants' ages ranged from 15 to 68 at the moment the data were collected and the age they started studying English

ranged from 7 to 34. Many of the participants had started studying at a young age but had stopped for some time, whereas others started late but never stopped. Participants 1, 3, 9, 10 and 14 had lived in an English speaking country. Despite these individual differences in the participants' profiles, they were considered to be a homogeneous group because their pronunciation was very similar regarding both vowel epenthesis and other changes in the clusters, as well as the substitution of *-ed* ending words by other words (see Chapter 4 for detailed information about these changes as well as Appendix M with detailed information about the participants' profile).

3.3 Material

This section describes the materials used to collect the data, which include two production tasks – paragraph reading and free speech – and one participants' profile questionnaire.

3.3.1 Paragraph reading task

The preparation of the material for the paragraph reading task involved two steps. The first step was the preparation of two lists of words, one containing monosyllabic regular verbs in the past or past participle and adjectives, and a second one containing the *contrastive words* in which the pronunciation of the codas is the same as those in words ending in *-ed* (see Chapter 1 for the definition of *contrastive words*). Only monosyllabic words were used in this study to avoid interference of stress placement or shifting (see the lists of words ending in *-ed* and *contrastive* words

presented on Tables 3.1 and 3.2, respectively, in this section to check the words used in the study, and Appendix L to see the whole list of words).

For the monosyllabic English words ending in *-ed*, the phonological contexts analyzed were /p, b, k, g, f, v, s, z, ʃ, tʃ, dʒ, m, n, l, r, eɪ, oʊ, aɪ/, which occur before the past markers /t/ or /d/. Other phonological contexts were not analyzed due to syllable constraints (see section 2.1.2 for more details about the AE syllable).

According to this selection, the three-member clusters investigated were /spt, skt, mpt, ŋkt, lpt, rkt, lft, rft, lvd, rvd, kst, nst, rtʃt, ndʒd, lmd, rnd/, whereas the two-member clusters were /pt, bd, kt, gd, ft, vd, st, zd, ʃt, tʃt, dʒd, md, nd, ld, rd/, and the vowel/diphthong plus /d/ coda were /eɪ, oʊ, aɪ/, as shown in the following list displayed on Table 3.1.

Table 3.1

List of words ending in *-ed* used in the study grouped according to coda constituency

Two-member clusters		Three-member clusters		Vowel/diphthong + /d/	
/pt/	stopped, mapped, hoped, skipped	/spt/	grasped	/eɪd/	played, prayed, stayed
/bd/	robbed, grabbed	/skt/	asked, risked	/oʊd/	rowed, snowed, slowed
/kt/	walked, talked, liked, looked like, checked	/mpt/	jumped, camped	/aɪd/	cried, tried, died
/gd/	jogged, dogged, plugged	/ŋkt/	linked, ranked		
/ft/	laughed, coughed, miffed, loafed	/lpt/	helped		
/vd/	saved, lived, moved	/rkt/	worked, parked		
/st/	missed, passed, kissed, crossed	/lft/	golfed		
/zd/	closed, used, caused, raised	/rft/	surfed		
/ʃt/	washed, brushed, wished	/lvd/	solved		
/tʃt/	touched, watched, reached	/rvd/	served		
/dʒd/	judged	/kst/	mixed, fixed		
/md/	climbed, bombed, claimed, screamed	/nst/	danced		
/nd/	trained, planned, phoned	/rtʃt/	searched		
/ld/	killed, called, filed, mailed	/ndʒd/	changed, ranged		
/rd/	cheered, scared, shared, stored	/lmd/	filmed		
		/rnd/	turned, learned		

However, as pointed out by Baptista (2001), final clusters as [skt], found in verbs such as *asked* and *risked,* tend to be frequently reduced to [st] by native speakers of English. Since the participants of this study are EFL learners who do not generally know that the cluster reduction mentioned by Baptista (2001) are produced by native

speakers of English, the production of final cluster [skt] – without the cluster reduction – was considered correct pronunciation of the cluster.

The second step in the design of the material for the reading task was the writing of paragraphs containing the target words. The topics of the paragraphs were recent events, such as the 2004 Olympic Games and the September 11th tragedy, or stories involving unreal characters (see Appendix A).

Owing to the need to obtain a substantial number of tokens, that is, production of *-ed* endings in different phonological contexts, it was not possible to use texts from textbooks. Ten short paragraphs were written by the researcher with the help of two professors of English at UFSC.

Each phonological context appeared at least three times in different monosyllabic words in the ten paragraphs. The exceptions were /b/, that occurred only twice, in the verbs *robbed* and *grabbed*, and the words *stopped* that appeared three times, and *used*, *passed, called*, *worked*, *played*, and *prayed* that appeared twice.

Altogether, the reading task comprised 83 monosyllabic words ending in *-ed*, which with the repetition of some words, as explained above, provided the opportunity for the production of 91 *-ed* tokens. Eighty tokens had a consonantal context (56 in two-member clusters and 24 in three-member clusters), and 11 tokens had a vocalic context followed by /d/. Altogether, the twenty-six participants were expected to produce 2,080 tokens with consonantal contexts and 286 tokens with vocalic contexts, totaling 2,366 pronunciations of *-ed* ending words.

In the case of *contrastive words*, it was not possible to find clusters in the written form that corresponded to all clusters found in the pronunciation of English monosyllabic words ending in *-ed*. For example, the orthographic clusters *bd*, *gd*, *vd*, *zd*,

and *md* do not appear in English words (http://www.allwords.com). Consequently, the final two-member and three-member clusters found in *contrastive words* used in this research to compare with the final clusters in English monosyllabic words ending in *-ed* were /pt, kt, ft, st, nd, ld, rd/ and /kst/, respectively, and the vowel + /d/ was /eɪd/. The following list shows the *contrastive words* and the transcriptions of the codas.

Table 3.2

List of *contrastive words* grouped according to final clusters and the final single coda /d/

Final clusters		Vowel + /d/	
/pt/	slept	/eɪd/	made
/kt/	act, fact		
/ft/	left, lift		
/st/	best, fast, last, most, just		
/nd/	end, hand, spend, friend, find, found, sound		
/ld/	child, told, gold, old		
/rd/	hard, third, heard		
/kst/	next, text		

The clusters and the rhyme appeared in three different monosyllabic words. The exceptions were the cluster /pt/, that occurred only once in *slept*, the cluster /kt/, that occurred three times, one in *fact* and, repeating one of the words, as in *act*, the cluster /kst/, that occurred only twice in two different words, once in each of the words *text* and *next*, and the rhyme /eɪd/, that occurred twice, repeating the word *made*.

Each participant read and recorded 34 tokens of final clusters (32 final two-member clusters and 2 final three-member clusters) and 2 tokens of vowel/diphthong followed by the singleton consonant /d/. Altogether, participants had the opportunity to

produce 884 tokens of final clusters and 52 tokens of vowel + /d/, totaling 936 tokens of *contrastive words*. Summing up the English words ending in *-ed* and the *contrastive words*, each participant recorded 127 tokens in the reading task and the twenty-six participants were expected to produce a total of 3,302 tokens.

3.3.2 Free speech task

The main objective of this task was to gather data to be compared with the data collected in the text reading task in order to investigate task effects. Four pictures were selected and adapted for the task. The pictures used in this activity were taken from EFL textbooks, and depicted sequences of events that would elicit the use of verbs in the past tense in general (Appendix B). Only the monosyllabic regular verbs were analyzed in the study. Simulations of the possibilities of reports, and the pilot study showed that ten monosyllabic regular past tense verbs could be produced by each participant. The verbs expected to appear in the participants' reports of each picture are showed in the following list displayed on Table 3.3.

Table 3.3

List of regular verbs expected to be elicited by the pictures

Picture	Verb
One	talked, played
Two	played
Three	asked, stopped, called/phoned, saved
Four	cooked, called/phoned, watched

The four pictures were organized for presentation in a sequence of increasing difficulty in terms of number and variety of verbs that could be elicited, according to the simulations and the pilot study.

3.3.3 Participants' profile questionnaire

Although all the participants were from the same level in the English course, the upper-intermediate level, an additional measure to assure homogeneity in terms of oral performance as much as possible was taken by giving them a questionnaire aimed at checking their background in English. The questionnaire was written in Portuguese to avoid misunderstanding of words and/or questions (Appendix C).

3.3.4 Pilot study

The paragraphs used in the reading task, and Picture 3 used in the free speech task were previously tested in a pilot of this study (Delatorre, 2005). The participants of the pilot were from the intermediate level – level five – of the same English course of the participants of the present study, but one level below them. The pilot study demonstrated that paragraph reading was an appropriate task to collect data on the production of medial vowel epenthesis in English words ending in *-ed* and *contrastive words*, since the results showed that participants did not pay much attention to their production of these target words. Their concern with words involving 'th', for example, was evident, since many of them were repeated or overemphasized. As to the words ending in *-ed*, they were produced in a normal flow of speech, and never repeated.

Furthermore, the pilot study also demonstrated that the phonological contexts following the *-ed* ending words should be taken into account. For example, in a sequence such as "liked to practice" the following /t/ affects the production of the *-ed* ending form. Such problematic sequences were modified to "liked practicing" to be used in the collection of the data for the thesis, avoiding such interference in the present study.

The results of the free speech task called attention to the fact that the number of pertinent tokens would be very limited. So, it was decided that more pictures would be used in the experiment.

All other aspects of the material design of the pilot were considered appropriate and were, consequently, replicated in the present study.

3.4 Procedures

The data were collected in the first semester of 2005, in the Language Laboratory of UFSC using cassette tape recorders (Sony model ER5030), and head-mounted microphones (Sony model HS95). Students were divided into two groups so that they could sit in alternate desks to avoid background noise in the recordings, and the sessions took fifty-minutes.

Participants were given the sheets containing the sequences of 10 paragraphs and the sequences of pictures, and were instructed to read the paragraphs and to report on the situations depicted in the pictures in the past in the order of presentation, without taking notes. It is important to observe that the students were used to the procedures, since they use the language laboratory frequently in the course. Immediately after the recording session, participants answered the profile questionnaire.

3.5 Analysis of the data and transcriptions

The English monosyllabic words ending in *-ed* and the *contrastive words* produced in the two tasks were auditorially analyzed by three different raters Besides the researcher, the two other raters were advanced Brazilian EFL speakers with experience in EFL teaching and foreign language research. They received the same instructions from the researcher (Appendix I). The material given to the raters included (a) the recordings of the participants' productions in the text reading task and in the free speech task; (b) the typewritten texts – the 10 paragraphs (Appendix A); and (c) the orthographic transcriptions of the participants' reports on the events depicted in the pictures of the free speech task (Appendix E).

The researcher listened to the tapes, transcribed all tokens and grouped the *-ed* ending words and *contrastive words* from the paragraph reading task and the *-ed* ending words from the free speech task in three lists (see Appendices F, G, H, respectively). The second rater received by e-mail one file by each participant containing a list with the 127 *-ed* ending words and *contrastive words* presented in the order they had been read in the paragraph reading task, and another list, in the same file, containing the sequence of verbs in the simple past produced by each participant in free speech task (see a sample in Appendix J). The reason for indicating to the rater the sequence in which the words occurred and for separating the data into two different lists was to facilitate the rater's job.

The third rater worked with the words for which there was disagreement between the researcher's and the second rater's analyses. A third rater was invited because it was difficult for the researcher and the second rater to meet and discuss the data since they did not leave in the same city. She also received by e-mail a list with the

-ed ending words and *contrastive words* that each participant produced in the paragraph reading task and a list of *-ed* ending words produced in the free speech task (see a sample in Appendix K). As occurred with the second rater, the third rater received separate lists in order to facilitate her job. In both cases, the raters had to indicate their answers by writing an "X" under their option on the line of each word.

The researcher and the other two raters analyzed the recordings separately indicating (a) whether or not there was a medial epenthetic vowel before the *-ed* ending or; (b) whether the verb was pronounced in the present tense rather than with the *-ed* inflectional ending or; (c) whether the phonological context preceding the *-ed* ending was mispronounced; or finally, (d) whether the target word was substituted by another word. The criterion used to establish whether or not an epenthetic vowel was produced was the agreement between two raters. When there was disagreement among the three raters, the researcher analyzed the token again and chose one of the answers previously identified by one of the three raters (the researcher and the other two raters). This fourth analysis was taken to avoid drastically reducing the number of tokens by discarding extra tokens since many of them had already been discarded due to mispronunciations.

A total of 3,430 words were analyzed. This included 2,366 *-ed* ending words from the paragraph reading task, 128 words from the free speech task, and 936 *contrastive words* from the paragraph reading task.

The researcher carried out the first analysis of the data, organized them according to the type of cluster and rhyme and then, transcribed them following the IPA. The data were then presented to the second rater, who received the material as described above. The comparison of the researcher's and the first rater's analyses showed an overall rate of 17.58% of disagreement. Owing to this high rate, a third rater was asked to analyze the tokens for which there was disagreement. This second

comparison resulted in an overall disagreement rate of 30.31% and to avoid discarding useful data, the researcher decided to analyze the tokens for which there was disagreement in the three analyses. After this fourth analysis of the data, the researcher checked the phonetic transcriptions made after her first analysis, to adjust them to the results of the analyses, when it was necessary.

Owing to the mispronunciations, not all the possible tokens were produced. The criteria used to include/exclude tokens was the correct pronunciation of the vowel or consonant in the phonological context preceding *-ed*, and the correct pronunciation of the clusters or of the vowels preceding the singleton consonant /d/ in *contrastive words*. Words in which there was devoicing or palatalization of the final /d/, or a following epenthetic vowel were accepted since these alterations were not the focus of the study. Taking into account the constraints explained above regarding the analysis of the data, the total number of tokens used in the statistical analysis was smaller than that predicted. Thus, the number of tokens included in this study was 1,780 *-ed* endings and 822 *contrastive words*, both in text reading task, and 123 *-ed* endings in the free speech task, totaling 2,725 tokens.

3.6 Statistical analysis of the data

The statistical analysis of the results obtained in this study consisted of the application of Chi-square tests with the *p* value set at .05. Chi-square tests with 1 degree of freedom were used in all tests even in cases of hypotheses comparing three different contexts. In these cases the comparisons were made in pairs, following the reasoning of statements of markedness relations, in which X is considered more marked than Y, which is considered more marked than Z.

The following procedures were used in the organization of the data for the application of the statistical analysis: (1) the consonantal contexts (/p, b, k, g, f, v, s, z, ʃ, tʃ, dʒ, m, n, l, r/) found in two-member and three-member clusters were compared to the vocalic contexts (/eɪ, oʊ, aɪ/) to test hypothesis one; (2) the voiced obstruents (/b, g, v, z, dʒ/) were compared to the voiceless obstruents (/p, k, f, s, tʃ/) found in two-member and three-member clusters to test hypothesis two; (3) the obstruents (/p, b, k, g, f, v, s, z, ʃ, tʃ, dʒ/) were compared to the sonorants (/m, n, l, r/), which were compared to the vowels/diphthongs (/eɪ, oʊ, aɪ/) to test hypothesis three; (4) the affricates (/tʃ, dʒ/) were compared to the fricatives (/f, v, s, z, ʃ/), which were compared to the stops (/p, b, k, g/) to test hypothesis four; (5) the nasals (/m, n/) were compared to the liquids (/l, r/) to test hypothesis five; (6) the voiced velar stop (/g/) was compared to the voiced bilabial stop (/b/) to test hypothesis six; (7) the two-member clusters /pt, bd, kt, gd, ft, vd, st, zd, ʃt, tʃt, dʒ/ were compared to the three-member clusters /spt, skt, mpt, ŋkt, lpt, rkt, lft, lvd, rft, rvd, kst, nst, rtʃt, ndʒd, lmd, rnd/ to test hypothesis seven; (8) the codas and rhymes /pt, kt, ft, st, nd, ld, rd/ and the rhyme /eɪd/ found in words ending in *-ed* were compared with the same codas and rhyme found in *contrastive words* to test hypothesis eight; and finally, (9) the codas and rhymes found in words ending in *-ed* produced in the paragraph reading task were compared to the codas and rhymes produced in words ending in *-ed* in the free speech task to examine hypothesis nine.

CHAPTER FOUR

RESULTS AND DISCUSSION

This study investigated the production of medial vowel epenthesis by BP speakers learning English as a foreign language in *-ed* endings having as data collection instruments two tasks: a paragraph reading task and in a free speech task. As mentioned in section 3.5, in the paragraph reading task, each participant could produce 91 English words ending in *-ed*, which would give a total of 2,366 words for the 26 participants; however, due to mispronunciations, the total of words produced was 1,780. In the free speech task the number of expected words per participant was 10, which would give a total of 260, computing the 26 participants; however, only 123 verbs were produced in this task. In regard to the pronunciation of *contrastive words* (see definition in Chapter 1) in the paragraph reading task, each participant could produce 36 words, reaching a total of 936; however, due to mispronunciations, the total number of *contrastive words* produced by the 26 participants was 822.

General results of this study demonstrate that the production of epenthesis in *-ed* endings was higher in the paragraph reading task (78.14%) than in the free speech task (61.78%). Additionally, the results demonstrate that no epenthesis was produced in *contrastive words*, which suggests an influence of orthography on the production of epenthesis in *-ed* endings. The overall results for the production of epenthesis in the two tasks are displayed in Table 4.1.

Table 4.1

Overall rates of epenthesis in *-ed* endings and in *contrastive words*

	-ed endings paragraph reading test	*contrastive words* paragraph reading test	*-ed* endings free speech test
N° productions	1,780	822	123
N° epenthesis	1,391	0	76
% epenthesis	**78.14%**	**0%**	**61.78%**

As previously mentioned, this study investigates the influence of the preceding contexts on the production of *-ed* endings. The analysis of the data showed that some mispronunciations had to be taken into account. First, it was observed that in some cases the pronunciation of the consonant following vowel epenthesis was /t/. This occurred, for example, in *linked*. It was also noticed that some participants palatalized the final /d/ with and without epenthesis, as occurred in *parked* in the phrase "parked his car", and in *plugged* in "plugged by a computer", where other participants produced a flap. Flaps occurred in phrases such as "jumped a wall", "mapped an area" and "helped a woman". In some other productions, final /d/ was epenthesized with both medial and final vowels, as in *solved* [sowvede].

Regarding the nature of the vowel used in the epenthesis, Major (1986) found that his Brazilian advanced EFL learners tended to use /ə/ as the epenthetic vowel whereas his beginning learners tended to insert /ɪ/. In this study, it seemed that the vowel most frequently inserted was the Brazilian Portuguese vowel /e/, and there were some instances of the BP /ɛ/, as well. These productions seem to argue in favor of influence of orthography and transfer of the L1 pronunciation. Thus, it is possible to say that participants seemed to rely on the interaction between the orthographic and phonological system of the L1 in the pronunciation of *-ed* endings. Much research in

this field is needed, though, including acoustic analysis, to enable detailed analyses of the quality of the vowels inserted by Brazilians.

The results concerning the production of medial vowel epenthesis in English monosyllabic words ending in *-ed* were analyzed according to the influence of the variables of markedness and phonological environment in interaction (Hypotheses 1 – 7), the influence of orthography (Hypothesis 8), and the influence of the type of task (Hypothesis 9) used in the data collection.

This chapter is organized into 10 sections. Nine sections present and discuss the results for the hypotheses investigated here, and the last section presents a summary of the results.

4.1 The influence of the preceding consonantal and vocalic environments – HYPOTHESIS 1

The first hypothesis of the study was based on the results of Delatorre (2005) and on Eckman's (1987b) MDH. This hypothesis predicted that consonants as preceding environment of *-ed* endings would induce more epenthesis than vowels, since the resulting coda of the consonantal context is more marked than that of the vocalic. The results of the present study followed the expected tendency. They are displayed in Table 4.2.

Table 4.2

Rates of epenthesis after consonants and vowels/diphthongs preceding *-ed* endings

	Consonants	Vowels/Diphthong	Total
N° Prod	1,540	240	1,780
N° Epen	1,271	120	1,391
% Epen	**82.53%**	**50.00%**	**78.14%**

The Chi-square test (χ^2 (1, N = 1,780) = 128.67, $p < .0001$) demonstrated that the difference between the production of epenthesis in consonantal and vocalic contexts was statistically significant. The greater difficulty (higher rate of epenthesis) in *-ed* endings with previous consonantal contexts seems to be due to the creation of more complex, marked and, consequently, more difficult codas than those in words with vocalic contexts. These results are in agreement with those found in Delatorre's (2004, 2005) studies. These results suggest that markedness in terms of length of the coda tend to influence the production of epenthesis in *-ed* endings by Brazilians. The discussion about markedness in terms of length of clusters is presented in Section 4.7.

Although it was not the aim of this study to investigate the effect of different vowels/diphthongs in the previous context of *-ed* endings, the low production of epenthesis in verbs in which /aɪ/ was the preceding context was salient, and the analysis on Table 4.3 below was carried out.

Table 4.3

Rates of epenthesis after vowels/diphthongs preceding *-ed* endings

	/eɪ/	/oʊ/	/aɪ/	Total
N° Prod	114	63	63	240
N° Epen	52	55	13	120
% Epen	**45.61%**	**87.30%**	**20.63%**	**50.00%**

As the results in the table demonstrate, the production of vowel epenthesis was higher for /oʊ/, than for /eɪ/, which was higher than that for /aɪ/. The results of the comparison between /aɪ/ and /eɪ/ yielded a statistically significant difference, as demonstrated by the Chi-square test (χ^2 (1, N = 177) = 10.89, $p < .001$) as well as the difference between /eɪ/ and /oʊ/, as attested by the Chi-square test (χ^2 (1, N = 177) =

29.49, $p < .0001$). These differences on vowel epenthesis production among the two semi-diphthongs (/eɪ/ and /oʊ/), and the diphthong (/aɪ/) is intriguing.

A tentative analysis of the characteristics of each context, might provide some light, as suggested by Rauber (2006, personal communication). First, frontness and backness might have influenced epenthesis production after the semi-diphthong /oʊ/. Since there is effort in tongue movement from back to front to produce /d/, the epenthetic vowel /e/ might appear as a facilitator, intermediating the shift. Then, vowel height might influence the higher percentage of epenthesis after /eɪ/ than after /aɪ/, since /eɪ/ and /e/ occupy almost the same height, triggering more epenthesis, and /aɪ/, which occupies a lower position inducing less epenthesis.

Other tentative analyses of these results were carried out by two researchers in the field of English Phonetics and Phonology and they suggested that the pronunciation of *-ed* endings preceded by vocalic contexts is possibly influenced by orthography or spelling of the target words. Baptista (2006, personal communication) considers that, although the explanation based on articulatory terms makes sense, the fact that orthography had an influence in the production of *-ed* endings possibly induced participants to feel, even unconsciously, that they should pronounce the "e" in "ed" and that in pronouncing the /aɪ/ they had already pronounced the "e", whereas in the case of /eɪ/ they were not so sure about pronouncing the "e", and, finally, in the case of /oʊ/ they were even less sure that they had already pronounced it, thus inducing an increasing rate of epenthesis production after /aɪ/, /eɪ/ and /oʊ/. Moreover, Watkins (2006, personal communication) suggested that spelling interfered in the pronunciation of *-ed* endings preceded by vocalic contexts since /eɪ/ and /oʊ/ had "y" and "w" before

the suffix whereas the /aɪ/ looks like a diphthong. As said above, the points raised here are just conjectures that need to be further very well investigated.

Among the consonants, affricates were the consonants most frequently modified by vowel epenthesis, followed by stops, fricatives, nasals, and then liquids. These productions will be analyzed in the following hypotheses.

4.2 The influence of voicing of the preceding obstruent – HYPOTHESIS 2

Based on Eckman's (1987b) MDH, the second hypothesis of this study predicted that the more marked voiced obstruents would induce vowel epenthesis more frequently than their less marked voiceless counterparts. Nevertheless, the results of this study displayed in Table 4.4 show an opposite tendency.

Table 4.4

Rates of epenthesis after obstruents – voiced/voiceless pairs – preceding *-ed* endings

	Bilabial Stops	Velar Stops	L-dental Fricatives	Alveolar Fricatives	Alveopal. Affricates	Total
N^{o} Prod [-Vd]	218	238	89	169	67	781
N^{o} Epen [-Vd]	197	212	73	143	65	690
% Epen [-Vd]	**90.36%**	**89.07%**	**82.02%**	**84.61%**	**97.01%**	**88.34%**
N^{o} Prod [+Vd]	47	59	94	104	44	348
N^{o} Epen [+Vd]	45	50	75	78	38	286
% Epen [+Vd]	**95.74%**	**84.74%**	**79.78%**	**75.00%**	**86.36%**	**82.18%**
Total N^{o} Prod	265	297	183	273	111	1,129
Total N^{o} Epen	242	262	148	221	103	976
total % Epen	**91.32%**	**88.21%**	**80.87%**	**80.95%**	**92.79**	**86.44%**

The Chi-square test (χ^2 (1, N = 1,129) = 7.80, $p < .005$) demonstrated that, overall, markedness in terms of voicing influenced the production of epenthesis in *-ed*

endings, but in the opposite direction of the MDH, since participants produced significantly more epenthesis in the context of voiceless consonants.

These results corroborate those of Delatorre (2004, 2005) in which the voiceless contexts induced more epenthesis as well. Among the classes of obstruents, the velar stops, labio-dental fricatives, alveolar fricatives and alveopalatal affricates followed the same tendency producing higher rates of vowel epenthesis in preceding voiceless contexts, whereas the class of bilabial stops was the only one that followed the expected tendency producing more vowel epenthesis in preceding voiced contexts.

Chi-square tests for the pairs of obstruents showed that the differences between voiced and voiceless velars, labio-dental fricatives, and bilabial stops were not statistically significant ($p > .05$). On the other hand, the tests for the alveolar fricatives and the alveopalatal affricates showed that the differences between voiced and voiceless counterparts reached significance (χ^2 (1, N =273) = 3.86; and χ^2 (1, N = 111) = 4.50, $p < .05$).

In regard to previous studies that analyzed the influence of voicing of final-single consonants, the results of the present study do not follow the tendency observed by Baptista and Silva Filho (1997), Koerich (2002) and Silveira (2004). Voicing played a role in Baptista and Silva Filho's (1997) study indicating a strong tendency for voiced obstruents to be more frequently modified by vowel epenthesis than their voiceless counterparts; however it indicated a slight tendency for most voiced obstruents to induce more epenthesis than their voiceless counterparts in Koerich's (2002) and Silveira's (2004) studies. However, it must be said that in the last two studies, markedness in terms of voicing does not seem to be a major factor on the production of epenthesis as it seems to have in Baptista and Silva Filho's study. Other factors such as

L1 transfer and sonority are suggested as influencing more directly than markedness by voicing, especially in Koerich's and Silveira's studies.

The results of the present study are in consonance with Hooper's (1976) strength hierarchy and Selkirk's (1984) sonority hierarchy since the hierarchies attribute different consonantal strength/sonority values for voiced and voiceless obstruents. Overall, voiceless obstruents are considered stronger/less sonorant than their voiced counterparts, which may possibly explain why voiceless obstruents that precede *-ed* endings have induced more epenthesis than their voiced counterparts in the same context. On the other hand, Greenberg's universals demonstrate that there is a preference for voiceless consonants or clusters over voiced consonants or clusters to occur in final position. However, the results of the present study followed an opposite tendency of that demonstrated by Greenberg's universals with the preferable voiceless counterparts inducing more epenthesis than the voiced ones, thus contradicting the predictions. So, the results of this study seem to indicate that markedness in terms of sonority/consonantal strength has a stronger influence than markedness in terms of voicing on the production of vowel epenthesis in *-ed* endings by Brazilian EFL learners.

4.3 The influence of sonority or strength of the preceding context – HYPOTHESIS 3

The third hypothesis of this study, based on Eckman's (1987b) MDH, Hooper's (1976) consonantal strength hierarchy and Selkirk's (1984) sonority sequence, predicted that obstruents would induce more epenthesis than sonorants, which would induce more epenthesis than vowels as preceding contexts of *-ed* endings. Table 4.5 displays the results for the hypothesis.

Table 4.5

Rates of epenthesis after obstruents, sonorants and vowels preceding *-ed* endings

	OBSTRUENTS (stops, fricatives, affricates)	SONORANTS (nasals, liquids)	VOWELS
N^{o} Prod	1,200	340	240
N^{o} Epen	1042	229	120
% Epen	**86.83%**	**67.35%**	**50.00%**

Chi-square tests on the production of epenthesis in the context of obstruents /p, b, k, g, f, v, s, z, ʃ, tʃ, dʒ/ vs. sonorants /m, n, l, r/ and of sonorants vs. vowels/ diphthongs /eɪ, oʊ, aɪ/ indicated that obstruents induced significantly more epenthesis than sonorants (χ^2 (1, N = 1,540) = 69.73, $p < .0001$), whereas sonorants induced significantly more epenthesis than vowels and (χ^2 (1, N = 580) = 16.86, $p < .0001$), following the expected tendencies. These results are in agreement with those of Delatorre's (2004, 2005) studies which suggested that markedness in terms of consonantal strength/sonority was a relevant factor in the production of vowel epenthesis in *-ed* endings.

As mentioned in section 2.3.4, the comparison between obstruents and sonorants should be run on voiced obstruents vs. sonorants, eliminating the influence of voicing. The results of this comparison are displayed in Table 4.6.

Table 4.6

Rates of epenthesis after voiced obstruents and sonorants preceding *-ed* endings

	VOICED OBSTRUENTS (stops, fricatives, affricate)	SONORANTS (nasals and liquids)
N^{o} Prod	348	340
N^{o} Epen	286	229
% Epen	**82.18%**	**67.35%**

The Chi-square test on epenthesis production after voiced obstruents /b, g, v, z, dʒ/ and sonorants /m, n, l, r/ yielded a statistical significant difference (χ^2 (1, N = 688) = 20.09, $p < .0001$), corroborating the results of Delatorre (2005) as well as the results of the comparison between all obstruents vs. all sonorants showed above. These results seem to reinforce the argument that markedness in terms of consonantal strength/sonority plays a more important role in epenthesis production in *-ed* endings than voicing, as discussed in section 4.2.

4.4 The influence of markedness within the class of obstruents – HYPOTHESIS 4

Based on Eckman's (1987b) MDH, Eckman and Iverson's (1994) study and on Baptista and Silva Filho's (1997) study on epenthesis production by Brazilians, the fourth Hypothesis predicted that affricates as preceding contexts of *-ed* endings would induce more epenthesis than fricatives, which would induce more epenthesis than stops. The results of these comparisons are displayed in Table 4.7.

Table 4.7

Rates of epenthesis after classes of obstruents preceding *-ed* endings

	STOPS (bilabial & velar)	FRICATIVES (labiodental, alveolar & alveopalatal)	AFFRICATES (alveopalatal)
N° Prod	562	527	111
N° Epen	504	435	103
% Epen	**89.67%**	**82.54%**	**92.79%**

These results demonstrate that hypothesis 4 was partially supported. The Chi-square test comparing epenthesis production after affricates and fricatives yielded a

statistically significant difference (χ^2 (1, N = 638) = 7.28, $p < .01$), thus confirming the hypothesis and also corroborating the results of Delatorre (2005).

In regard to the comparison of epenthesis following fricatives vs. stops, the results of the statistical test indicated a statistically significant difference, as attested by the Chi-square (χ^2 (1, N = 1089) = 11.66, $p < .001$), but with stops causing more epenthesis than fricatives, contrary to the predictions made with basis on Eckman and Iverson's (1994) study. This tendency of higher epenthesis production after stops than after fricatives, in opposition to Eckman and Iverson's results, was also found by Delatorre (2005). Also as in Delatorre (2005), there was more epenthesis following affricates than following stops, but the difference was not statistically significant (χ^2 (1, N = 673) = 1.01, $p > .05$). The same tendency found here for stops and fricatives, different from Eckman and Iverson's suggestion, was found in Koerich (2002) studying the production of epenthesis after final-single consonants; however in that study, affricates had the lowest rates of epenthesis of the three classes of consonants.

As for Greenberg's (1978) implicational universals, the results of this study are in accordance with his claims that clusters constituted of fricative plus stop are preferred over clusters constituted of stop plus stop since the rate of epenthesis after stops preceding *-ed* endings, which are always represented by a stop, was statistically significant higher than the rate of epenthesis after fricatives preceding *-ed* endings. Concerning affricates, Greenberg mentioned that they are constituted of a stop plus a fricative which can possibly indicate that the production of epenthesis after affricates preceding *-ed* endings is more frequent than after stops in the same context because of the articulation of a stop and a fricative in one speech segment.

Hooper (1976) states that affricates due to their complexity are attributed value seven (the highest value) in her hierarchy of strength, which characterizes them as the

strongest/least sonorous consonants, more difficult than stops. These results seem to suggest that Brazilian EFL learners' production of epenthesis within the class of obstruents tends to be influenced by consonantal strength/sonority in that epenthesis production decreases with sonority or as strength increases.

4.5 The influence of markedness within the class of sonorants – HYPOTHESIS 5

Hypothesis five was based on Eckman's (1987b) MDH, Hooper's (1976) consonantal strength hierarchy and on Selkirk's (1984) sonority sequence and predicted that nasals, as preceding contexts of *-ed* endings, would induce more epenthesis than liquids. The results obtained for the analysis of this hypothesis are expressed in Table 4.8.

Table 4.8

Rates of epenthesis after classes of sonorants preceding *-ed* endings

	NASALS (bilabial & alveolar)	LIQUIDS (lateral & retroflex)
N° Prod	165	175
N° Epen	123	106
% Epen	**74.54%**	**60.57%**

The results demonstrate that nasals as preceding contexts of *-ed* endings induced more epenthesis than liquids with a statistically significant difference, as attested by the Chi-square test (χ^2 (1, N = 340) = 7.54, $p < .01$), thus following the expected tendency also found in Delatorre (2005). The results of the present study, associated with the results of Delatorre (2005), suggest that markedness within the class of sonorants is a relevant factor for the production of epenthesis in *-ed* endings. However, as demonstrated in sections 4.2, 4.3 and 4.4, sonority is also an important factor in

determining the production of epenthesis. In the case of the comparison of epenthesis production within the class of sonorants, markedness in terms of sonority is a relevant factor affecting the production of epenthesis within the class of sonorants since nasals, which are considered more marked and less sonorous than the liquids, induce more vowel epenthesis. Greenberg (1978) states that the existent of the sequence obstruent plus nasal implies the existence of the sequence obstruent plus liquid in initial systems. He also points out that initial and final systems are distinctive though similar systems. Taking into account Greenberg's universals, this is possible that the existence of the sequence nasal plus obstruent implies the existence of the sequence liquid plus obstruent in final systems, which is also in consonance with Hooper's (1976) SSC for the syllable coda. According to Eckman's (1987b) MDH, it is possible to consider that a nasal preceding the obstruent representing the *-ed* induces more epenthesis than the liquid. In this sense, the results of the present study followed this tendency with nasals inducing more epenthesis than liquids when they precede the *-ed* ending.

A relevant aspect of the production of epenthesis in *-ed* endings preceded by liquids is the vocalization of the final /ɬ/. This process seemed to have occurred in verbs with two-member clusters in the coda produced in the past tense without epenthesis – verbs such as *called* and *killed* which were produced as [kɔwd] and [kɪwd], respectively, and in verbs with three-member clusters in the coda produced in the past tense with epenthesis, as in the case of *solved* being produced as [sowved] (See Appendix F). The substitution of /ɬ/ by the glide /w/ was probably caused by L1 transfer, since this is a characteristic process in BP. In this sense, instrumental analysis would be important to detect vocalization more precisely, and discard vocalized tokens in the comparison between nasals and liquids.

Baptista (2006, personal communication) mentioned that even with acoustic analysis it would be difficult to distinguish the [ʍ] and the [ɬ]. But even so acoustic analysis would be extra information to help better distinguishing between the two sounds. Moreover, Baptista also mentioned that some native speakers of English also vocalize the /ɬ/ in words like *called*. But, the present study involves the production of *-ed* endings by non-native speakers and in being so, it is necessary to follow the pattern that after a voiced consonant it is necessary to add /d/ to represent the -ed ending, considering that the final /ɬ/ is also pronounced in the present tense.

4.6 The influence of markedness in terms of place of articulation – HYPOTHESIS 6

Hypothesis six considered that place of articulation has an influence on the production of epenthesis and predicted that the more marked voiced velar stop would cause more vowel epenthesis than the less marked voiced bilabial stop, which is based on Yavas (1994, 1997), who found voiced velar stop induced more devoicing than voiced bilabial stop, and on Eckman's (1987b) MDH. The results of the production of epenthesis in *-ed* endings preceded by the voiced bilabial or the velar stop regarding place of articulation are displayed in Table 4.9.

Table 4.9

Rates of epenthesis after the voiced bilabial and the velar stop preceding *-ed* endings

	VOICED BILABIAL STOP (/b/)	VOICED VELAR STOP (/g/)
Nº Prod	47	59
Nº Epen	45	50
% Epen	**95.74%**	**84.74%**

The results in Table 4.9 demonstrate that the voiced bilabial stop induced more epenthesis than the voiced velar stop, contradicting the predicted tendency, as occurred in Silveira's (2004) study; however, the difference was not statistically significant, as attested by the chi-square test (χ^2 (1, N = 106) = 3.40, $p > .05$). The results here do not follow the tendency found in Yavas' (1994), Baptista and Silva Filho's (1997) and Koerich's (2002) studies for the production of epenthesis in final-single consonants, nor they do follow the results of Delatorre (2005) on *-ed* endings.

A comparison between bilabials vs. velars was run since voicing effects were not shown to be a definite factor (Hypothesis 2) in the production of epenthesis, and specifically concerning bilabials and velars, although the differences between voiced and voiceless counterparts were not significant, for the velars the voiceless obstruent had more epenthesis. The objective of this analysis, then, was to check if place of articulation had an effect independent of voicing. The results comparing the production of epenthesis in the bilabial and velar stops are presented on Table 4.10.

Table 4.10

Rates of epenthesis in the bilabial and velar stops preceding *-ed* endings

	BILABIAL STOPS (/p, b/)	VELAR STOPS (/k, g/)
Nº Prod	265	297
Nº Epen	242	262
% Epen	**91.32%**	**88.21%**

Table 4.10 demonstrates that bilabial stops induced more epenthesis than velar stops; however the difference was not statistically significant, as attested by the Chi-square test (χ^2 (1, N = 562) = 1.45, $p > .05$). This result, again, contradicts the hypothesis that the more marked velar stops would induce more epenthesis than the less marked bilabial stops, indicating that place of articulation does not interfere on epenthesis production in bilabial and velar stops preceding *-ed* endings.

4.7 The influence of markedness in terms of cluster length – HYPOTHESIS 7

Based on Eckman's (1987b) MDH, Greenberg's (1978) description of final syllables regarding cluster length, and on Carlisle's (1991, 1992, 1994, 1998), Rauber's (2002), Cornelian Jr.'s (2003) and Delatorre's (2004) studies of initial /s/-clusters, the seventh hypothesis predicted that final three-member clusters formed by the addition of *-ed* endings would be more frequently modified by vowel epenthesis than two-member clusters. The results obtained for the analysis of the hypothesis are displayed in Table 4.11.

Table 4.11

Rates of epenthesis by cluster length including *-ed* endings

	two-member clusters (/pt, kt, ft, st, ʃt, tʃt, bd, gd, vd, zd, dʒd, md, nd, ld, rd/)	three-member clusters (/spt, skt, mpt, ŋkt, lpt, rkt, lft, rft, kst, nst, rtʃt, lvd, rvd, ndʒd, lmd, rnd/)
N° Prod	1,089	451
N° Epen	867	404
% Epen	**79.61%**	**89.57%**

The Chi-square test showed that the results followed the expected tendency (χ^2 (1, N = 1,540) = 21.96, $p < .0001$). These results corroborate those of Delatorre (2005), indicating that cluster length is possibly a relevant factor influencing the production of epenthesis in *-ed* endings.

Moreover, the results of this study are also in agreement with those observed in Weinberger (1987) and in Hansen (2004), in which participants from different L1s tended to modify final three-member clusters more frequently than two-member clusters, which, in turn, were more frequently modified than final-single codas, either by vowel epenthesis or by vowel epenthesis and deletion.

In regard to the comparison of epenthesis production in initial /s/-clusters and in final clusters formed by *-ed* endings by Brazilian EFL learners, the results of the present study corroborate the results of previous studies on initial /s/-clusters (Rauber, 2002; Cornelian Jr., 2003; Delatorre, 2004) concerning the influence of cluster length, since they show the same tendency, that is, for initial two-member /s/-clusters to be less frequently modified by epenthesis than three-member clusters. Despite the specificities of initial and final clusters, taken together, these results indicate that Brazilians tend to have more difficulty in pronouncing longer clusters. Furthermore, these results can

possibly be interpreted in terms of Greenberg's (1978) comment that initial and final systems are distinctive systems that have similar properties. One possible similar property is, then, cluster length.

4.8 The influence of orthography – HYPOTHESIS 8

Hypothesis eight predicted that the production of epenthesis would be influenced by the orthographic representation of *-ed* endings. In order to test this influence, words in which the codas have the same pronunciation of those ending in *-ed,* but with different spelling – *contrastive words* – were used to test the hypothesis. The *contrastive words* contained the final clusters /pt, kt, ft, st, nd, ld, rd, kst/, and the rhyme /ɛɪd/. For example, the *contrastive words last* and *found* have the same final clusters as *missed* and *planned* (see Tables 3.1 and Table 3.2 on section 3.3 and Appendix L to check the lists of *-ed* ending words and *contrastive words* used in this study).

Table 4.12

Rates of epenthesis production by class of word on reading test

	words ending *-ed* paragraph reading test	contrastive words paragraph reading test
N° Prod	1,105	822
N° Epen	794	0
% Epen	**71.85%**	**0%**

The results strongly supported hypothesis eight, since none of the participants produced vowel epenthesis in the *contrastive words*, whereas they produced 71.85% of vowel epenthesis in words with *-ed* endings. The statistical test yielded a highly

statistically significant difference as attested by the Chi-square test (χ^2 (1, N = 1,927) = 1,004.57, $p < .0001$).

Thus, the results followed the expected tendency, corroborating the results found in Delatorre (2005), Alves (2004) and Pereira (1994). Comparing the results of this study to Delatorre (2005), it can be said that they reinforce the claim made by Ellis (2002) based on the correspondence between sound and spelling, in which he considers that words that have a consistent sound-spelling correspondence induce fewer mistakes than words that do not have this correspondence. The two studies demonstrated that words ending in *-ed*, which do not have a consistent relationship between sound and spelling, induced a high rate of epenthesis, whereas the *contrastive words*, in which sound and spelling have a more direct relationship, that is, do not have vowels in the spelling form splitting the cluster, did not present epenthesis.

Pereira (1994) observed that her participants tended to produce the past tense of the verbs as [ed], what she attributed to the influence of orthography. In the present study [ed] was the most frequent pronunciation of the *-ed* ending, as well (see Appendix F). It seems reasonable to state that the pronunciation of the vowel as the BP [e] is highly influenced by spelling, since the vowels used in epenthesis production in other contexts are most frequently [ɪ], [ə] or [i] (Baptista & Silva Filho, 1997; Koerich, 2002; Silveira, 2004).

Flege (1995), Wade-Woolley (1999), Lessa (1985) and Alves (2004) pointed out that adult L2 learners tend to rely on L1 knowledge and on visual input to deal with the pronunciation of L2 words. The mental representation of the spelling of English words, possibly interpreted from the point of view of L1 parameters, induced the participants to pronounce /l/ and /b/ in some clusters, such as in the words *walked* and *climbed*, as well

as to pronounce inaccurately verbs such as *laughed, coughed, judged*, which were pronounced as [lauged], [kɔtʃied] and [dʒudgɛt], respectively, reinforcing the claim that orthography is a relevant factor affecting the production of *-ed* endings by Brazilian learners of English as a foreign language. Moreover, a tentative analysis was pointed out by Baptista (2006, personal communication), in which she considered that is possible that participants simply did not know the rule for pronouncing these words. However, her analysis implies that, according to the explanation based on Flege's, Wade-Woolley's, Lessa's and Alves's suggestions mentioned above, participants had to use other parameter to pronounce these words, possibly their L1 knowledge.

4.9 The influence of task – HYPOTHESIS 9

Based on Carlisle (1994) and Major (1994b), the ninth Hypothesis predicted that a more formal task (text reading) would induce less epenthesis than a less formal task (reporting sequences of events depicted in pictures). The results for this hypothesis are presented in Table 4.13.

Table 4.13

Rates of epenthesis in words ending in *-ed* in paragraph reading task and in free speech task

	words ending *-ed* paragraph reading task	words ending in *-ed* free speech task
N° Prod	1,780	123
N° Epen	1,391	76
% Epen	**78.14%**	**61.78**

As Table 4.13 demonstrates, the results showed an opposite tendency, that is, the rate of epenthesis in the more formal task (reading) was higher than that in the less

formal task (free speech). A Chi-square test attested the statistical significance of the difference (χ^2 (1, N = 1,903) = 17.57, $p < .0001$). These results corroborate those of Delatorre (2005), which reinforces the claim that orthography has a strong influence on the production of epenthesis in words ending in *-ed*. Moreover, these results also corroborate Major and Faudree's (1996) results for the production of final obstruents by Korean learners of English.

These results, together with the results of Beebe (1987a, b), which suggested a possible transfer of L1 stylistic variation, seem to indicate that the discussion of the influence of task types on the expected outcomes has to take into account the characteristics of the linguistic object under investigation, not only in terms of the target language, but also, and very importantly, taking into account possibilities of L1 transfer.

As commented in Koerich (2002), the difficulty of collecting experimental data in natural speech is expressed in Labov's Observer's Paradox (Ellis, 1986), where Labov states this difficulty, saying that despite the artificiality of language samples collected through more structured elicitation, this is usually the only way of putting together a substantial amount of pertinent samples. Alves (2204) pointed out that he had difficulty in collecting free speech data, despite meeting his participants on a very frequent basis, and using two different types of task – interviews and oral activities in the classroom. Furthermore, the author, as well as Pereira (1994), observed that participants tended to produce the target words expected to be produced with *-ed* endings, using the '*ing'* form or in the present tense. Despite the instructions given in the present study and the situation created that would favor reportings/descriptions in the past, the same tendency of Alves's and Pereira's studies was observed in the present study. It is important to notice that the three studies used different materials to collect

the data – interviews and class activities in Alves' study, a questionnaire in Pereira's study, and picture reporting/description in the present study.

In regard to the verbs produced in free speech task, it was expected that each participant would produce 10 verbs (see the list of expected verbs on Table 3.3 in Chapter 3). However, many of the participants produced lower number of verbs than expected or produced other verbs that were not in the list of verbs (see Appendix H to check out the verbs). The difference between what was expected and what was found demonstrates that the reportings were based on the interpretations of the pictures, which was different from the researcher's interpretation. Furthermore, many participants tended to produce the verbs in the past continuous form rather than in the simple past. These differences are also explained by the fact that they were instructed to report the sequence of events in the past, without specifying the verbs they should have used or the form or the verb, such as past continuous or simple past.

The production of *-ed* endings by Brazilians seems not to be dependent on task, but rather dependent on orthography working as a reference from the point of view of L1 sound-spelling association patterns since BP have a consistent sound-spelling correspondence, which is, in addition, much more consistent than the relation between sound-spelling in English. Moreover, it is also possible that participants' production of words ending in *-ed* was affected by access to the orthographic representation of the target words, despite the fact that the production of epenthesis in words ending in *-ed* in the free speech task was statistically significant smaller than the production of epenthesis in the same words in the reading task. In other words, it is possible that participants interpreted and pronounced the words ending in *-ed* according to the orthography of these words, accessing the mental representations.

4.10 Summary of the results

The focus of this study was the production of vowel epenthesis in *-ed* endings. The data were collected through a text reading task and a free speech task. Epenthesis production was investigated having consonants and vowels as preceding contexts of *-ed* endings, considering: (a) the Markedness Differential Hypothesis and Hooper's consonantal strength hierarchy – analyzing hypothesis 1; and (b) Selkirk's sonority sequence generalization (SSG) – analyzing hypotheses 2 to 7, and, the influence of orthography and of different tasks – analyzing Hypotheses 8 and 9, respectively. Two different types of tasks were used to check their influence on the production of epentheses preceding *-ed* endings.

In regard to the results obtained, for some hypotheses the results followed the expected tendencies whereas for others they contradicted the predictions. In sum, the results that followed the expected tendencies were related to (a) Hypothesis 1, where the preceding consonantal context induced more epenthesis than the preceding vocalic context; (b) Hypothesis 3, in which obstruents induced more epenthesis than sonorants, which induced more epenthesis than vowels, thus confirming the prediction; (c) Hypothesis 5, which showed that within the class of sonorants, nasals induced more epenthesis than liquids as predicted; (d) Hypothesis 7, which showed that the more marked three-member clusters induced more epenthesis than the less marked two-member clusters; and, (e) Hypothesis 8, where orthography was shown to be a strong factor influencing epenthesis production in words ending in *-ed*.

On the other hand, the results that did not follow the predictions were those concerning (a) Hypothesis 2, where voiced obstruents induced less epenthesis than their voiceless counterparts, suggesting the reasoning that sonority would be a factor of

influence since, as Hooper (1976) and Selkirk (1984) observed, voiceless obstruents have higher consonantal strength values (lower sonority values); (b) Hypothesis 4, in which, within the class of obstruents, affricates induced more epenthesis than stops, as hypothesized, but contrary to the hypothesis, stops induced more epenthesis than fricatives, possibly due to the influence of sonority/consonantal strength, as pointed out by Hooper and Selkirk; (c) Hypothesis 6, in which the results showed that the voiced velar stop /g/ did not cause more epenthesis than the voiced bilabial /b/, contradicting the predictions; and finally, (d) Hypothesis 9, investigating task type effects, in which a higher rate of epenthesis was obtained in words ending in *-ed* produced in the more formal task (text reading) than in the less formal task, which was attributed to the influence of orthography in the reading test.

In terms of Greenberg's (1978) universals, the results of the present are in consonance with universals which considered that (a) liquids are preferred over nasals; (b) fricatives are preferred over stops, and, (c) shorter clusters are preferred over longer clusters, since liquids, fricatives and two-member clusters presented less epenthesis than nasals, stops and three-members clusters. However, the results of the present study did not conform to Greenberg's universal that voiceless obstruents or clusters are preferred over voiced obstruents or clusters, since voiced obstruents induced less epenthesis than their voiced counterpart as previously mentioned.

CHAPTER FIVE

CONCLUSION

The 26 participants of this study produced 2,725 tokens of *-ed* endings in a paragraph reading task and in a free speech task. This number is smaller than the predicted 3,588 tokens since many participants mispronounced some verbs, produced them in the simple present or in the continuous form, or replaced them by other words. Medial vowel epenthesis was the strategy most frequently used to split the final clusters in *-ed* endings forming less complex sequences of sounds, as in the case of the verbs *stopped* and *planned*, pronounced as [stɔped] and [plæned]. Interestingly, vowel epenthesis was also used in verbs where *-ed* followed the nucleus as in *played* and *cried* pronounced as [pleɪed] and [kraɪed].

The results that followed the expected tendencies were those for (a) Hypothesis 1, which predicted that the preceding consonantal context would induce more epenthesis than the preceding vocalic context; (b) Hypothesis 3, predicting that obstruents would induce more epenthesis than sonorants which would induce more epenthesis than vowels; (c) Hypothesis 5, predicting that within the class of sonorants, nasals would induce more epenthesis than liquids; (d) Hypothesis 7, in which the more marked three-member clusters were thought to induce more epenthesis than the less marked two-member clusters; and (e) Hypothesis 8, predicting that orthography would be a strong factor influencing epenthesis production in words ending in *-ed*.

On the other hand, the results that did not confirm (a) Hypothesis 2, predicting that voiced obstruents would induce less epenthesis than their voiceless counterparts; (b) Hypothesis 4, in which, within the class of obstruents, affricates were predicted to

induce more epenthesis than stops, which, in turn were predicted to induce more epenthesis than fricatives; (c) Hypothesis 6, predicting that the voiced bilabial (/b/) would cause less epenthesis than the voiced velar stop (/g/); and, (d) Hypothesis 9, in which less epenthesis was thought to be produced in the more formal task (text reading) than in the less formal task (reporting on sequences of events depicted in pictures).

These results showed that epenthesis production in codas formed with the addition of *-ed* was influenced by markedness relations in terms of a previous consonantal or vocalic context (Hypothesis 1), and in terms of length of clusters, where three-member clusters were more frequently modified than two-member clusters (Hypothesis 7). However, the investigation about the influence of markedness by voicing (Hypothesis 2), within the class of obstruents (Hypothesis 4), and by place of articulation (Hypothesis 6) indicated that markedness in terms of these three variables did not seem to be a decisive factor. Allied to the results of the comparison of obstruents, sonorants and vowels (Hypothesis 3), and of the influence of markedness within the class of sonorants (Hypothesis 5), which followed the expected tendency for more sonorous sounds to induce less epenthesis, these results seem to suggest that sonority relations are a more decisive factor than either voicing or place of articulation in epenthesis production.

In general terms, these tendencies were also observed in Delatorre's (2004, 2005) studies. In regard to the influence of markedness on coda length, the results of both studies, as well as the results of the present study, showed that more marked three-member clusters and more marked codas which had a preceding consonant context induced more epenthesis than less marked two-member clusters and codas which had a preceding vocalic context.

Furthermore, in relation to the influence of sonority, less sonorous obstruents induced more vowel epenthesis production than more sonorous consonants which, in turn, induced more epenthesis than vowels in the three studies. Moreover, the results of these studies followed the same tendency for the influence of voicing, that is, voiceless obstruents induced more vowel epenthesis than their voiced counterparts. In addition, Delatorre (2005) and the present study, which followed Hooper's (1976) Hierarchy of Strength and Selkirk's (1984) Sonority Sequencing Generalization, also indicate that sonority is a relevant factor affecting the production of vowel epenthesis within the classes of obstruents and sonorants, since in both studies the rates of epenthesis production decreased from affricates to stops, fricatives, nasals, liquids, and then vowels.

Concerning Hypothesis 8, orthography was shown to be a strong factor affecting the production of epenthesis in words ending in *-ed*, since there was no epenthesis in the *contrastive words*, against 71,854% of epenthesis production in the *-ed* words (all of the words compared had the same codas or rhyme). As previously stated, these results corroborate those of Delatorre (2005), Alves (2004) and Pereira (1994), who found that orthography influenced the production of vowel epenthesis in -e*d* endings since they were frequently produced as [ed]. Based on Ellis (2002), Flege (1995), Wade-Woolley (1999), Lessa (1985), and Alves (2004) it is possible to suggest that this pronunciation was caused by the lack of correspondence between sound and spelling, and by the influence of L1 orthographic and phonological knowledge.

The influence of task showed results contradicting previous research (e.g. Beebe, 1980; L. Dickerson, 1975; L. Dickerson & J. Dickerson, 1977; Major, 1987; Sato, 1985; Tarone, 1988; Weinberger, 1987) proposing that more formal tasks would induce more accurate productions. In this study, the less formal task (reporting on events) induced

more accurate productions. In the line with Beebe's (1988), Sharwood-Smith's (1994) and Towell and Hawkins's (1994) comments, in more formal tasks such as reading, learners pay more attention to form, and produce more target-like language, whereas in less formal tasks, such as telling stories based on pictures, learners tend to focus on meaning using a more spontaneous, and less focused on form type of speech, producing more mistakes. In other words, the degree of task formality is related to the amount of attention to language forms involved in the task.

However, the results of the present study showed an opposite tendency corroborating the results of Beebe's (1988), Major and Faudree's (1996), Major's (1999) and Delatorre's (2005) studies. It seems to be the case here that by drawing more attention to language form, the more formal task (reading) elicited more epenthesis because the orthographic representation of *-ed* endings was more salient than in the less formal task, which did not involve visual input. This outcome indicate the need for more detailed analyses of the factors involved in the discussion of the influence of task type, considering that tasks involving higher degrees of attention to form should promote more accurate language productions. When dealing with speech, attention to form might have a negative effect simply by slowing down speech rate.

5.1 Pedagogical implications

As for the pedagogical implications, the results of this study revealed that Brazilian EFL learners with around 270 hours of instruction tended to produce high rates of vowel epenthesis in words ending in *-ed*.

It is important to mention that the recordings evidenced that the participants were concerned about pronunciation, since they tried to be accurate in the pronunciation

of words beginning and ending with 'th' sounds, by repeating the ones they did not feel satisfied with. This concern with pronunciation and the high rates of epenthesis in *-ed* ending words suggest that whereas participants had received instruction and/or training on the pronunciation of the interdentals they were not aware of the 'rules' about the pronunciation of regular past tense verbs.

In regard to pronunciation instruction, one suggestion is to practice first the codas that induce less epenthesis, supposedly the least difficult ones. Thus, applying this suggestion to the results of the present study, words in which the *-ed* is preceded by vocalic contexts should be practiced before *-ed* preceded by sonorants (liquids before nasals), which should be taught before the *-ed* preceded by obstruents (fricatives before stops and stops before affricates). Instruction should also take into consideration the production of endings in which *-ed* is preceded by one of the alveolar stops, which implies the addition of an extra syllable. However, the instruction must show that *-ed* endings can be pronounced in three different ways, as /t/, /d/, and /ɪd/, avoiding overcorrection in words such as *needed* and *wanted*, as probably occurred to Alves's (2004) participants when producing those verbs without the vowel. Other possibility regarding pronunciation instruction is to teach the verbs grouped according to voicing of the sound that precedes *-ed* endings. However, in both cases, instruction must be clear enough for learners to be able to note that (a) there are three different types of *-ed* ending pronunciation, /t/, /d/ or /ɪd/; and (b) the pronunciation of *-ed* ending forms comprises codas with two or three consonants in the same syllable, in which the last consonant can be one of the alveolar stops /t/ or /d/, as in *washed, linked, loved,* and *changed*; codas with one consonant in the same syllable, as in *played* and *cried*; or a new syllable, as in *wanted* and *needed*. A further suggestion to complement the instruction about words ending in *-ed* stems from the results of the present study – the

addition of *contrastive words* to the instruction material on the pronunciation of *-ed*. The two types of words have homophonic codas, consequently helping the students to decrease the production of vowel epenthesis on words ending in *-ed*.

Training and formal instruction about the 'rules' should be provided as soon as students start to use the simple past tense to avoid future fossilization of the wrong forms. Besides helping learners to improve their production of words ending in *-ed*, instruction should help them improve the perception of these sounds stimulating them to listen to music and to watch movies, for example.

The results of this study, concerning the effect of orthography and task type, seem to indicate that it is also important to avoid *-ed* endings to be interpreted from the perspective of L1 association between orthography and phonology. For example, it is very unlikely that English L2 learners pronounce the verb *called* with medial epenthesis if they do not refer to the visual input as straightforwardly as when reading. These results indicate that substantial oral practice dissociated from the orthographic input is essential.

5.2 Limitations of the study and suggestions for further research

One limitation of this study is the restriction to monosyllabic words; however this was due to the possible negative influence of stress placement and shifting. This limitation leaves space for further research focusing on epenthesis production in words ending in *-ed* with two or more syllables, such as the troublesome verbs *studied*, *realized*, and *listened to*. A second limitation of this study is related to the type of reading task applied – a paragraph reading task – which implied the use of different

numbers of verbs of each context. A suggestion for further research is the use of reading tasks that counterbalance the number of tokens of each context.

The use of a paragraph reading task to collect the data also resulted in some difficulty in analyzing the production of some verbs due to the influence of the following phonological context. The production of vowel epenthesis in *-ed* endings is affected by the following context, since the onset of the following word interferes in the production of the preceding coda. The influence of the following context is, at least, as important as that of the preceding one.

Concerning the production of three and two-member clusters, the study of vowel epenthesis in clusters violating and not violating the SSC is another interesting question to be investigated in further research.

Besides studying the influence of these different variables affecting the production of epenthetic vowels in *-ed* endings, further research should focus on the perception and production of the *-ed* endings by Brazilian learners of English with different levels of proficiency.

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APPENDICES

Appendix A

Material for Paragraph Reading Test

1 - The puppy

The child cried a lot when her mother told her her puppy had died. The little dog was killed by a car that passed by on the street. The girl prayed it could be alive but her father called a veterinarian and it was too late. She touched it for the last time and kissed him goodbye. Then, she slept in her father's arms.

2- A terrible day

George woke up late that day. He washed his face and brushed his teeth very quickly. He didn't have breakfast, but even so, he missed the bus. He wished so much he had a car! However, he had never saved enough money to buy one. He tried to take a cab, but he remembered there was a strike. So, lucky George walked fast to work. He worked hard that day and at the end of the day, his boss said that the company was going to be closed soon.

3 - Olympic Games

In Athens 2004, Brazil had the best performance in the Olympic Games ever. The male volleyball team played against the Italian team and won the gold medal for the second time. Many Brazilian families watched the game that Sunday morning. At the end, all Brazilians were very proud of their team. A number of Brazilian athletes helped Brazil to be ranked in 18^{th} place. Maybe the country could have reached 16^{th} place if the Brazilian marathonist had not been stopped by a mad guy. Then, Vanderlei Cordeiro de

Lima was the third. When he entered the stadium, the crowd cheered him with enthusiasm. The crazy guy was arrested but not judged guilty.

4 - September 11th

That was the day nine terrorists attacked the United States. The first and the second attacks happened in New York and the third one in Washington. Four planes were used in the attacks. The terrorists were mixed with the other passengers. They said they were linked to Osama Bin Laden. Many policemen and firemen risked their lives to save people. Everywhere people stopped and prayed for the victims. People who lived in New York were scared and afraid of new attacks. Many Brazilians changed their minds and moved back to Brazil after September 11th. After that the United States bombed Afghanistan and Iraq. They claimed it was an act to find and punish Bin Laden who, according to the American government, caused the war.. The government didn't accept arguments against the war although many people asked for a stop all over the world.

5 - Primitive people

This story is about an ancient culture in which people liked practicing different sports. Every year they planned what they were going to do and trained for the competitions. During the summer they climbed hills, jogged, rowed, golfed and surfed. In the winter, when it snowed, the women worked on handcraft while the men hunted and played ball games. When they won the game, they raised a flag with their left hand. As a tradition, the winner of the season got married on that day. After the ceremony, the tribe gathered together, talked, danced and laughed a lot.

6 - The robber

Yesterday, the police arrested a robber who used to spend some time watching an area before he mapped it. Ten days before, he camped near the house he intended to rob and studied the family's routine. Then, he waited till the moment the owners went out and jumped over the wall and broke into the house. He robbed all he could and shared with a friend. The police solved the case immediately because the guy was filmed by the safety system and then they found the campsite.

7 - Technology

Human society has searched for new technologies throughout time. In the beginning, men made fire of the wood. Some time later, they started to use stored food, which would be served throughout the years. With the development of electricity, human society has been dogged by the necessity of creating new things all the time. Interesting creations have been the lift and the stereo where the sound of the era could be heard. Nowadays, plugged to a computer, text can be filed and mailed everywhere instantly.

8 - Good Friends

Last Friday John went downtown and parked his car near the shopping center. Suddenly, he saw a man who looked like his friend Paul. John didn't expect to meet Paul there, but he crossed the street and called the guy. When the guy turned his head, John saw that, in fact, it was not Paul but a very old friend that had just arrived from a long trip around the world.

9 - Bus-driver

Mr. Smith learned to drive when he was 12. At a young age he became a bus-driver. One day the bus broke down. He slowed down, stopped the bus and the passengers left it. Mr. Smith phoned a mechanic. After half an hour, the mechanic came. He checked transmission and fixed it. When Mr. Smith realized that the time spent to fix the bus ranged from 3 to 5 minutes, he made an important decision: He decided he was going to take a course and learn how to fix engines. Nowadays, Mr. Smith owns a chain of fancy garages.

10 - Children

Peter and Helen are brother and sister. They generally play together but yesterday Peter got sick. He coughed whole night and when he woke up in the morning he couldn't go to school. He stayed in bed until his sister got back home from school. She thought he was asleep, so she passed near him and grabbed his sandwich. Peter screamed and their parents were miffed. They grasped both children's hands and took them to the dinner table. Peter's parents hoped he would be fine next morning and he was. However, the following day at school, Peter's teacher said he had skipped most of the activities during the last days he was sick. In fact, Peter got what he wanted: he loafed a lot at home while he was sick.

Appendix B

Material for Free Speech Test

Picture One

Picture Two

Picture Three

Picture Four

Appendix C

Participants' Profile Questionnaire

Universidade Federal de Santa Catarina
Centro de Comunicação e Expressão
Programa de Pós-Graduação em Inglês e Literatura Correspondente
Orientadora: Dra Rosana Denise Koerich
Mestranda: Fernanda Delatarre

Questionário

1) Idade _____ 2) Sexo ( ) M ( ) F

3) Em que ano você começou a estudar inglês? _____

4) Que idade você tinha na ocasião? _____

5) Você interrompeu seu estudo de inglês durante algum tempo? ( ) Sim ( ) Não. Caso você tenha interrompido seu estudo, no total, por quanto tempo você ficou parado ?

_____

6) Você já viveu em algum país de língua inglesa por mais de um mês?

( ) Sim ( ) Não. Se sua resposta for sim, diga qual é o país e o tempo que esteve lá.

_____

7) Se sua resposta a questão 6 for sim, você fez algum curso de inglês enquanto esteve lá? ( ) Sim ( ) Não

Nome: _____

Telefone: _____

Observação: em hipótese alguma o nome e telefone dos participantes desta pesquisa serão revelados. Solicito o nome e telefone para poder entrar em contato com os participantes e esclarecer possíveis dúvidas. As informações obtidas visam somente contribuir para a pesquisa desenvolvida no PPGI.
Obrigada por aceitarem participar da pesquisa.
Fernanda Delatorre

Termo de Aceitação

Eu, _____ (nome do participante) não tenho nenhuma objeção em participar deste estudo. Eu também estou ciente que meus dados pessoais não farão parte dos resultados finais de pesquisa.

_____
Assinatura do participante

Universidade Federal de Santa Catarina
Centro de Comunicação e Expressão
Programa de Pós-Graduação em Inglês e Literatura Correspondente
Orientadora: Dra Rosana Denise Koerich
Mestranda: Fernanda Delatarre

Questionnaire

1) Age _____ 2) Sex ( ) M ( ) F

3) When did you start studying English? _____

4) How old were you? _____

5) Did you stop studying English for such time? ( ) Yes ( ) No. If so, for how long did you stop?

_____

6) Have you ever lived in an English speaking country for more than one month? ( ) Yes ( ) No. If so, say the country and how much time you lived there.

_____

7) If your answer to question 6 is yes, say if you took an English course there. ( ) Yes ( ) No

Name: _____

Phone: _____

PS: Participants' names and phone numbers will not be mentioned anywhere. They are asked to get in contact with participants to solve some possible doubts. These data will contribute to the research developed by the student.
Thanks for helping me to carry out my research.
Fernanda Delatorre

Term of agreement

I, _____(participant's name) have no objection to participating in this study. I am aware that my name is not going to be mentioned in the researcher's final paper.

_____
Participant's signature

Appendix D

List of Words in each Paragraph

Paragraph one – The puppy

English word ending in -*ed*: cried, died, killed, passed, prayed, called, touched, kissed,

Total: 08

Contrastive words: child told, last, slept.

Total: 04

Paragraph two – A terrible day

English word ending in -*ed*: washed, brushed, missed, wished, saved, tried, walked, worked, closed.

Total: 09

Contrastive words: fast, hard, end.

Total: 03

Paragraph Three – Olympic Games

English word ending in -*ed*: played, watched, helped, ranked, reached, stopped, cheered, judged.

Total: 08

Contrastive words: best, gold, end, third.

Total: 04

Paragraph Four – September 11th

English word ending in *-ed*: used, mixed, linked, risked, stopped, prayed, lived, scared, changed, moved, bombed, claimed, caused, asked.

Total: 14

Contrastive words: third, act, find.

Total: 03

Paragraph Five – Primitive people

English word ending in *-ed*: liked, planned, trained, climbed, jogged, rowed, golfed, surfed, snowed, worked, played, raised, talked, danced, laughed.

Total: 15

Contrastive words: left, hand.

Total: 02

Paragraph Six – The robber

English word ending in *-ed*: used, mapped, camped, jumped, robbed, shared, solved, filmed.

Total: 08

Contrastive words: spend, friend, found.

Total: 03

Paragraph Seven – Technology

English word ending in *-ed*: searched, stored, served, dogged, plugged, filed, mailed.

Total: 07

Contrastive words: made, lift, sound, heard, text.

Total: 05

Paragraph Eight – Good friends

English word ending in -*ed*: parked, looked, crossed, called, turned.

Total: 05

Contrastive words: last, friend, head, fact, old, friend, just.

Total: 07

Paragraph Nine – Bus-driver

English word ending in -*ed*: learned, slowed, stopped, phoned, checked, fixed, ranged.

Total: 07

Contrastive words: left, made.

Total: 02

Paragraph Ten – Children

English word ending in -*ed*: coughed, stayed, passed, grabbed, screamed, miffed, grasped, hoped, skipped, loafed.

Total: 10

Contrastive words: bed, next, most, last, fact.

Total: 05

Appendix E

Outcomes from Free Speech Test – Picture Description

Participant 1

Picture one

There is a guy who was feeding the birds, there is a woman that was with a bird in her legs, there is a boy who was playing with a ball and there is a man .. there is a statue with a man hiding a horse.

Picture two

There is a woman who woke up in the morning and she tooks a breakfast and she took breakfast and then she played tennis and after that she took a shower.

Picture three

There was a car falling dawn the mountain. He couldn't make the … then the woman asked for help and another car call and the fire station. At the fire station a man asked phone and the woman was standing out of the car just waiting for the fireman. Then, the fireman came and there was little child … the doctor came and the woman … the doctor came to take care of the little baby who was at the car in the moment of the accident. Then they brought the children to the hospital and took care of him.

Picture four

The alarm clock rang and the boy woke up and he took breakfast, he eat bread and he drinks some milk, he drunk some milk. He was listening to the radio and drinking some milk. Then he … to cut onions and carrots and then the guy called someone and talked on the telephone. After that, he stay, stayed, he sat on the sofa and watched TV. After that, it was night and he put his pajamas and go to bed, and went to bed.

List of verbs: played, asked, asked, called, talked, stayed, watched.

Participant 2

Picture one

The boy played at with ball, played ball, the woman was talking with another woman, she was feeding the birds, the man, the man was feeding the birds too. The man, the man behind, the boy playing the ball is hiding a horse, He hode a horse, he played the ball, the woman talked with another and the woman fed the birds.

Picture two

The girl woke up and had her breakfast and then she played tennis and she took shower when she became … she went to the … her home.

Picture three

A family was going with, was going to Los Angeles and the car felt in a road and the mother desesparated she went to the road to ask somebody's help. And he stopped the car that was a man who called Bill and Bill say that they was a, they was going to be pilot. He phoned the doctor and the doctor went to the place that the woman suffered the accident and it was OK and nobody died but they was OK there.

Picture four

Richard woke up at 7 o'clock and he had his breakfast and he went to the work and instead of working he was listening to music and drinking coffee. At 12 p.m. started to cook and he calls his mother and she said "Oh, Bill, go here to my house" and he was. And then he was watching, he watched TV and went to the bed to started a very … to started another day.

List of verbs: played, played, played, talked, played, stopped, called, phoned, died, watched.

Participant 3

Picture one

I can see a little, on the bank, a little … two trees, horse, a man, a boy on the left is feeding the birds, two ladies sitting on the right side … one of them is feeding another bird. There is a boy passing a … I think he is running, making a physical fitness.

Picture two

On the left, the girl just woke up in the morning. Then she is having a breakfast, then she went to a tennis course to play some tennis and finally she is taking shower at home or apartment.

Picture three

Well, the picture number three, I think, let me see. The first picture, there is a car just a little of road. In the next picture, I think the driver was stopping someone else passing away to help. The third, the man on the second car …a phone call to the fire station. I think they called a doctor, why? Ah, it's because there is one … a person was hit maybe in an accident. In the last, they are in a hospital.

Picture four

It's 1 o'clock a.m. and there was … rang and the man woke up, he's getting his breakfast, watching the radio for the news, now he is preparing his salad, I think, talking on the phone, watching the TV and finally come back to the bed for sleeping, I think.

List of verbs: called.

Participant 4

Picture one

Two girls were talked about something sit on the … on the chair. One guy was feeding two birds. A boy was playing … a boss played with the ball. A man sit on the horse.

Picture two

A woman woke up very early. A girl drunk a coffee. A girl played with the ball. Some person taked … some person took a … took a shower in the bathroom.

Picture three

A woman drived the car. The woman tried to stop the car. The woman talked with the man into the car. A man called from fire station to somewhere. The woman stopped the car and go up .. went out. Two woman prepared the food in order to eat and after that.

Picture four

The boy woke up very early. The man ate a bread with a coffee. The man drank a coffee while he was listening the radio. The man … the man prepared the food. The man talked with the phone. A guy watched TV sit down on the sofa. The man mixed the clothes.

List of verbs: talked, played, played, tried, talked, called, stopped, talked, watched, mixed.

Participant 5

Picture one

In this picture we saw two woman who talked about their lives all the time. The boy gave food to the two birds, and another guy run away.

Picture two

This girl woke up early and as she always do, she had a breakfast, she "practaized" sports and after this she took a shower.

Picture three

The woman drove around the street when another woman stopped her car and asked for a right. And said that they needed to called the fire station. That woman parked her car.

So, number six, the girls did something in the mountains and seven, nurses took care of the babies.

Picture four

The guy woke up, had a breakfast, listened some songs on the radio, after this, he cooked his lunch, called some friends, watched TV, went back to the bed.

List of verbs: talked, stopped, asked, called, parked, cooked, called, watched.

Participant 6

Picture one

Yesterday, Paul was in a square with his mother. His mother was talking to Mss Helen and … feeding the birds, I think. There was two trees, a lot of roses, a beautiful garden and a bank. It was a wonderful day, I guess.

Picture two

Tina woke up at 7 and she was very tired because she is training, because she was … she was very tired because she was training a lot but not anymore. She took a breakfast on 8 hours and then she gone to the club to play with Martina Hings. And she … she arrived home at his house, at her house and took some shower. She is very nice.

Picture three

Mss Johnson was driving his child, his children to the school yesterday when she lost her car. Then she screamed for some help and a good guy helped her. Then … the fire station helped her and doctor had gone to them. Her children … now her children are good.

Picture four

Steve woke up … early and then he ate something, some coffee and a bread. Then he listened the radio and prepared some food. After he called to his mamma and then watched television. At night, he gone to bed, gone to bed, I think.

List of verbs: screamed, helped, helped, called, watched.

Participant 7

Picture one

A boy was running with a ball and a man was feeding chickens. Two womans are were ….two wamans were talking about their lives.

Picture two

Mary

Mary woke up at 9 a.m. She had her breakfast and she eat bread and coffee. She was dressing his …his clothes … her clothes to play tennis. So, she went to the club, she played tennis and afterwards she went to home to took a bath.

Picture three

A woman was driving in a road with her kids. So, his car, her car broken. She went to the road to somebody help her. So, a man stopped and called to the help service, a fire station. He called he called to fire station and to and he called to a doctor too. So, the doctor went at the place of accident and the kids were … and they take care, taked care the kids. The kids were at the hospital and two nurses are taking care of them.

Picture four

The Paul's routine

Paul woke up ate 7 o'clock, so he had his breakfast, he drunk a cup of, a cup of coffee and a piece of bread. So, until he was drinking his coffee, he heard the notice by the radio. So, afterwards he goes, went to his job and because he … he is … he works in a

restaurant. When he come, came back from his home, he watched TV and he went to be 10 o'clock.

List of verbs: played, stopped, called, called, called, called, watched

Participant 8

Picture one

One boy was playing with a ball and two old ladies talk, talked sitting on a bank. And another men are feeding the animals.

Picture two

A beautiful day

The girl woke up and say "Oh, it's a beautiful day". She gets to the kitchen and take a breakfast. Quicker breakfast because he needs to play tennis, play bad menton. Then, he played bad menton all the … she come home just at night very tired and go, and go, and went to the bathroom take a shower and sleep.

Picture three

It's raining a lot. It's very dangerous street. One woman was hiding her car when it broke. And one man pass and help her calling to the fire station. OK. They say. Latter we go there. When they go there, the doctor go there too. Two kids wasn't at the car had died because of the accident of the car.

Picture four

A normal day

John woke up early because he had a lot of things to do. He go to take a breakfast, great breakfast and latter listened a radio too during the breakfast. At 10 o'clock, he went to the kitchen and start preparing her lunch. He cut some onions and carrots and vegetarian food. Latter he called to her girlfriend just to say to her that she remember he she, he

remember him. OK. Latter he go to the … in front of the TV stay there for four hours just spending her time, spending his time. At 10 o'clock went to bedroom and sleep.

List of verbs: talked, played, died, called

Participant 9

Picture one

The guy was serving the birds in a park while your son played a soccer in a path. Your wife is waiting in a chair with her friends.

Picture two

The girl wake up like eight in the morning and went to eat something, your breakfast but because she need to go to play tennis but he didn't take a shower and she later probably lost your game.

Picture three

That night Mr. Julia is bringing your sons to your camping but she is stopped by another woman coming in the middle of the street and told about that have a fire in our house and she said you can help me and Mss Julia take the phone and call your fire station that can help. The fire station mans comes and help your songs went to the hospital to do another exams.

Picture four

The guy wake up and he went to breakfast and listen the radio to prepare your lunch and called your friend, watch, watched TV and after this, he went to your bad to sleep because another day is coming.

List of verbs: played, stopped, watched.

Participant 10

Picture one

I saw some birds in this picture and a guy who was giving the food to the birds. I can see two womans that was sited in the bank and another guy that was running across the park. I think this picture was in a park and have two trees and in the back of the park, there was a city.

Picture two

It was four squares and it was showing a day of a woman. First square, she was, wake up, in the second she was had breakfast, in the third, she was playing tennis and in the forty she was had a shower.

Picture three

It's seven squares. The first ones, was a car that was driving and he went out of the street in a "sandness". The second, a woman was asking a right to a car. The thirty the car stopped and was talking with the woman and the man of the car was calling to a mechanic, I think. In the forty, in the fire station, the fireman was talking to the man of the car of the picture 3. The square number five, the woman was in front of the car, I think it's the doctor cars, I don't know if somebody was hurt. In the square number six, the doctor was taking care with some kids, I think, I don't know. In the seventh, the fireman is talking about the kids that was in the car.

Picture four

It's a guy that was waking up in seven o'clock, it's early and he took his breakfast, and he listen the news, after he made the lunch, he was cutting some food, and after he was talking on the phone, after he was watching TV, sited in the sofa, and after he was going to bed.

List of verbs: stopped

Participant 11

Picture one

It was a small city, it looks like a small city, there was a statue of a horse and a horseman, and there was trees, there was a boy that was playing the ball. This guy gave food to the birds like these two woman talking on the bank, and that's it.

Picture two

It's a girl, it was a girl, he woke up, wake up in the morning then she took a … the breakfast and went to play tennis or squash, I don't know. And after to play squash she went to … to went home and to took a shower as well.

Picture three

A family was going to anywhere but in the middle of the way, the woman, who was driving, had an accident. She had children and she decided to went out the car and asked to help. She stopped a car who … that a man asked to help on the fire station. Then came the doctors and helped, helped the children and take them to the hospital.

Picture four

This guy don't have so much things to do. This day he went …. Wake up at 7 o'clock and the .. he eat the breakfast … and listened to the radio. After this he does the lunch and took like carrots and onion, I don't know, he talked on the telephone, watched TV and go again to the bed. That's it.

List of verbs: asked, stopped, asked, helped, helped, talked, watched.

Participant 12

Picture one

The boy played with the ball in a park. Two womans had sited and talking. One talked with the other woman and the woman heard the talk gave food to bird. The man had food to birds too. I don't know. This is picture one.

Picture two

A girl waked up early to go to gym. She had her breakfast with milk, coffee, bread and a lot of things. So he went to tennis classes and he practice a lot and after go back to home and take and took a shower.

Picture three

The woman were in road at her car fall the road. So, she returned to the road and stopped a car to help her. In the other car had a man and this man called a car security … but it … haven't asked. So he called the fire station and the people went to help her. So, she went to the hospital, the doctor left her at the hospital just to see if it's all right and … saw the babies talking what happen with her family.

Picture four

John wake up early. He dressed… and he dressed and had a breakfast in his office. So, after he went to his job and listen a radio and your break time and come back to his house and made a food, call to him friend, watch television and come back to him bedroom.

List of verbs: played, talked, stopped, called, asked, called, dressed, dressed.

Participant 13

Picture one

…is enjoying a park … I'm sorry, it's in the present. … was enjoying the park

Picture two

Jane's day

She wake up and had had a breakfast before she leave and took a shower.

Picture three

It's a woman who cause a car accident and then ask help for a guy who passed around.

Picture four

The day of John since woke up until he went to the bed again.

First, he woke up, after had a breakfast, and listened the radio, after he cooked some food, called his friend, watched TV news and finally he went bed.

List of verbs: passed, cooked, called, watched.

Participant 14

Picture one

In a Sunday morning Mark was playing ball in a garden and a man was feeding the birds and two wonans was talking about what happen in the week.

Picture two

Sally woke up and took her breakfast, then she went to a club to play tennis with a friend. When she finish she came back home and took a shower.

Picture three

A woman was traveling by a car with her family and she crash it. She could get out the car and she could stopped another car and ask for help. The man that she asked for help called, called the doctor and the doctor came to help them. The doctor took the family to hospital.

Picture four

Brian woke up at 6 a.m. yesterday. Victor called his girlfriend Saturday night. Daniels was listen to the radio, listened the news in the radio. Bruno made a dinner yesterday. Lucas was watching TV and Cláudio was having a lunch.

List of verbs: stopped, asked, called, called, called.

Participant 15

Picture one

There's many peoples. There's a woman put meal to the birds and other site I saw a man on the horse. In the street I saw a man … on the bank there is two woman talked.

Picture two

In the bedroom there was a woman put out her clothes. Next, was a woman drunk a coffee. Another picture a woman was played basketball. In the last pictures the woman was … was bed.

Picture three

The woman drove a car. Another woman started in front of the car. The woman stop a car and told with a man …the man talked in the phone. The woman walking near the car. Two wonans was in the beach. The nurses "salv" the … slept.

Picture four (not recorded)

List of verbs: talked, played, talked.

Participant 16

Picture one

There was a boy playing with a ball, there were two women talking, an statue of a man and a horse.

Picture two

Martha woke up and she took a breakfast, she played tennis and she took a bath.

Picture three

A car were over the street, a woman asked help from another car, a man called for help. In the fire station a fireman asked the phone. And there is a doctor. Picture six, a doctor helped a woman with a kid and in picture seven a man told a woman there were a kid in the hospital.

Picture four

Bob woke up, Bob took the breakfast, Bob listened the radio, Bob made food, Bob talked on the phone, Bob watched TV and Bobby went to the bed.

List of verbs: played, asked, called, asked, helped, talked, watched.

Participant 17

Picture one

In the picture I saw a guy who was hiding a horse, I saw other guy who was feeding a birds and two womans who spoke together and food bird, fooded birds and I saw two child who play with a ball.

Picture two

She woke in the morning and went to the chicken and got her breakfast and then he go, he went to the club and play tennis a lot. Then he got home and… decided to take a shower.

Picture three

There was a car crash and the woman stopped another car and they call, called the fire station for men and the doctor to request her and … the childrens. And now they are in a hospital.

Picture four

The man was… the man got up and had his breakfast with and … listened music and radio and news, I don't know. Then they make a food, made a food, call, called to friends, watched TV and after all the hard day he went to sleep.

List of verbs: played, stopped, called, called, watched.

Participant 18

Picture one

People was giving food to the birds.

Picture two

The girl woked up to play tennis. The she back to home and took a shower.

Picture three

An accident happens and a woman asked for help and a man call, than a man called to a .. to the fire station and the doctor came and they saved to the children that were in the car with the woman.

Picture four

The man woked up … and then the started to cook and after cooked, he started to watch television and then he sleep, he slept.

List of verbs: asked, called, saved, cooked.

Participant 19

Picture one

There was a man that was fooding … any… any birds. There were two woman that are talking, was, sorry, that were talking and a once that … was fooding a bird a … there was a boy that was running. There was many birds fooding.

Picture two

So, the girl, it means that the girl, picture A, the girl was … waking; picture B, the girl was breakingfast, no sorry. He was in a breakfast, she was drinking something, in picture C, the same girl was playing, I don't know, playing tennis, and picture D, the same girl was showing and there were many clothes in the bedroom.

Picture three

I think that the family was … was driving at the street and suddenly the car, the car dropped. The woman, the woman that was driving… stopped beside of the street and … and starting to get help to the others cars that crossing. On picture C, the woman was talking with … a person in his car… this person is a man that is talking with a service of emergence, I don't know. And picture D, they were in fire station, probably, the fireman were talking, are talking in the phone with the, the … the man that was helping the victims of the … accident. And picture E, there is, there was a doctor that was arriving the situation that occurred the accident. Number F, probably the doctor was helping the baby, who probably was… I don't know, that was sick, and number G, the baby was sleeping in a hospital.

Picture four

The man that was waking up and after he was in a breakfast … when… when he was drinking something, he was listening the radio. After he was cutting something, after he was … calling in the phone, after he was washing TV, I don't know what the program and after he was going to sleep.

List of verbs: dropped, stopped.

Participant 20

Picture one

I think this is a …. I forgot, It's a "praça". This is a man feeding the birds, two woman are sitting at a bank feeding the birds too. I saw a kid playing for ball. There is a statue with a man hiding a horse, some houses in the back … there are two trees and some clouds in the sky. It's a beautiful day!

Picture two

San is woking up after a long night, a long drinking night. He is with a …he is very tired. She takes a good breakfast and goes to the club to play tennis with his uncle. And there after the physic, they practice, I don't know, after the game, he took a shower to be … to be not … to not be smelling.

Picture three

Judie was driving … in a .. Judie was driving and he run out of the street and almost died. But he was… he couldn't go out of that place. She was stuck. Then she asked for help and stopped a car. The man who was, the man, John, was very attentions and called the firemans by the phone. The fireman asked the phone and immediately … go to that place and … send a doctor. They send a doctor. … is taking care of two childrens with another woman. The kids are Mary and James.

Picture four

This is Billy. He woke up every morning and he get very nervous with the clock. He take a breakfast with a lemonade and a hamburger, or something. And when he was still drinking the lemonade, he listened to the radio, he always listen to the Ramones by the morning, he wants to relax. He is a grate cooker. He like to make his own food. He don't like restaurants because they … he think they put poison on the food. He is shopping some onions and carrots and then she is, she is… she is no, he, Billy kids on the phone, he is talking with a girl … he's telling… at night I'm going to see television.

I don’t see “Fautão”. And then I’m going to bed because I ... I don’t want to go out with you. OK. Bye-bye.

List of verbs: died, asked, stopped, called, asked.

Participant 21

Picture one

There was two womans talking. There was a man giving food to the birds. There was a children running on the park and there was a man hiding a horse.

Picture two

In the first part, the girl woke up. In the second part, the girl was having breakfast, in the third part she was playing tennis and in the forty party she was taking a bath.

Picture three

In the first part, had an accident, the woman, who was driving the car, was saying for help. In the third part, she asked a man to call a police. In the fourth part, there was a police on the phone. In the fifth part, is a car of a doctor in the local. Six part, two womans with childrens that were in the accident. In the seven part, the childrens in the hospital.

Picture four

There was a guy woke up, second part, the guy was eating breakfast, the third part he is with the radio, the five part he is preparing the lunch, in the four part he is talking on the phone, in the five part he is watching television and in the finish he is going to sleep.

List of verbs: asked

Participant 22

Picture one

There were four people in the park. A boy was playing ball, the women were talking about birds and a young man was giving food for the birds

Picture two

Jane woke up very late. He, opa! She, she had her breakfast at 6 o'clock and then she went to club to play tennis. In the afternoon, she took a shower at her home.

Picture three

Sabrina had problem with her car and she called a man that were passing on the street. He called… he called to her husband and he saved her.

Picture four

John woke up at 7 o'clock and he ate bread and cheese for breakfast. Then he listened the radio, he made the lunch and called for some friends to have lunch with him. Then he watch TV and he studied a lot. John went to bed at 10 o'clock.

List of verbs: called, called, called, saved, called.

Participant 23

Picture one

There are four people in the picture …the place seems like a park in the city and there are couple of ladies sited down on a bank and they … they … gift food to birds and there are a man that gift food to birds and there are a boy that was playing a ball, a dark ball.

Picture two

There a woman, she woke up and taken a breakfast. After that she played tennis and … after play a tennis, she come back home and got a shower.

Picture three

A woman was driving her car when the car suffered and accident and she was with her child, children and so, she went to the round … to the street and asked for help, a man that had a phone called, called help by phone, and in … fire station some guy … the guy called a … some help and called to a friend in the fire station that asked for a doctor… go there in the accident and help the children and then the doctor arrived there and help the kitchen and … brought to a hospital.

Picture four

There are a guy and he woke up a 6 o' clock a.m. and she taking a breakfast, listened a radio and did … a lunch and called his girlfriend and after that he watched TV and back to his … in the end of the day and sleep again.

List of verbs: played asked, called, called, called, called, asked, called, watched.

Participant 24

Picture one

John was give some food to birds while these two girls were talking about the guy with the ball. This guy was playing with a ball.

Picture two

Tina was waking up and she ate some food and went to the tennis club. After that she took a shower.

Picture three

The girl was traveling in a road and she had problems with the car in a mountain. She runed after some help. A guy stopped at the road called to a fire station. Then, a doctor went there and helped a girl. Finally, a child went to the hospital and the policeman told the story to a woman.

Picture four

There About a routine of John. John woke up, did some breakfast, listened to radio, prepared a lunch, talked in the telephone, watched TV and went to sleep.

List of verbs: stopped, called, helped, talked, watched.

Participant 25

Picture one

The ladies was talking. The man was giving food to the birds. The boy was playing the ball.

Picture two

The girl was one was wake up. The girl two was taking her breakfast and drinking coffee. The girl two was playing tennis and she was wearing a skirt and a T-shirt. The other in the other picture was a people taking a shower.

Picture three

A girl was driving a car … but she, perhaps she was lost … Al right, had a continuation. The girl was driving and the one she was driving she saw a woman and the woman talk to… it's a woman. No. Let me start again.

The girl was driving and her car was broken and went to the street and stopped a man that was driving his car. So the man called to the to … I don't know. He call someone at the fire station. Oh, six is the other thing. Two ladies was in the camp … and they was having a picnic and seven was nurses taked care of babies.

Picture four

A boy was wake up. A man was eating a bread and drinking coffee. The boy… the man was listening the radio and drinking water. The boy was cooking and picked the vegetables. The man was taked the phone, was calling somebody. The other boy was watching TV. The other boy was sleeping, was going to the bed.

List of verbs: stopped, called, picked.

Participant 26

Picture one

There is a boy who was give food to bird and the right of the picture there are two girls talking and there is a boy running, I don't know, there isn't. And are four houses, one bird, two trees in the picture.

Picture two

Sally woke up at 6 a.m. She woke up the bed and … had breakfast and … eated .. no!, ate, ate bread and drink, drank, dranked coffee. After the breakfast, she went to the gym and played tennis. And… and in the end of the class, the tennis class, she went to home, came back to home and take a washe, took, taked a wash.

Picture three

I think picture three talk about an accident but I didn't understand the pictures.

Picture four

The guy woke up very early yesterday. He had breakfast and ate bread and drinked coffee. He was listened, listening, he was listening the radio and he listened your preferred music. He was cooking because he cooks very well. He turned on the TV, watch your favorite program and the day was finished, finished. And he go to be and sleep, slept a lot.

List of verbs: played, turned on.

Appendix F

Transcription of Words Ending in *-ed* – Paragraph Reading Test

Two-member clusters

Transcription of English verbs ending in stop-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
stopped /pt/	[stɔped]	[stɔped]	[stɔped]	[stɔpid]
stopped /pt/	[stɔped]	[stɔped]	[stɔpet]	[stɔpt]
stopped /pt/	[stɔpe]	[stɔped]	[stɔped]	[stɔped]
mapped /pt/	[mæpəɾ]	[mæpəɾ]	[mæp]	[mɛped
hopped /pt/	[hoʊpt]	[hoʊpt]	[huped]	[hoʊpt]
skipped /pt/	[skript]	[skɪpt]	[skɪpəd]	[skaɪped]
robbed /bd/	[rɔbəd]	[roʊbed]	[rɔbed]	[robed]
grabbed /bd/	[gɾæmbed]	[græbəd]	[greɪbed]	[græbed]
walked /kt/	[wɔlked]	[wɔlked]	[wɔked]	[wɔlked]
talked /kt/	[tɔlkəd]	[tɔlked]	[tɔkt]	[tɔlked]
liked /kt/	[laɪkt]	[likt]	[laɪked]	[laɪked]
looked /kt/	[lʊkt]	[lʌked]	[lʊked]	[lʊked]
checked /kt/	[tʃɛkt]	[ʃɛked]	[tʃɛke]	[tʃɛked]
jogged /gd/	[dʒʌdz]	[dʒɔged]	[dʒɔged]	[dʒɔgd]
dogged /gd/	[dɔdʒied]	[dɔgt]	[dɔged]	[dɔgd]
plugged /gd/	[plʌgedʒ]	[plʌgʒɛt]	[plʌgd]	[plʌged]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
stopped /pt/	[stɔped]	[stɔped]	[stɔpəd]	[stɔpɪd]
stopped /pt/	[stɔped]	[stɔped]	[stɔpəd]	[stɔpɪd]
stopped /pt/	[stɔped]	[stoʊped]	[stɔped]	[stɔp]
mapped /pt/	[meɪped]	[mæpəɾ]	[meɪped]	[meɪpəɾ]
hopped /pt/	[hoʊped]	[hoʊped]	[hoʊpəd]	[hoʊped]
skipped /pt/	[skɪped]	[skɪped]	[skɪped]	[skɪped]
robbed /bd/	[rɔbɪrɛd]	[robed]	[robɪt]	[rɔbed]
grabbed /bd/	[rɔbed]	[grɛbeʒ]	[græbɪd]	[grɑbed]
walked /kt/	[wɔlked]	[wɔlked]	[wɔlkɪd]	[wɔlkɪd]
talked /kt/	[tɔlked]	[tɔkt]	[tɔlked]	[tɔlk]
liked /kt/	[laɪked]	[laɪkt]	[laɪked]	[laɪkɪd]
looked /kt/	[lʊked]	[lʊked]	[lʊkete]	[lʊked]
checked /kt/	[tʃɛked]	[tʃɛkt]	[tʃɛked]	[tʃɛkt]
jogged /gd/	[dʒoʊdʒɛd	[dʒɔged]	[dʒɔged]	[dʒɔged]
dogged /gd/	[dɔged]	[dɔgd]	[dɔdʒ]	[dɔdʒied]
plugged /gd/	[plʌged]	[plʌged]	[plʌdʒɪd]	[plʌged˺]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
stopped /pt/	[stɔped]	[stɔped]	[stɔped]	[stɔped]
stopped /pt/	[stɔpɪ]	[stɔp]	[stɔped]	[stɔp]
stopped /pt/	[stɔped]	[stɔp]	[stɔped]	[stɔp]
mapped /pt/	[mæped]	[mæpeɾ]	[mæped]	[mæped]
hopped /pt/	[hoʊped]	[hoʊped]	[hʊped]	[hoʊped]
skipped /pt/	[skɪped]	[skɪped]	[skɪpet]	[skɪpet]
robbed /bd/	[rʌbed]	[hʌbed]	[robet]	[roʊbet]
grabbed /bd/	[græbɪd]	[greɪmbəd]	[græbed]	[græbed]
walked /kt/	[wɔlkəd]	[wɔlk]	[wɔlked]	[wɔlk]
talked /kt/	[tɔlked]	[tɔked]	[tawket]	[tɔlked]
liked /kt/	[laɪk]	[laɪk]	[laɪked]	[laɪked]
looked /kt/	[lʊked]	[lʊked]	[lʊked]	[lʊkət]
checked /kt/	[tʃɛked]	[tʃɛked]	[tʃɛked]	[tʃɛk]
jogged /gd/	[dʒʌgəd]	[dʒɔged]	[dʒɔget]	[dʒʌged]
dogged /gd/	[dʌged]	[dɔged]	[dɔged]	[dɔdʒied]
plugged /gd/	[pluged]	[pluged]	[pluged]	[plʌged]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
stopped /pt/	[stɔped]	[stɔped]	[stɔped]	[stoʊped]
stopped /pt/	[stɔped]	[stɔped]	[stɔped]	[stɔped]
stopped /pt/	[stɔpt]	[stɔped]	[stɔpɪŋ]	[stɔpeɾe]
mapped /pt/	[mæped]	[meɪped]	[meɪped]	[meɪpeɾ]
hopped /pt/	[hoʊped]	[hoʊped]	[hoʊped]	[hoʊped]
skipped /pt/	[ʃiped]	[skɪped]	[kiped]	[skaɪpɛd]
robbed /bd/	[robed]	[rɔbed]	[rɔbet]	[robeɾe]
grabbed /bd/	[græbɪt]	[græbe]	[græbet]	[gæbɛd]
walked /kt/	[wɔlkɪd]	[wɔlked]	[wɔlked]	[wɔlked]
talked /kt/	[tɔlked]	[tawked]	[tɑʊki]	[tɔlke]
liked /kt/	[laɪked]	[laɪked]	[laɪki]	[laɪkəd]
looked /kt/	[lʊked]	[lʊked]	[lʊked]	[lɔked]
checked /kt/	[tʃɛked]	[ʃɛke]	[tʃɛke]	[tʃɛket]
jogged /gd/	[dʒoged]	[dʒʌdʒ]	[dʒɔdʒied]	[dʒɔged]
dogged /gd/	[dɔged]	[dʒʌdʒ]	[dʌdʒied]	[doʊged]
plugged /gd/	[pluged]	[pludʒ]	[pluget]	[plʌged]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
stopped /pt/	[stɔped]	[stɔped]	[stɔped]	[stɔpt]
stopped /pt/	[stɔped]	[stɔped]	[stɔped]	[stɔp]
stopped /pt/	[stɔpi]	[stɔpidid]	[stɔp]	[stɔpi]
mapped /pt/	[mæped]	[mɑped]	[mæpet]	[mæp]
hopped /pt/	[hoʊpəd]	[hoʊpt]	[hoʊped]	[hoʊped]
skipped /pt/	[skipet]	[skipt]	[skipt]	[skɪpɪŋ]
robbed /bd/	[robe]	[rɔbet]	[rɔbɛt]	[rɔbed]
grabbed /bd/	[grɛbɛt]	[græbd]	[græbed]	[græbed]
walked /kt/	[wɔlked]	[wɔlked]	[wɔlked]	[wɔlked]
talked /kt/	[tɔlked]	[tawket]	[tɑlked]	[tɔlked]
liked /kt/	[laɪket]	[laɪkedə]	[laiked]	[laɪket]
looked /kt/	[lʊked]	[lʊked]	[lʊkt]	[lʊked]
checked /kt/	[ʃɛked]	[tʃɛked]	[tʃɛke]	[tʃɛk]
jogged /gd/	[dʒɔged]	[dʒogəd]	[dʒoget]	[dʒɔged]
dogged /gd/	[dɔged]	[dɔgedʒ]	[dɔgd]	[dɔged]
plugged /gd/	[plugede]	[pluget∫i]	[plʌgdə]	[pluged]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
stopped /pt/	[stɔped]	[stɔpt]	[stɔped]	[stɔped]
stopped /pt/	[stɔped]	[stɔpt]	[stɔped]	[stɔped]
stopped /pt/	[stɔpt]	[stɔpt]	[stɔp]	[stɔp]
mapped /pt/	[meɪped]	[meɪped]	[meɪped]	[mæped]
hopped /pt/	[hoʊped]	[hoʊpi]	[hoʊped]	[hoʊped]
skipped /pt/	[skɪped]	[skɪpt]	[skɪpet]	[skɪp]
robbed /bd/	[robed]	[rɔbəd]	[rɔbəd]	[rɔbd]
grabbed /bd/	[græbed]	[græbed]	[græbed]	[græbed]
walked /kt/	[wowked]	[wɔkt]	[wowkt]	[wɔlked]
talked /kt/	[tawked]	[tɔkt]	[towked]	[tɔlket]
liked /kt/	[laɪked]	[laɪkt]	[laɪked]	[laɪked]
looked /kt/	[lʊked]	[lʊkti]	[lʊked]	[lʊked]
checked /kt/	[ʃɛked]	[tʃɛkt]	[tʃɛked]	[tʃɛkt]
jogged /gd/	[dʒʌdʒed]	[dʒɔged]	[dʒoged]	[dʒɔged]
dogged /gd/	[dɔged]	[dɔgdʒ]	[dɔged]	[dɔgd]
plugged /gd/	[plʌged]	[plʌge]	[plugi]	[plʌge]

VERB	Participant 25	Participant 26
stopped /pt/	[stɔped]	[stɔped]
stopped /pt/	[stɔped]	[stɔped]
stopped /pt/	[stɔpet]	[stɔpedid]
mapped /pt/	[meɪped]	[mæped]
hopped /pt/	[hoʊped]	[hoʊpɛt]
skipped /pt/	[skɪped]	[skɪpɛt]
robbed /bd/	[robed]	[rɔbet]
grabbed /bd/	[geɪbed]	[grɑbed]
walked /kt/	[wɔlked]	[wɔlket]
talked /kt/	[tɑlked]	[tɔlked]
liked /kt/	[laɪked]	[laɪkt]
looked /kt/	[lʊked]	[lʊked]
checked /kt/	[tʃɛked]	[tʃɛked]
jogged /gd/	[dʒʌdʒ]	[dʒɔged]
dogged /gd/	[dʌdʒd]	[dɔged]
plugged /gd/	[plʌget]	[plʌged]

Transcriptions of English verbs ending in fricative-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
laughed /ft/	[lɔfɪd]	[lɔf]	[lɔf]	[lɔfed]
coughed /ft/	[kɔtʃied]	[kɔted]	[kɔf]	[kɔlt]
miffed /ft/	[mɪfed]	[mɪfɛt]	[maɪfed]	[mɪfed]
loafed /ft/	[loʊfed]	[loʊft]	[lɔfed]	[lʌft]
saved /vd/	[seɪv]	[seɪvɪ]	[seɪved]	[seɪvd]
lived /vd/	[lɪv]	[liv]	[livd]	[livd]
moved /vd/	[muv]	[muved]	[muved]	[muvd]
passed /st/	[pæs]	[pæsed]	[pæsəd]	[pæsəd]
passed /st/	[pæsed]	[pæsed]	[pɑsed]	[pæsed]
kissed /st/	[kɪst]	[kɪsed]	[kɪsed]	[kɪsəd]
missed /st/	[mɪs]	[mɪzed]	[mɪsəd]	[mɪsəd]
crossed /st/	[krɔst]	[krɔst]	[krɔsed]	[krɔsed]
closed /zd/	[kloʊzed]	[kloʊzed]	[kloʊzed]	[kloʊz]
used /zd/	[juzd]	[juzed]	[juzəd]	[juzd]
used /zd/	[juzd]	[juzed]	[juzed]	[juzəd]
caused /zd/	[kaʊzd]	[kɔz]	[kouzed]	[kɔz]
raised /zd/	[reɪzd]	[reɪzed]	[reɪzed]	[reɪz]
washed /ʃt/	[wɔʃɪ]	[wɔʃed]	[wɔʃed]	[wɔʃed]
brushed /ʃt/	[brʌʃɪ]	[brʌʃed]	[brʌʃed]	[brʌʃ]
wish /ʃt/	[wɪʃed]	[wɪʃed]	[wɪʃt]	[wɪʃed]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
laughed /ft/	[lɔfed]	[lɔfeɾ]	[lɔʊef]	[lɔf]
Coughed /ft/	[kɔgəd]	[kɔft]	[kɔt]	[koʊd]
miffed /ft/	[mɪfed]	[mɪfed]	[mɪfet]	[mɪf]
loafed /ft/	[lʊfɛd]	[loʊfed]	[loʊfed]	[loʊfed]
saved /vd/	[seɪved]	[seɪved]	[seɪved]	[seɪved]
lived /vd/	[lɪved]	[lɪved]	[lɪvɪd]	[lɪvd]
moved /vd/	[muved]	[muved]	[muved]	[muv]
passed /st/	[pæsed]	[pæsed]	[pɑsed]	[pɑsɪd]
passed /st/	[pæsed]	[pæse]	[pæsed]	[pæs]
kissed /st/	[kɪsed]	[kɪst]	[kɪsed]	[kɪs]
missed /st/	[mɪsed]	[mɪst]	[mɪsed]	[mɪs]
crossed /st/	[krɔsed]	[krɔs]	[krɔsed]	[krɔs]
closed /zd/	[kloʊzed]	[kloʊd]	[kloʊz]	[kloʊzed]
used /zd/	[juzed]	[juzed]	[juzed]	[juz]
used /zd/	[juzd]	[juzd]	[juzed]	[juzɪd]
caused /zd/	[kaʊzed]	[kɔzed]	[kaʊzed]	[kaʊzd]
raised /zd/	[raɪzed]	[raɪz]	[[reɪzed]	[reɪz]
washed /ʃt/	[wɔʃed]	[wɔʃed]	[wɔʃed]	[wɔʃed]
brushed /ʃt/	[brʌʃed]	[brʌʃed]	[brʌʃed]	[brʌʃɪd]
wish /ʃt/	[wɪʃed]	[wɪʃed]	[wɪʃed]	[wɪʃed]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
laughed /ft/	[laud]	[lɔged]	[laʊfed]	[lɔfe]
Coughed /ft/	[koʊdʒied]	[kɔtʃt]	[kɔʊded]	[kɔ]
miffed /ft/	[mɪfed]	[mɪfed]	[mɪfet]	[mɪfedʒ]
loafed /ft/	[lɔfed]	[lʌfet]	[loʊfed]	[loʊfet]
saved /vd/	[seɪved]	[seɪvd]	[seɪved]	[seɪvəd]
lived /vd/	[lɪvəd]	[lɪvəd]	[lɪved]	[lɪvd]
moved /vd/	[muved]	[muvd]	[muved]	[muved]
passed /st/	[peɪsed]	[pæst]	[pæsed]	[pæsəd]
passed /st/	[pæst]	[pæst]	[pæsed]	pæsed]
kissed /st/	[kɪsed]	[kɪs]	[kɪsed]	[kɪsed]
missed /st/	[mɪsed]	[mɪsɪz]	[mɪsed]	[mɪst]
crossed /st/	[krɔs]	[krɔs]	[krɔsed]	[kroʊz]
closed /zd/	[kloʊd]	[kloʊz]	[kloʊzed]	[kluzed]
used /zd/	[juz]	[juz]	[juzed]	[juz]
used /zd/	[juzd]	[juzd]	[juzed]	[juzed]
caused /zd/	[kaʊzd]	[keɪzed]	[kaʊzed]	[kaʊz]
raised /zd/	[raɪzd]	[reɪzed]	[reɪzed]	[reɪzed]
washed /ʃt/	[wɔʃed]	[wɔʃe]	[wɔʃed]	[wʌʃed]
brushed /ʃt/	[brʌʃed]	[brʌʃe]	[brʌʃe]	[brʌʃed]
wish /ʃt/	[wɪʃed]	[wɪʃed]	[wɪʃed]	[wɪʃed]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
laughed /ft/	[lɔfe]	[laʊʒed]	[laʊde]	[laʊɾed]
Coughed /ft/	[kɔtʃied]	[kaʊʒed]	[koʊtʃied]	[kaʊdʒ]
miffed /ft/	[mɪfed]	[mɪfed]	[mɪfɛt]	[mɪfɛd]
loafed /ft/	[lɔft]	[lɔfed]	[loʊfed]	[loʊfɛd]
saved /vd/	[seɪved]	[seɪved]	[seɪved]	[seɪved]
lived /vd/	[lɪvdi]	[lɪvd]	[lɪvɪd]	[lɪvɪd]
moved /vd/	[muved]	[muv]	[muved]	[muved]
passed /st/	[pɑsed]	[pæs]	[pæsed]	[pæsed]
passed /st/	[pæsed]	[pæsed]	[pæst]	[pæse]
kissed /st/	[kɪse]	[kɪsed]	[kɪsed]	[kɪsed]
missed /st/	[mɪsed]	[mɪsed]	[mɪsed]	[mɪsɛd]
crossed /st/	[krosed]	[kroʊsed]	[kroʊset]	[kroʊsed]
closed /zd/	[kloʊze]	[kloʊzed]	[kloʊzed]	[kloʊz]
used /zd/	[juzd]	[juze]	[juze]	[juzɪdə]
used /zd/	[juzed]	[juzed]	[uzid]	[juzd]
caused /zd/	[kaʊzed]	[kaʊzd]	[kaʊzen]	[kɔʊzed]
raised /zd/	[raɪzed]	[raɪzed]	[raɪzed]	[reɪzɛd]
washed /ʃt/	[wɔʃte]	[wɔʃed]	[wɔʃed]	[wɔʃɛd]
brushed /ʃt/	[brʌʃt]	[brʌʃed]	[bruʃed]	[brʌʃɛed]
wish /ʃt/	[wɪʃed]	[wɪʃed]	[wɪʃet]	[wɪʃɛd]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
laughed /ft/	[laʊdeɾ]	[lɔt]	[laʊted]	[lɔft]
Coughed /ft/	[kaʊged]	[kotʃied]	[kaʊted]	[kɔf]
miffed /ft/	[mɪfet]	[mɪfed]	[mɪfed]	[mɪfed]
loafed /ft/	[ləfet]	[lɔftɪ]	[lʊft]	[loʊfed]
saved /vd/	[seɪvə]	[seɪft]	[seɪved]	[seɪved]
lived /vd/	[lɪvə]	[lɪvɪdə]	[lived]	[lɪvd]
moved /vd/	[muve]	[muvedʒi]	[muved]	[muved]
passed /st/	[pɑsed]	[pæst]	[pæsed]	[pæs]
passed /st/	[pæse]	[pæst]	[pæsed]	[pæst]
kissed /st/	[kɪsed]	[kɪst]	[kɪsed]	[kɪs]
missed /st/	[mɪsed]	[mɪsti]	[mɪsed]	[mɪsed]
crossed /st/	[krɔse]	[krɔsid]	[krɔsed]	[krɔsed]
closed /zd/	[kloʊzed]	[kloʊzet]	[kloʊzed]	[kloʊzed]
used /zd/	[juz]	[juzed]	[juzed]	[juzed]
used /zd/	[juzd]	[juzd]	[juzd]	[juzed]
caused /zd/	[kaʊzd]	[kaʊzd]	[kaʊz]	[kaʊzed]
raised /zd/	[raɪzed]	[reɪzəd]	[reɪzd]	[reɪzed]
washed /ʃt/	[wɔʃed]	[wɔʃed]	[wɔʃed]	[wɔʃed]
brushed /ʃt/	[brəʃed]	[brʌʃed]	[brʌʃed]	[brʌʃed]
wish /ʃt/	[wɪʃed]	[wɪʃed]	[wɪʃed]	[wɪʃed]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
laughed /ft/	[laʊged]	[lɛft]	[lɔft]	[lɔft]
coughed /ft/	[koʊdid]	[kɔtʃed]	[kaued]	[kʊked]
miffed /ft/	[mɪf]	[mɪfed]	[mɪfed]	[mɪfed]
loafed /ft/	[loʊfed]	[loʊft]	[lɔfed]	[loʊfed]
saved /vd/	[seɪved]	[seɪvd]	[seɪvd]	[seɪved]
lived /vd/	[lɪvi]	[lɪvd]	[lɪved]	[lɪved]
moved /vd/	[muv]	[muved]	[muved]	[muved]
passed /st/	[peɪsed]	[pɑsed]	[pæsed]	[pæsed]
passed /st/	[pæsed]	[pæst]	[pæsed]	[pæsed]
kissed /st/	[kɪsɪ]	[kɪst]	[kɪsed]	[kɪst]
missed /st/	[mɪsed]	[mɪste]	[mɪsed]	[mɪs]
crossed /st/	[krɔsed]	[krɔsed]	[kroʊsed]	[krɔsed]
closed /zd/	[kloʊz]	[kloʊ]	[kloʊzed]	[kloʊzed]
used /zd/	[juzed]	[juzd]	[juzed]	[juzed]
used /zd/	[juzd]	[juzd]	[juzd]	[juzed]
caused /zd/	[kaʊzed]	[kɔz]	[kaʊzed]	[kaʊzed]
raised /zd/	[reɪzed]	[reɪzd]	[reɪzed]	[reɪzd]
washed /ʃt/	[wɔʃed]	[wɔʃt]	[wɔʃed]	[wɔʃed]
brushed /ʃt/	[brʌʃed]	[brʌʃt]	[brʌʃed]	[brʌʃed]
wish /ʃt/	[wɪʃed]	[wɪʃ]	[wɪʃed]	[wɪʃed]

VERB	Participant 25	Participant 26
laughed /ft/	[lɛft]	[laʊɾed]
coughed /ft/	[kɔtʃ]	[kaʊed]
miffed /ft/	[mɪfed]	[mɪfɛd]
loafed /ft/	[lofed]	[lɔfɛd]
saved /vd/	[seɪved]	[sɛved]
lived /vd/	[lɪvɪd]	[lɪved]
moved /vd/	[muved]	[mʊved]
passed /st/	[pɑsed]	[pæsed]
passed /st/	[pæsed]	[pæsed]
kissed /st/	[kɪsed]	[kɪsed]
missed /st/	[mɪsed]	[mɪsed]
crossed /st/	[krɔsed]	[krɔsed]
closed /zd/	[kloʊzed]	[kloʊzed]
used /zd/	[juzed]	[juzed]
used /zd/	[juzed]	[juzed]
caused /zd/	[kaʊzed]	[kaʊz]
raised /zd/	[reɪzed]	[raɪzed]
washed /ʃt/	[wɔʃed]	[wɔʃed]
brushed /ʃt/	[brʌʃed]	[brʌʃed]
wish /ʃt/	[wɪʃed]	[wɪʃed]

Transcription of English verbs ending in affricate-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
touched /tʃt/	[tʌtʃiet]	[tɔtʃ]	[tʌtet]	[toʊtʃit]
watched /tʃt/	[wɔtʃied]]	[wɔtʃed]	[wɔtʃ]	[wɔtʃ]
reached /tʃt/	[riʃard]	[ritʃied]	[ritʃied]	[ritʃied]
judged /dʒd/	[dʒʌdied]	[dʒʌdʒied]	[dʒʌdʒied]	[dʒʌdʒied]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
touched /tʃt/	[tʌtʃied]	[tɔtʃiet]	[tʌtʃet]	[tɔtʃied]
watched /tʃt/	[wɔtʃied]	[wɔtʃed]	[wɔtʃed]	[wɔtʃed]
reached /tʃt/	[ritʃɛd]	[ritʃed]	[risɪdʒ]	[ritʃt]
judged /dʒd/	[dʒʌdʒied]	[dʒʌdʒied]	[dʒʌdʒied]	[dʒʌdʒ]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
touched /tʃt/	[toʊt]	[tɔtʃi]	[toʊtʃed]	[tʌtʃ]
watched /tʃt/	[wɔtʃed]	[wɔtʃs]	[wɔtʃs]	[wɔtʃied]
reached /tʃt/	[ritʃied]	[ritʃiet]	[ritʃed]	[ritʃied]
judged /dʒd/	[dʒudʒed]	[ʒudʒ]	[dʒud]	[dʒʌdʒed]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
touched /tʃt/	tɔʃed]	[tʌtʃed]	[tuʃ]	[tɔtʃied]
watched /tʃt/	[wɔʃed]	[wɔtʃed]	[wɔtʃe]	[wɔtʃed]
reached /tʃt/	[ritʃed]	[riʃed]	[ritʃet]	[ritʃɛd]
judged /dʒd/	[dʒuged]	[dʒʌdied]	[dʒudʒied]	[dʒʌd]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
touched /tʃt/	ttɔʃied̆]	[tɔtʃiet]	[taʊted]	[tʌtʃed]
watched /tʃt/	[wɔtʃed]	[wɔtʃed]	[wɑtʃed]	[wɔtʃed]
reached /tʃt/	[ritʃedə]	[ritʃed]	[ritʃied]	[ritʃied]
judged /dʒd/	[dʒdʒied]	[dʒʌdi̲ʒied]	[dʒʌdʒied]	[dʒʌdʒied]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
touched /tʃt/	[tʌtʃied]	[tʌtʃ]	[tɔtʃiet]	[tʌtetʃ]
watched /tʃt/	[wɔtʃed]	[wɔtʃt]	[wɔtʃ]	[wɔtʃ]
reached /tʃt/	[ritʃt]	[ritʃiet]	[ritiʃed]	[ritʃed]
judged /dʒd/	[dʒʌdʒied]	[dʒʌdʒied]	[dʒʌdʒd]	[dʒʌdiʒed]

VERB	Participant 25	Participant 26
touched /tʃt/	[tʌtʃied]	[taʊtʃiet]
watched /tʃt/	[wɔtʃed]	[wɔtʃed]
reached /tʃt/	[riʃed]	[ritʃed]
judged /dʒd/	[dʒudget]	[dʒudʒied]

Transcription of English verbs ending in nasal-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
bombed /md/	[boʊmbed]	[boʊmbed]	[boʊmbed]	[boʊmbd]
climbed /md/	[klaɪmb]	[klaɪmbed]	[klaɪmed]	[klɪmd]
claimed /md/	[klaɪmd]	[kleɪm]	[klaɪməd]	[kleɪmd]
screamed /md/	[skrɛmd]	[skrimz]	[skrimd]	[skrimd]
planned /nd/	[plɛin]	[pleɪn]	[plɛned]	[plænd]
trained /nd/	[treɪn]	[treɪn]	[trɛned]	[treɪnd]
phoned /nd/	[foʊn]	[foʊnd]	[founed]	[foʊnd]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
bombed /md/	[bombed]	[boʊmbed]	[boʊmbed]	[boʊbɪd]
climbed /md/	[[klaɪmbed]	[klaɪmbed]	[klimbed]	[kleɪmbɪd]
claimed /md/	[kleɪmed]	[kleɪmed]	[kleɪmɪd]	[klæmd]
screamed /md/	[skrimed]	[skrimd]	[skrɛmed]	[skrimed]
planned /nd/	[plæned]	[plænd]	[plæned]	[plænd]
trained /nd/	[trɛned]	[treɪnd]	[treɪnɪd]	[treɪnd]
phoned /nd/	[foʊned]	[foʊned]	[fɔned]	[foʊn]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
bombed /md/	[boʊmbed]	[bɔmbd]	[boʊmbed]	[boʊmbed]
climbed /md/	[klaɪmed]	[klemd]	[klaɪmbet]	[klaɪmd]
claimed /md/	[klɛmd]	[klɛməd]	[kleɪmed]	[klɛm]
screamed /md/	[skrimed]	[skrimed]	[skrɛmed]	[skrimed]
planned /nd/	[plæned]	[plɛn]	[plɛned]	[plɛned]
trained /nd/	[treɪn]	[treɪnd]	[trened]	[treɪnd]
phoned /nd/	[fɔned]	[fɔned]	[foʊned]	[foʊn]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
bombed /md/	[boʊmbed]	[boʊmbed]	[boʊmbed]	[boʊmbɪt]
climbed /md/	[klaɪmed]	[klaɪm]	[klaɪmbed]	[klɪmbed]
claimed /md/	[klɛmed]	[kleɪmed]	[klaɪmed]	[klɛmd]
screamed /md/	[skrimed]	[skrimed]	[skrimed]	[skrimɛd]
planned /nd/	[plɛnəd]	[plɛned]	[plʌned]	[plɛned]
trained /nd/	[trened]	[treɪned]	[traɪned]	trenəd]
phoned /nd/	[fɔned]	[foʊne]	[fɔne]	[fonɛd]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
bombed /md/	[boʊmbed]	[boʊmbed]	[boʊmbed]	[boʊmbed]
climbed /md/	[klɪmbez]	[klaɪmbed]	[klimbed]	[klaɪmed]
claimed /md/	[keɪmed]	[klɛmedə]	[klɛmed]	[kleɪmed]
screamed /md/	[skrimed]	[skrimd]	[skrimed]	[skrimed]
planned /nd/	[plene]	[plæned]	[plæned]	[plæned]
trained /nd/	[trened]	[treɪnd]	[trened]	[trene]
phoned /nd/	[fond]	[fɔnd]	[foʊned]	[foned]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
bombed /md/	[boʊmbed]	[bʊumbd]	[boʊmbed]	[boʊmbed]
climbed /md/	[klaɪmed]	[klaɪmd]	[klaɪmbed]	[kleɪmbed]
claimed /md/	[klemed]	[kleɪm]	[kleɪmed]	[kleɪmed]
screamed /md/	[skrimd]	[skrimәd]	[skrimed]	[skrimed]
planned /nd/	[plæn]	[plænd]	[plænet]	[plænd]
trained /nd/	[treɪned]	[treɪnd]	[trened]	[trened]
phoned /nd/	[foʊn]	[foned]	[foned]	[foned]

VERB	Participant 25	Participant 26
bombed /md/	[boʊmbed]	[boʊmbed]
climbed /md/	[klaɪmbed]	[kleɪmbed]
claimed /md/	[klaɪmed]	[klɛmed]
screamed /md/	[skrimɪd]	[skrimed]
planned /nd/	[plæned]	[plæned]
trained /nd/	[treɪnd]	[treɪned]
phoned /nd/	[foned]	[fɔned]

Transcription of words ending in liquid-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
killed	[kɪld]	[kɪled]	[kɪld]	[kɪwd]
called	[kɔld]	[kɔld]	[kɔld]	[kɔw]
called	[kɔwd]	[kawd]	[kɔld]	[kɔwde]
filed	[faild]	[fiwd]	[faɪld]	[fɪwd]
mailed	[meɪd]	[maɪɪled]	[meɪld]	[meɪld]
cheered	[ʃɛred]	[tʃindʒ]	[ʃɛrd]	[tʃird]
scared	[skɛrd]	[skerd]	[skɛrdˀ]	[skerɪd]
shared	[ʃɛred]	[ʃɛrɛd]	[ʃɛr]	[ʃɛred]
stored	[stɔred]	[stɔr]	[stɔrd]	[stɔrd]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
killed	[kɪled]	[kɪl]	[kɪled]	[kiwd]
called	[koled]	[kɔld]	[kɔlɪd]	[kɔw]
called	[koled]	[kɔld]	[kɔlɪd]	[kɔl]
filed	[faɪld]	[faɪwd]	[faɪn]	[faɪld]
mailed	[meɪld]	[meɪld]	[meɪld]	[meɪld]
cheered	[tʃirɛd]	[tʃired]	[ʃərd]	[ʃərid]
scared	[skæred]	[skærdʒi]	[skæred]	[skærd]
shared	[ʃɛred]	[ʃɛred]	[ʃɛred]	[ʃɛrd]
stored	[stɔr]	[stɔre]	[stɑred]	[stɔrd]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
killed	[kɪled]	[kɪwd]	[kɪled]	[kɪld]
called	[kɔled]	[kɔl]	[kɔld]	[kɔləd]
called	[kɔled]	[kaw]	[kɔled]	[kɔl]
filed	[fɪwd]	[fiwd]	[faɪld]	[fɪled]
mailed	[meɪld]	[meɪowd]	[meɪləd]	[meɪld]
cheered	[tʃɛred]	[tʃird]	[tʃired]	[ʃɛr]
scared	[skærd]	[skærd]	[skærd]	[skærd]
shared	[ʃɛrʌŋ]	[ʃɛred]	[ʃɛred]	[ʃɛred]
stored	[stɔred]	[stɔred]	[stɔred]	[stɔred]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
killed	[kɪled]	[kɪled]	[laɪked]	[kɪwd]
called	[kɔled]	[kɔlɪd]	[kɑled]	[kɔwd]
called	[kɔled]	[kɔlɪd]	[kɑlen]	[kɔl]
filed	[faɪlɪd]	[faɪld]	[faɪlid]	[fiwd]
mailed	[meɪled]	[meɪld]	[maɪlid]	[meɪld]
cheered	[ʃʌrd]	[tʃɛred]	[tʃered]	[tʃird]
scared	[skærd]	[skæred]	[skæred]	[skærd]
shared	[ʃɛred]	[ʃɛred]	[ʃɑr]	[ʃɛrd]
stored	[stɔred]	[stɔr]	[stored]	[stɔrd]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
killed	[kɪled]	[kɪled]	[kɪled]	[kɪwd]
called	[kɔled]	[kɔld]	[kɛled]	[kɔwd]
called	[kɔled]	[kɔləd]	[kɑled]	[kɑwde]
filed	[fɪled]	[fiwle]	[faɪld]	[faɪld]
mailed	[meɪled]	[meɪld]	[meɪld]	[meɪld]
cheered	[tʃɛred]	[tʃered]	[tʃired]	[tʃird]
scared	[skæred]	[skærd]	[skærd]	[skærd]
shared	[ʃɛred]	[ʃɛred]	[ʃɛrde]	[ʃɛrd]
stored	[stɔred]	[stored]	[stɔrd]	[stɔred]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
killed	[kɪwd]	[kɪwd]	[kɪwd]	[kɪld]
called	[kɑwd]	[kɔld]	[kɔled]	[kɔld]
called	[kɑw]	[kɔw]	[koled]	[kɔld]
filed	[faɪwd]	[faɪwd]	[faɪled]	[faɪld]
mailed	[meɪwd]	[meɪwd]	[meɪled]	[meɪl]
cheered	[ʃerd]	[tʃerɪd]	[tʃired]	[tʃird]
scared	[skærkd]	[skæred]	[skæred]	[skærd]
shared	[ʃɛred]	[ʃɛred]	[ʃɛred]	[ʃɛrd]
stored	[stɔred]	[stɔrd]	[stɔred]	[stɔr]

VERB	Participant 25	Participant 26
killed	[kɪwd]	[kɪled]
called	[kɔled]	[kɔled]
called	[kɔw]	[kɔwd]
filed	[fɪled]	[fɪled]
mailed	[meɪwd]	[meɪled]
cheered	[tʃɛred]	[tʃired]
scared	[skærd]	[skæred]
shared	[ʃɛred]	[ʃɛred]
stored	[stɔr]	[stɔr]

Three-member clusters

Transcription of English verbs ending in fricative-stop-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
grasped /spt/	[græspt]	[græsped]	[grɑsped]	[grɑsped]
risked /skt/	[rɪsked]	[rɪsked]	[riskəd]	[rɪsked]
asked /skt/	[æsk]	[æsked]	[æsked]	[ɑskt]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
grasped /spt/	[græsped]	[græsped]	[græsped]	[græsped]
risked /skt/	[rɪskɛd]	[rɪsked]	[rɪsked]	[rɪskɪd]
asked /skt/	[æsked]	[æsked]	[æsked]	[æsked]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
grasped /spt/	[græsped]	[græsped]	[græsped]	[græsped]
risked /skt/	[rɪsked]	[rɪsked]	[rɪsked]	[rɪsked]
asked /skt/	[æsked]	[æsk]	[æsked]	[æsked]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
grasped /spt/	[græsped]	[grɑsped]	[grɑspet]	[græpɛd]
risked /skt/	[rɪsked]	[rɪsked]	[rɪsked]	[rɪskɛd]
asked /skt/	[æsked]	[æsket]	[ɑsked]	[æsked]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
grasped /spt/	[græspet]	[græspet]	[grɑsped]	[græsped]
risked /skt/	[rɪsked]	[rɪsked]	[rɪsked]	[rɪsked]
asked /skt/	[æsked]	[æsked]	[ɑsked]	[æsket]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
grasped /spt/	[græsped]	[græspt]	[græsped]	[græsped]
risked /skt/	[rɪsked]	[rɪskt]	[rɪsked]	[rɪsked]
asked /skt/	[æsked]	[æsked]	[æsk]	[æsked]

VERB	Participant 25	Participant 26
grasped /spt/	[græspet]	[græsped]
risked /skt/	[rɪsked]	[rɪsked]
asked /skt/	[æsked]	[æsked]

Transcription of English verbs ending in nasal-stop-stop-cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
camped /mpt/	[kæmped]	[kʌmpɛt]	[kʌmped]	[kæmped]
jumped /mpt/	[dʒʌmpt]	[dʒʌmpəɾ]	[dʒʌmped]	[dʒʌmped]
ranked /nkt/	[rʌŋket]	[ræŋkt]	[raŋked]	[rʌŋked]
linked /nkt/	[lɪŋket]	[lɪŋkɪŋ]	[lɪŋked]	[lɪŋked]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
camped /mpt/	[kæmped]	[kæm]	[kæmpɪd]	[kænped]
jumped /mpt/	[dʒʌmped]	[dʒʌmped]	[dʒʌmpɪd]	[dʒʌmpɪd]
ranked /nkt/	[rʌŋked]	[ræŋked]	[ræŋket]	[rʌŋked]
linked /nkt/	[lɪŋkɛd]	[lɪŋked]	[lɪŋked]	[laɪk]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
camped /mpt/	[kæmped]	[kæmped]	[kæmped]	[kqmped]
jumped /mpt/	[dʒʌmpeŋ]	[dʒʌmped]	[dʒʌmped]	[dʒʌmpeɾ]
ranked /nkt/	[rʌŋked]	[rʌŋked]	[rəŋked]	[rɛŋked]
linked /nkt/	[lɪŋked]	[lɪŋked]	[lɪŋked]	[lɪŋket]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
camped /mpt/	[kæmped]	[kæmped]	[kompet]	[kæmped]
jumped /mpt/	[dʒʌmped]	[dʒʌmped]	[dʒʌmpet]	[dʒmpeɾ]
ranked /nkt/	[rʌŋked]	[rʌŋked]	[reɪŋkend]	[maɪk ɪt]
linked /nkt/	[lɪŋked]	[lɪŋked]	[lɪŋked]	[kɪŋkɛd]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
camped /mpt/	[kɑmped]	[kæmped]	[kæmpt]	[kæmpe]
jumped /mpt/	[dʒʌmpeɾ]	[dʒʌmped]	[dʒʌmpet]	[dʒʌmped]
ranked /nkt/	[rɑŋked]	[ræn]	[rɛŋkɪŋ]	[rɑŋked]
linked /nkt/	[lɪŋkɪŋ]	[lɪŋked]	[lɪŋkɪŋ]	[lɪŋked]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
camped /mpt/	[kæmped]	[kæmpt]	[kæmped]	[kæmped]
jumped /mpt/	[dʒʌmped]	[dʒʌpəd]	[dʒʌmpəd]	[dʒʌmped]
ranked /nkt/	[rɑŋked]	[rʌŋkt]	[rʌŋked]	[rʌŋked]
linked /nkt/	[lɪŋked]	[lɪŋkt]	[lɪŋked]	[lɪŋkt]

VERB	Participant 25	Participant 26
camped /mpt/	[kɛmped]	[kæmped]
jumped /mpt/	[dʒʌmped]	[dʒʌmped]
ranked /nkt/	[reŋked]	[rʌŋked]
linked /nkt/	[lɪŋked]	[lɪŋkɛt]

Transcription of English verbs ending in liquid-stop-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
helped /lpt/	[hɛlped]	[hɛlped]	[hewpəd]	[hæp]
worked /rkt/	[wərked]	[wərked]	[wərked]	[wərked]
worked /rkt/	[wərked]	[wərked]	[wərked]	[wərk]
parked /rkt/	[pɑrked]	[pɑrked]	[pɑrked]	[pɑrked]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
helped /lpt/	[hɛwped]	[hɛlped]	[hɛwpɪd]	[hɛwlped]
worked /rkt/	[wərked]	[wərked]	[wərkɪd]	[wərk]
worked /rkt/	[wərket]	[wərket]	[wərkɪd]	[wərkt]
parked /rkt/	[pɑrked]	[pɑrked]	[pʌrked]	[pɑrked]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
helped /lpt/	[hɛwpɛd]	[hɛlped]	[hɛlped]	[hɛwped]
worked /rkt/	[wərked]	[wərk]	[wərked]	[wərket]
worked /rkt/	[wərk]	[wərk]	[wərked]	[wərke]
parked /rkt/	[pɑrked]	[pɑrked]	[pɑrket]	[pɑrket]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
helped /lpt/	[hɛwped]	[hɛwped]	[hɛwped]	[hɛlpe]
worked /rkt/	[wərked]	[wərked]	[wərket]	[wərked]
worked /rkt/	[wərked]	[wərked]	[wərke]	[wərkɛt]
parked /rkt/	[pɑrked]	[pɑrked]	[pɑrked]	[pɑrked]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
helped /lpt/	[hɛlped]	[hɛwped]	[hɛwped]	[hɛlped]
worked /rkt/	[wərkedə]	[wərkedʒ]	[wərked]	[wərke]
worked /rkt/	[wrked]	[orkedʒi]	[wərkt]	[wərked]
parked /rkt/	[pɑrket]	[pɑrked]	[pɑrket]	[pɑrked]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
helped /lpt/	[hɛwped]	[hɛwped]	[hɛlpt]	[hɛlped]
worked /rkt/	[wərked]	[wərkt]	[wərked]	[wərked]
worked /rkt/	[wərk]	[wərked]	[wərked]	[wərkedʒ]
parked /rkt/	[pɑrked]	[pɑrkt]	pɑrked]	[pɑrked]

VERB	Participant 25	Participant 26
helped /lpt/	[hɛwped]	[hɛwped]
worked /rkt/	[wərked]	[wərket]
worked /rkt/	[wərked]	[wərket]
parked /rkt/	[pɑrked]	[pɑrked]

Transcription of English verbs ending in liquid-fricative-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
golfed /lft/	[gowfed]	[gowfed]	[gowfed]	[goulft]
surfed /rft/	[sərfed]	[sərft]	[sərfed]	[sərfet]
solved /lvd/	[soʊlv]	[sowv]	[sowved]	[sɔlvd]
served /rvd/	[sɛvəral]	[sərvd]	[sərvɪd]	[sərved]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
golfed /lft/	[gowfɛd]	[gowfed]	[gowfed]	[gowfed]
surfed /rft/	[sərfed]	[sərfed]	[sərfed]	[sərf]
solved /lvd/	[sowved]	[sowv]	[sowve]	[sowv]
served /rvd/	[sərvede]	[sɛrvede]	[sərved]	[sɛrved]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
golfed /lft/	[gowfed]	[gowfed]	[gowfet]	[gawfed]
surfed /rft/	[sərfed]	[sərfed]	[sərfet]	[sərfed]
solved /lvd/	[sɔwved]	[sloʊed]	[sowved]	[sowved]
served /rvd/	[sərvɪd]	[sirved]	[served]	[sɛrved]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
golfed /lft/	[gowfed]	[gowfed]	[gawfet]	[gowfɛd]
surfed /rft/	[sərfet]	[sərfed]	[surfet]	[sərfɛd]
solved /lvd/	[sowved]	[sowv]	[sowve]	[sowved]
served /rvd/	[sɪrvəd]	[served]	[sɛrved]	[sərved]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
golfed /lft/	[gowfed]	[goʊlft]	[goʊlft]	[gowfed]
surfed /rft/	[sərfed]	[sərfetə]	[sərft]	[sərfed]
solved /lvd/	[sowved]	[sɔwved]	[soʊlvd]	[sɔlved]
served /rvd/	[serverət]	[sərved]	[sɛrvd]	[served]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
golfed /lft/	[gowfed]	[gowfet]	[gowfed]	[goʊlfed]
surfed /rft/	[surfed]	[sərft]	[sərfed]	[sərfet]
solved /lvd/	[sowved]	[sowvd]	[soʊlvd]	[sowve]
served /rvd/	[sɛrved]	[sərved]	[sərvɪd]	[served]

VERB	Participant 25	Participant 26
golfed /lft/	[gowf]	[gowfet]
surfed /rft/	[sərfed]	[sərfet]
solved /lvd/	[sowvede]	[sɔwved]
served /rvd/	[sɛrved]	[served]

Transcription of English verbs ending in stop-fricative-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
mixed /kst/	[mɪkst]	[mɪksed]	[mɪksed]	[mɪks]
fixed /kst/	[fɪks]	[fɪksɐ]	[fɪksed]	[fɪksed]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
mixed /kst/	[mɪksɛd]	[mɪksed]	[mɪksɪd]	[mɪkst]
fixed /kst/	[fɪksed]	[fɪksed]	[fɪks]	[fɪkst]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
mixed /kst/	[mɪksed]	[mɪks]	[mɪksed]	[mɪksed]
fixed /kst/	[fɪks]	[fɪks]	[fɪksed]	[fɪkse]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
mixed /kst/	[mɪksede]	[mɪksed]	[mɪksed]	[mɪksɛd]
fixed /kst/	[fɪks]	[fɪksed]	[fɪksɐ]	[fɪksɐ]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
mixed /kst/	[mɪkset]	[mɪksedʒ]	[mɪksed]	[mɪksed]
fixed /kst/	[fɪks]	[fɪksed]	[fɪks]	[fɪkset]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
mixed /kst/	[mɪksɛd]	[mɪkst]	[mɪksed]	[mɪkst]
fixed /kst/	[fɪksed]	[fɪks]	[fɪks]	[fɪkst]

VERB	Participant 25	Participant 26
mixed /kst/	[mɪksed]	[mɪksɛd]
fixed /kst/	[fɪks]	[fɪksɛt]

Transcription of English verb ending in nasal-fricative-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
danced /nst/	[dænsɪd]	[dænsed]	[dæɛnsed]	[dæɛnsed]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
danced /nst/	[dænsed]	[dænsed]	[dænsed]	[dæns]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
danced /nst/	[dænsed]	[dæsed]	[dænsed]	[dænse]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
danced /nst/	[dænsed]	[dænsed]	[dɑnsɪŋ]	[dænsed]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
danced /nst/	[dænsed]	[dænsed]	[dænsed]	[dænsed]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
danced /nst/	[dænsed]	[dænst]	[dæned]	[dænset]

VERB	Participant 25	Participant 26
danced /nst/	[dɑnsed]	[dænsed]

Transcription of English verb ending in liquid-affricate-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
searched /rtʃt/	[risərtʃ]	[sirtʃi]	[sərft]	[sərtʃetʃ]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
searched /rtʃt/	[sərtʃed]	[sərtʃ]	[risərʃɪd]	[sərtʃied]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
searched /rtʃt/	[sərtʃ]	[sərʃed]	[sərtʃed]	[sərtʃiɛd]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
searched /rtʃt/	[risərtʃ]	[sərʃed]	[sərʃet]	[sərtʃɛd]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
searched /rtʃt/	[sərtʃiet]	[sərtʃied]	[sərʃed]	[sərʒed]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
searched /rtʃt/	[sərtʃed]	[sərtʃied]	[sərtʃiet]	[sərʃed]

VERB	Participant 25	Participant 26
searched /rtʃt/	[sərʃed]	[sərtʃied]

Transcription of English verbs ending in nasal-affricate-stop

VERB	Participant 1	Participant 2	Participant 3	Participant 4
changed/ndʒd/	[tʃeɪndʒ]	[tʃendʒ]	[tʃeɪnʒed]	[tʃeɪndʒied]
ranged /ndʒd/	[rændʒd]	[reɪndʒied]	[rænʒed]	[reindʒed]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
changed/ndʒd/	[tʃeɪndʒed]	[tʃeɪndʒied]	[tʃæns]	[tʃeɪndʒd]
ranged /ndʒd/	[rændʒed]	[reɪnged]	[rænʒed]	[reɪndʒied]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
changed/ndʒd/	[tʃeɪndʒ]	[tʃeɪndʒ]	[tʃeɪndʒɪŋ]	[tʃeɪndʒe]
ranged /ndʒd/	[rænʒ]	[reɪndʒed]	[reɪnʒedʒ]	[reɪndʒied]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
changed/ndʒd/	[tʃeɪndʒied]	[tʃendʒ]	[tʃændʒ]	[tʃeɪndʒied]
ranged /ndʒd/	[reɪndʒ]	[reɪnʒet]	[rɛndʒe]	[rendʒed]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
changed/ndʒd/	[tʃeɪndʒ]	[tʃeɪndʒeded]	[tʃeɪndʒed]	[tʃeɪndʒed]
ranged /ndʒd/	[rɑnʒe]	[reɪndʒied]	[renedʒ]	[rendʒed]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
changed/ndʒd/	[tʃeɪndʒ]	[tʃeɪndʒd]	[tʃeɪndʒed]	[tʃeɪndʒd]
ranged /ndʒd/	[renʒed]	[reɪndʒed]	[reɪndʒed]	[reɪnged]

VERB	Participant 25	Participant 26
changed/ndʒd/	[tʃeɪndʒe]	[tʃeɪndʒed]
ranged /ndʒd/	[reɪndʒed]	[rendʒed]

Transcription of English verbs ending in liquid-nasal-stop cluster

VERB	Participant 1	Participant 2	Participant 3	Participant 4
filmed /lmd/	[fɪlm]	[fɪwmed]	[fɪlmd]	[fɪlmd]
turned /rnd/	[tərn]	[tərn]	[tərned]	[tərnd]
learned /rnd/	[lərn]	[lərn]	[lərned]	[lərnd]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
filmed /lmd/	[fɪwmed]	[fɪwmed]	[fɪwmed]	[fɪwmed]
turned /rnd/	[tərned]	[tərne]	[tərnəd]	[tərnɪ]
learned /rnd/	[lərned]	[lərnd]	[lərnɪd]	[lərned]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
filmed /lmd/	[fɪwmed]	[fɪwmed]	[faʊmed]	[fɪwmed]
turned /rnd/	[tərned]	[tərn]	[tərned]	[tərn]
learned /rnd/	[lərned]	[lərne]	[lərnəd]	[lərnd]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
filmed /lmd/	[fɪwmed]	[fɪwmed]	[fɪwmɪŋ]	[fiwmɛd]
turned /rnd/	[tərned]	[tərned]	[turne]	[tərned]
learned /rnd/	[lərned]	[lərned]	[lərned]	[lərned]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
filmed /lmd/	[fɪwmed]	[fɪwmed]	[fɪwmed]	[fɪlmed]
turned /rnd/	[tərned]	[tərnd]	[tərned]	[tərne]
learned /rnd/	[lərned]	[lərned]	[lərnd]	[lərnd]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
filmed /lmd/	[fɪwmed]	[fɪwmd]	[fɪlmd]	[fɪwmed]
turned /rnd/	[tərned]	[tərned]	[tərned]	[tərned]
learned /rnd/	[lərned]	[lərned]	[lərned]	[lərned]

VERB	Participant 25	Participant 26
filmed /lmd/	[fɪwmed]	[fɪwmed]
turned /rnd/	[tərmed]	[tərned]
learned /rnd/	[lərned]	[lərned]

Vowel/Diphthong singleton consonant

Transcription of English verbs ending in vowel/diphthong singleton consonant

VERB	Participant 1	Participant 2	Participant 3	Participant 4
played /eɪd/	[pleɪd]	[pleɪ]	[pleɪed]	[pleɪd]
played /eɪd/	[pleɪd]	[pleɪed]	[pleɪed]	[pleɪd]
prayed /eɪd/	[preɪd]	[praɪed]	[preɪed]	[preɪd]
prayed /eɪd/	[preɪ]	[preɪde]	[preɪd]	[preɪd]
stayed /eɪd/	[steɪd]	[steɪd]	[steɪd]	[steɪed]
rowed /oʊd/	[roʊed]	[rɔd]	[roʊed]	[roʊd]
snowed /oʊd/	[snoʊed]	[snoʊed]	[snoʊed]	[snoʊd]
slowed /oʊd/	[sloued]	[sloʊed]	[sloʊed]	[sloued]
cried /aɪd/	[kraɪd]	[kraɪd]	not read	[kraɪd]
died /aɪd/	[daɪd]	[daɪd]	[daɪd]	[daɪd]
tried /aɪd/	[traɪd]	[traɪed]	[traɪd]	[traɪd]

VERB	Participant 5	Participant 6	Participant 7	Participant 8
played /eɪd/	[pleɪəd]	[pleɪd]	[pleɪɪd]	[pleɪd]
played /eɪd/	[pleɪəd]	[pleɪd]	[pleɪɪd]	[pleɪd]
prayed /eɪd/	[preɪed]	[preɪd]	[preɪed]	[preɪdɪ]
prayed /eɪd/	[preɪed]	[preɪd]	[preɪɪd]	[preɪd]
stayed /eɪd/	[steɪed]	[steɪed]	[steɪded]	[steɪd]
rowed /oʊd/	[roʊed]	[roʊed]	[rɔwed]	[rɔwed]
snowed /oʊd/	[snoʊəd]	[snoʊed]	[snoʊed]	[snoʊd]
slowed /oʊd/	[sloʊed]	[sloʊed]	[sloʊd]	[sloʊ]
cried /aɪd/	[kraɪed]	[krid]	not read	[kraɪ]
died /aɪd/	[daɪed]	[daɪd]	[daɪed]	[daɪd]
tried /aɪd/	[traɪd]	[traɪd]	[traɪd]	[traɪed]

VERB	Participant 9	Participant 10	Participant 11	Participant 12
played /eɪd/	[pleɪed]	[pleɪd]	[pleɪəd]	[pleɪ]
played /eɪd/	[pleɪed]	[pleɪd]	[pleɪed]	pleɪed]
prayed /eɪd/	[praɪed]	[preɪd]	[preɪ]	[preɪɪd]
prayed /eɪd/	[preɪed]	[praɪd]	[preɪed]	[preɪd]
stayed /eɪd/	[stʌdied]	[steɪd]	[steɪ]	[steɪed]
rowed /oʊd/	[rɔwəd]	[roʊed]	[rɔəd]	[roʊed]
snowed /oʊd/	[snɔwed]	[snoʊed]	[snoʊed]	[snoʊed]
slowed /oʊd/	[sloʊed]	[sloʊed]	[sloʊed]	[sloʊed]
cried /aɪd/	[kraɪed]	[kraɪd]	[kraɪ]	[kraɪ]
died /aɪd/	[daɪd]	[daɪd]	[daɪd]	[daɪəd]
tried /aɪd/	[traɪed]	[tʃaɪ]	[traɪd]	[traɪɪd]

VERB	Participant 13	Participant 14	Participant 15	Participant 16
played /eɪd/	[pleɪd]	[pleɪed]	[pleɪet]	[pleɪɪd]
played /eɪd/	[pleɪde]	[pleɪed]	[plaɪd]	[pleɪ]
prayed /eɪd/	[preɪd]	[preɪed]	[praɪed]	[preɪed]
prayed /eɪd/	[preɪd]	[preɪed]	[pleɪed]	[preɪɪd]
stayed /eɪd/	[steɪd]	[steɪed]	[steɪd]	[steɪed]
rowed /oʊd/	[rɔʊed]	[raʊed]	[rɔwed]	[roʊɪd]
snowed /oʊd/	[snoʊed]	[snoʊed]	[snoʊed]	[snoʊed]
slowed /oʊd/	[sloʊed]	[sloʊed]	[sloʊed]	[sloʊed]
cried /aɪd/	[kraɪd]	[kraɪd]	[kraɪd]	[kreɪd]
died /aɪd/	[daɪd]	[daɪd]	[daɪd]	[daɪd]
tried /aɪd/	[traɪd]	[traɪed]	[traɪd]	[traɪd]

VERB	Participant 17	Participant 18	Participant 19	Participant 20
played /eɪd/	[pleɪ]	[pleɪd]	[pleɪed]	[pleɪd]
played /eɪd/	[pleɪed]	[pleɪd]	[pleɪed]	[pleɪd]
prayed /eɪd/	[preɪd]	[preɪd]	[preɪed]	[preɪd]
prayed /eɪd/	[preɪd]	[preɪd]	[preɪd]	[preɪd]
stayed /eɪd/	[steɪd]	[steɪ]	[steɪd]	[steɪed]
rowed /oʊd/	[raʊded]	[roʊed]	[raʊed]	[roʊed]
snowed /oʊd/	[snoʊed]	[snoʊədʒi]	[snoʊed]	[snoʊed]
slowed /oʊd/	[sloʊed]	[sloʊit]	[sloʊd]	[sloʊd]
cried /aɪd/	[kraɪd]	not read	[kraɪd]	[kraɪ]
died /aɪd/	[daɪd]	not read	[daɪd]	[daɪd]
tried /aɪd/	[traɪd]	[traɪd]	[traɪede]	[traɪd]

VERB	Participant 21	Participant 22	Participant 23	Participant 24
played /eɪd/	[pleɪɪd]	[pleɪdi]	[pleɪɪd]	[pleɪd]
played /eɪd/	[pleɪed]	[pleɪd]	[pleɪed]	[pleɪd]
prayed /eɪd/	[preɪed]	[preɪd]	[preɪed]	[preɪd]
prayed /eɪd/	[preɪd]	[preɪd]	[preɪed]	[preɪd]
stayed /eɪd/	[steɪ]	[steɪd]	[steɪed]	[steɪd]
rowed /oʊd/	[roʊɪd]	[roʊed]	[roʊed]	[raʊet]
snowed /oʊd/	[snoʊɪd]	[snoʊed]	[snoʊed]	[snoʊd]
slowed /oʊd/	[sloʊed]	[sloʊed]	[sloʊed]	[sloʊd]
cried /aɪd/	not read	[kraɪ]	[kraɪd]	[kraɪd]
died /aɪd/	[daɪd]	[daɪd]	[daɪd]	[daɪd]
tried /aɪd/	[traɪed]	[traɪd]	[traɪ]	[traɪd]

VERB	Participant 25	Participant 26
played /eɪd/	[pleɪed]	[pleɪed]
played /eɪd/	[pleɪd]	[pleɪd]
prayed /eɪd/	[preɪed]	[preɪed]
prayed /eɪd/	[preɪd]	[pleɪd]
stayed /eɪd/	[steɪd]	[steɪed]
rowed /oʊd/	[rɔed]	[raʊɛd]
snowed /oʊd/	[snoʊed]	[snoʊɛd]
slowed /oʊd/	[sloʊed]	[sloʊed]
cried /aɪd/	[kraɪd]	not read
died /aɪd/	[daɪd]	[daɪd]
tried /aɪd/	[traɪd]	[traɪed]

Appendix G

Transcription of *Contrastive Words* – Paragraph Reading Test

Two-member clusters

Transcription of contrastive words ending in stop-stop cluster

WORD	Participant 1	Participant 2	Participant 3	Participant 4
slept /pt/	[slɛpt]	[slɛpt]	[slɛpt]	[slɛpt]
act /kt/	[ækt]	[ækt]	[ækt]	[ækt]
fact /kt/	[fækt]	[fækt]	[fækt]	[fækt]
fact /kt/	[fækt]	[fækt]	[fækt]	[fækt]

WORD	Participant 5	Participant 6	Participant 7	Participant 8
slept /pt/	[slɛpt]	[slɛpt]	[slɛpt]	[slɛpt]
act /kt/	[ətak]	[ækt]	[ækt]	[ækʧ]
fact /kt/	[fækt]	[fækt]	[fæktə]	[fækt]
fact /kt/	[fækt]	[fækt]	[fæktə]	[fækt]

WORD	Participant 9	Participant 10	Participant 11	Participant 12
slept /pt/	[slɛpt]	[slɛp]	[slɛpe]	[slɛpt]
act /kt/	[ækt]	[ækt]	[æktɪ]	[æktɪ]
fact /kt/	[fækti]	[fækt˺]	[fækt]	[fækt]
fact /kt/	[fækt]	[fækt˺]	[fækt]	[fækt]

WORD	Participant 13	Participant 14	Participant 15	Participant 16
slept /pt/	[slɛpt]	[slɛpt]	[slɛpt]	[slɛpti]
act /kt/	[ækt]	[ækt]	[ækt]	[ɑtɑk]
fact /kt/	[fæktə]	[fækt]	[fækt]	[fækt]
fact /kt/	[fæktʃ]	[fækt]	[fækt]	[fækt]

WORD	Participant 17	Participant 18	Participant 19	Participant 20
slept /pt/	[slɛpt]	[slɛpt]	[slɛpt]	[slɛp]
act /kt/	[ətɑk]	[æktə]	[æktə]	[ækt]
fact /kt/	[fæk]	[fæktə]	[fækti]	[fækt]
fact /kt/	[fækt]	[fækti]	[fæktə]	[fækt]

WORD	Participant 21	Participant 22	Participant 23	Participant 24
slept /pt/	[zlɛp]	[slɛpt]	[slɛpt]	[slɛpt]
act /kt/	[ækt]	[ækt]	[ɑtɑk]	[ækt]
fact /kt/	[fækt]	[fækt]	[fækt]	[fækt]
fact /kt/	[fækt]	[fækt]	[fækt]	[fækt]

WORD	Participant 25	Participant 26
slept /pt/	[slɛpt]	[slɛpt]
act /kt/	[ækti]	[ɑtɑk]
fact /kt/	[fæt]	[fækt]
fact /kt/	[fækt]	[fækt]

Transcription of contrastive words ending in fricative-stop cluster

WORD	Participant 1	Participant 2	Participant 3	Participant 4
left /ft/	[lɛft]	[left]	[lɛft]	[lɛft]
left /ft/	[lɛft]	[lɛft]	[left]	[lɛft]
lift /ft/	[lɪft]	[lɪft]	[lɪft]	[lɪft]
last /st/	[læstˀ]	[læstˀ]	[læstˀ]	[læstˀ]
last /st/	[læst]	[læst]	[læst]	[læstˀ]
last /st/	[lɑstˀ]	[læst]	[læst]	[læstˀ]
fast /st/	[fæst]	[fæstˀ]	[fæst]	[fæstˀ]
best /st/	[bɛst]	[bɛst]	[bɛst]	[bɛstˀ]
just /st/	[dʒʌst]	[dʒʌst]	[dʒʌst]	[dʒʌst]
most /st/	[moʊst]	[moust]	[moʊst]	[moʊst]

WORD	Participant 5	Participant 6	Participant 7	Participant 8
left /ft/	[lɛft]	[lɛft]	[lɛft]	[lɛft]
left /ft/	[lɛft]	[lɛft]	[lɛft]	[lɛft]
lift /ft/	[lɪft]	[lɪft]	[lɪft]	[lɪft]
last /st/	[læstˀ]	[læst]	[læstˀ]	[læst]
last /st/	[læst]	[læst]	[læst]	[læst]
last /st/	[læst]	[læst]	[læstˀ]	[læst]
fast /st/	[fæst]	[fæst]	[fæst]	[fæst]
best /st/	[bɛst]	[bɛst]	[bɪst]	[bɛst]
just /st/	[dʒʌst]	[dʒʌst]	[dʒʌstɪ]	[dʒʌstɪ]
most /st/	[moʊst]	[moʊst]	[moʊst]	[moʊst]

WORD	Participant 9	Participant 10	Participant 11	Participant 12
left /ft/	[lɛft]	[lɛft]	[lɛfti]	[lɛft]
left /ft/	[lɛft]	[lɛft]	[lɛft]	[lɛft]
lift /ft/	[lɪft]	[lɪft]	[lɪfti]	[lɪft]
last /st/	[læst]	[læst]	[læstˀ]	[læst]
last /st/	[læstˀ]	[læst]	[læstˀ]	[læst]
last /st/	[læst]	[læst]	[læst]	[læst]
fast /st/	[fæst]	[fæst]	[fæstˀ]	[fæstˀ]
best /st/	[bɛst]	[bɛst]	[bɛst]	[bɛstˀ]
just /st/	[dʒʌz]	[dʒʌz]	[dʒʌst]	[dʒʌstˀ]
most /st/	[mɔst]	[moʊst]	[moʊst]	moʊst]

WORD	Participant 13	Participant 14	Participant 15	Participant 16
left /ft/	[lɛfti]	[lɛft]	[lɛft]	[lɛft]
left /ft/	[lɛft]	[lɛft]	[lɛft]	[lɛft]
lift /ft/	[lɪftʃ]	[lɪftɪ]	[lɪft]	[lɪfti]
last /st/	[læst]	[læstˀ]	[læst]	[læstˀ]
last /st/	[læstˀ]	[læst]	[læst]	[læstˀ]
last /st/	[læst]	[læstˀ]	[læstˀ]	[læstˀ]
fast /st/	[fɑst]	[fæstˀ]	[fæst]	[fæst]
best /st/	[bɛst]	[bɛst]	[bɛst]	[bɛst]
just /st/	[dʒʌstˀ]	[dʒʌst]	[dʒʌste]	[dʒʌstˀ]
most /st/	[moʊst]	[moust]	[moʊst]	[moʊst]

WORD	Participant 17	Participant 18	Participant 19	Participant 20
left /ft/	[lɛft]	[lɛfti]	[lɛft]	[lɛft]
left /ft/	[lɛft]	[lɛfti]	[lɛft]	[lɛft]
lift /ft/	[lɪft]	[lɪftʃi]	[lɪfti]	lɪftɑ]
last /st/	[læst]	[læst]	[læst]	[læst]
last /st/	[læst]	[læst]	[læst]	[læst]
last /st/	[læst]	[læst]	læst]	[læst]
fast /st/	[fæst]	[fæsti]	[fæst]	[fæstˀ]
best /st/	[bɛst]	[bɛst]	[bɛstˀ]	[bɛst]
just /st/	[dʒʌst]	[dʒʌsti]	[dʒʌsti]	[dʒʌz]
most /st/	[mʊst]	[moʊst]	[moʊst]	[moʊst]

WORD	Participant 21	Participant 22	Participant 23	Participant 24
left /ft/	[lɛft]	[lɛfti]	[lɛft]	[lɛft]
left /ft/	[lɛf]	[lɛf]	[lɛft]	[lɛft]
lift /ft/	[lɪfti]	[lɪft]	[lɪft]	[lɪft]
last /st/	[læstˀ]	[læst]	[læst]	[læst]
last /st/	[læstˀ]	[læstˀ]	[læstˀ]	[læst]
last /st/	[læst]	[læst]	[læstˀ]	[ʒæstˀ]
fast /st/	[fæst]	[fæst]	[fæst]	[fæst]
best /st/	[bɛst]	[bɛstˀ]	[bɛst]	[bɛst]
just /st/	[dʒʌst]	[dʒʌst]	[dʒʌst]	[dʒʌst]
most /st/	[mɔst]	[moʊst]	[mɔst]	[moʊst]

WORD	Participant 25	Participant 26
left /ft/	[lɛft]	[lɛft]
left /ft/	[lɛft]	[lɛft]
lift /ft/	[lɪft]	[lɪft]
last /st/	[læstˀ]	[læst]
last /st/	[læst]	[læst]
last /st/	[læst]	[læst]
fast /st/	[fæstˀ]	[fæstˀ]
best /st/	[bɛst]	[bɛst]
just /st/	[dʒʌst]	[dʒʌstˀ]
most /st/	[moʊst]	[moʊst]

Transcription of contrastive words ending nasal-stop cluster

WORD	Participant 1	Participant 2	Participant 3	Participant 4
end /nd/	[ɛnd]	[ɛnd]	[ɛnd]	[ɛnd]
end /nd/	[ɛnd]	[ɛnd]	[ɛnd]	[ɛnd]
Find /nd/	[faɪnd]	[faɪnd]	[faɪnd]	[faɪnd]
hand /nd/	[hænd]	[hænd]	[hænd]	[hænd]
spend /nd/	[spɛnd]	[spɛnd]	[spɛnd]	[spɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛndz]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
found /nd/	[faʊnd]	[faʊnd]	[faund]	[faʊnd]
sound /nd/	[saʊnd]	[saʊnd]	[sond]	[saʊnd]

WORD	Participant 5	Participant 6	Participant 7	Participant 8
end /nd/	[ɛnd]	[ɛnd]	[ɛndˀ]	[ɛnd]
end /nd/	[ɛnde]	[ɛnd]	[ɛndˀ]	[ɛnd]
find /nd/	[faɪnd]	[faɪnd]	[faɪnd]	[faɪndˀ]
hand /nd/	[hænd]	[hænd]	[hænd]	[hænd]
spend /nd/	[spɛnd]	[spɛnd]	[spɛnd]	[spɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
found /nd/	[faʊnd]	[fɔʊnd]	[faʊnd]	[faʊd]
sound /nd/	[saʊnd]	[saʊnd]	[saʊnd]	[saʊnd]

WORD	Participant 9	Participant 10	Participant 11	Participant 12
end /nd/	[ɛnd]	[end]	[ɛnd]	[ɛnd]
end /nd/	[ɛnd]	[ɛnd]	[ɛnd]	[ɛnd]
find /nd/	[faɪndˀ]	[faɪndˀ]	[faɪnd]	[faɪnd]
hand /nd/	[hænd]	[hænd]	[hænd]	[hænd]
spend /nd/	[spɛnd]	[spɛnd]	[spɛnd]	[spɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
found /nd/	[faʊnd]	[faʊnd]	[faʊnd]	[faʊnde]
sound /nd/	[sɔnd]	[saʊnd]	[saʊnd]	[saʊnd]

WORD	Participant 13	Participant 14	Participant 15	Participant 16
end /nd/	[ɛnde]	[ɛnd]	[end]	[ɛnd]
end /nd/	[end]	[ɛnd]	[ɛnd]	[ɛnd]
find /nd/	[faɪndi]	[faɪn]	[faɪnd]	[faɪnd]
hand /nd/	[hænd]	[hænd]	[hɑnd]	[hænd]
spend /nd/	[spɛnd]	[spɛnd]	[spɛnd]	[spɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
found /nd/	[faʊnd]	[faʊnd]	[fɔwn]	[faʊnd]
sound /nd/	[saʊnd]	[saʊnd]	[sond]	[saʊnd]

WORD	Participant 17	Participant 18	Participant 19	Participant 20
end /nd/	[ɛnd]	[ɛnd]	[ɛndi]	[ɛnd]
end /nd/	[ɛnd]	[ɛnd]	[ɛndɪ]	[ɛndə]
find /nd/	[faɪnd]	[faɪnd]	[faɪne]	[faɪn]
hand /nd/	[hænd]	[hænd]	[hænd]	[hænd]
spend /nd/	[spɛnd]	[spɛnd]	[spɛnd]	[spɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛmd]	[frɛnd]	[frɛnd]	[frɛnd]
found /nd/	[faʊnd]	[faʊnd]	[faʊnd]	[faʊnd]
sound /nd/	[sond]	[saʊnd]	[sond]	[sond]

WORD	Participant 21	Participant 22	Participant 23	Participant 24
end /nd/	[ɛnd]	[ɛnd]	[ɛnd]	[ɛnd]
end /nd/	[ɛnd]	[endi]	[ɛnd]	[ɛnd]
find /nd/	[faɪnd]	[faɪnd̚]	[faɪnd]	[faɪn̪d]
hand /nd/	[hænd]	[hænd]	[hænd]	[hænd]
spend /nd/	[spɛnd]	[spɛnd]	[spɛnd]	[spɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]	[frɛnd]	[frɛnd]
found /nd/	[faʊnd]	[faɪmdi]	[faʊnd]	[faʊnd]
sound /nd/	[saʊnd]	[saʊnd]	[saʊnd]	[faʊnd]

WORD	Participant 25	Participant 26
end /nd/	[ɛnd]	[ɛnd]
end /nd/	[ɛndi]	[ɛnd]
find /nd/	[faɪnd]	[faɪnd]
hand /nd/	[hænd]	[hænd]
spend /nd/	[spɛnd]	[spɛnd]
friend /nd/	[frɛnd]	[frɛnd]
friend /nd/	[frɛnd	[frɛnd]
friend /nd/	[frɛnd]	[frɛnd]
found /nd/	[fɔd]	[faʊnd]
sound /nd/	[saʊnd]	[saʊnd]

Transcription of contrastive words ending in liquid-stop cluster

WORD	Participant 1	Participant 2	Participant 3	Participant 4
child /ld/	[tʃiʊdren]	[ʃawd]	not read	[tʃaɪld]
told /ld/	[toʊld]	[towd]	[towd]	[towd]
gold /ld/	[goʊld]	[goʊld]	[goʊld]	[goʊld]
old /ld/	[oʊld]	[oʊd]	[owd]	[owd]
hard /rd/	[hɑrd]	[hɑrd]	[hɑrd]	[hɑrd]
third /rd/	[θərd]	[θərd]	[θərd]	[θərd]
third /rd/	[θərd]	[tərd]	[tərd]	[θərd]
heard /rd/	[hird]	[hərd]	[hərt]	[hird]

WORD	Participant 5	Participant 6	Participant 7	Participant 8
child /ld/	[tʃaɪldʒ]	[tʃaɪl]	not read	[tʃaɪld]
told /ld/	[towd]	[toʊld]	not read	[towd]
gold /ld/	[goʊld]	[goʊld]	[goʊld]	[gowde]
old /ld/	[oʊld]	[oʊld]	[owd]	[owd]
hard /rd/	[hɑrd]	[hɛd]	[hɛrd]	[hɑrd]
third /rd/	[θərd]	[tərd]	[θərdʒ]	[tərdɪ]
third /rd/	[θərd]	[tərde]	[tərd]	[tərd]
heard /rd/	[hərd]	[hird]	[hɑrd]	[hərd]

WORD	Participant 9	Participant 10	Participant 11	Participant 12
child /ld/	[tʃaɪwd]	[tʃaɪld]	[tʃaɪld]	[tʃawd]
told /ld/	[towd]	[towd]	[towd]	[towd]
gold /ld/	[goʊld]	[gowd]	[goʊld]	[gowd]
old /ld/	[oʊld]	[owd]	[oʊld]	[owd]
hard /rd/	[hɑrd]	[hɑrd]	[hɑrd]	[hɑrd]
third /rd/	[tərdʒ]	[θərd]	[tərd]	[tərd]
third /rd/	[tərd]	[θərd]	[tərt]	[tərd]
heard /rd/	[hərd]	[hart]	[hərd]	[hərd]

WORD	Participant 13	Participant 14	Participant 15	Participant 16
child /ld/	[tʃaɪld]	[tʃaɪld]	[tʃaɪd]	[tʃaɪld]
told /ld/	[tod]	[towd]	[tɔwd]	[tow]
gold /ld/	[gowd]	[gowd]	[goʊld]	[goʊld]
old /ld/	[oʊld]	[owd]	[owd]	[oʊld]
hard /rd/	[hɑrd]	[hɑrd]	[hɑrt]	[hɑrd]
third /rd/	[tərd]	[tərd]	[tərdə]	[tərdi]
third /rd/	[tərd]	[tərd]	[tərdə]	[tərd]
heard /rd/	[hird]	[hird]	[hɑrt]	[hərd]

WORD	Participant 17	Participant 18	Participant 19	Participant 20
child /ld/	[tʃaɪld]	not read	not read	[tʃaɪld]
told /ld/	[toʊld]	not read	[towd]	[towd]
gold /ld/	[goʊld]	[gowd]	[goʊld]	[goʊld]
old /ld/	[oʊld]	[owd]	[oʊld]	[oʊld]
hard /rd/	[hɑrd]	[hɑrdi]	[hɛrd]	[hɑrd]
third /rd/	[fərd]	[tərdʒi]	[tərdɪ]	[θərd]
third /rd/	[tərd]	[təri]	[tərde]	[θərd]
heard /rd/	[hərd]	[hərt]	[hərd]	[hərd]

WORD	Participant 21	Participant 22	Participant 23	Participant 24
child /ld/	not read	[tʃaɪwdə]	[tʃaɪld]	[tʃaɪwd]
told /ld/	not read	[towd]	[towd]	[towd]
gold /ld/	[goʊld]	[goʊld]	[goʊld]	[goʊld]
old /ld/	[owd]	[oʊld]	[oʊld]	[owd]
hard /rd/	[hɑrd]	[hɑrd]	[hɑrd]	[hɑrd]
third /rd/	[tərd]	[θərd]	[tərd]	[tərd]
third /rd/	[tərd]	[θərd]	[tərd]	[tərd]
heard /rd/	[hərd]	[hərt]	[hərd]	[hərd]

WORD	Participant 25	Participant 26
child /ld/	[tʃaɪd]	not read
told /ld/	[towd]	not read
gold /ld/	[gowd]	[gowd]
old /ld/	[owd]	[owd]
hard /rd/	[hɑrd]	[hɑrd]
third /rd/	[tərd]	[θərd]
third /rd/	[tərd]	tərd]
heard /rd/	[hərd]	[hərd]

Three-member cluster

Transcription of contrastive words ending in stop-fricative-stop cluster

WORD	Participant 1	Participant 2	Participant 3	Participant 4
text /kst/	[tɛkst]	[tɛkst]	[tɛkst]	[tɛkst]
next /kst/	[nɛkstˀ]	[nɛkstˀ]	[nɛkstˀ]	[nɛkst]

WORD	Participant 5	Participant 6	Participant 7	Participant 8
text /kst/	[tɛkst]	[tɛkst]	[tɛks]	[tɛkst]
next /kst/	[nɛkstˀ]	[nɛkst]	[nɛks]	[nɛkt]

WORD	Participant 9	Participant 10	Participant 11	Participant 12
text /kst/	[tɛs]	[tɛks]	[tɛksi]	[tɛkstə]
next /kst/	[nɛks]	[nɛks]	[nɛks]	[nɛks]

WORD	Participant 13	Participant 14	Participant 15	Participant 16
text /kst/	[tɛks]	[tɛst]	[tɛst]	[tɛs]
next /kst/	[nɛks]	[nɛks]	[nɛks]	[nɛks]

WORD	Participant 17	Participant 18	Participant 19	Participant 20
text /kst/	[tɛks]	[tɛksti]	[tɛst]	[tɛks]
next /kst/	[nɛkst]	[nɛkst]	[nɛks]	[nɛks]

WORD	Participant 21	Participant 22	Participant 23	Participant 24
text /kst/	[tɛkst]	[tɛks]	[tɛkst]	[tɛks]
next /kst/	[nɛkst]	[nekst]	[nɛkst]	[nɛkst]

WORD	Participant 25	Participant 26
text /kst/	[tɛst]	[tɛs]
next /kst/	[nɛkst]	[nɛksti]

Vowel/Diphthong singleton consonant

Transcription of contrastive words ending in vowel/diphthong singleton consonant

WORD	Participant 1	Participant 2	Participant 3	Participant 4
made /eɪd/	[meɪd]	[mæt]	[meɪd]	[meɪd]
made /eɪd/	[meɪd]	[meɪde]	[meɪd]	[meɪd]

WORD	Participant 5	Participant 6	Participant 7	Participant 8
made /eɪd/	[meɪd]	[meɪd]	[meɪd̚]	[meɪd]
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪdˀ]

WORD	Participant 9	Participant 10	Participant 11	Participant 12
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪd]
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[hæd]

WORD	Participant 13	Participant 14	Participant 15	Participant 16
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪd]
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪd]

WORD	Participant 17	Participant 18	Participant 19	Participant 20
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪd]
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪɾ]

WORD	Participant 21	Participant 22	Participant 23	Participant 24
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪd]
made /eɪd/	[meɪd]	[meɪd]	[meɪd]	[meɪd]

WORD	Participant 25	Participant 26
made /eɪd/	[meɪd]	[meɪd]
made /eɪd/	[meɪd]	[meid]

Appendix H

Transcription of Words Ending in *-ed* – Free Speech Test

Transcription of verbs on free-speech test

Participant 1		Participant 2		Participant 3	
Verb	Transcription	Verb	Transcription	Verb	Transcription
played	[pleɪd]	played	[pleɪd]	called	[kɔld]
asked	[æsk]	played	[pleɪd]		
asked	[æskt]	played	[pleɪd]		
called	[kɔld]	talked	[tɔkt]		
talked	[tɔkt]	played	[pleɪd]		
stayed	[steɪd]	stopped	[stɔpɪd]		
watched	[wɔtʃt]	called	[kɔlɪd]		
		phoned	[fɔnd]		
		died	[daɪd]		
		watched	[wɔtʃed]		

Participant 4		Participant 5		Participant 6	
Verb	Transcription	Verb	Transcription	Verb	Transcription
talked	[tɔked]	talked	[tɔlkɪd]	screamed	[skrimed]
played	[pleɪed]	stopped	[stɔpɪd]	helped	[hɛwped]
played	[pleɪed]	asked	[æskɪd]	helped	[hɛlped]
tried	[traɪd]	called	[kɔlɪd]	called	[kɔw]
talked	[tɔked]	parked	[pɑrkɪd]	watched	[wɔtʃɪed]
called	[kɔld]	cooked	[kʊked]		
stopped	[stɔpt]	called	[kʌled]		
talked	[tɔlked]	watched	[wɔtʃed]		
watched	[wɔtʃɪt]				
mixed	[mɪksɪd]				

Participant 7		Participant 8		Participant 9	
Verb	Transcription	Verb	Transcription	Verb	Transcription
played	[pleɪd]	talked	[tɔlked]	played	[pleɪd]
stopped	[stɔped]	played	[pleɪd]	stopped	[stɔpəd]
called	[kɔld]	died	[daɪd]	called	[kɔld]
called	[kɔled]	called	[kɔld]	watched	[wɔtʃed]
called	[kɔled]				
called	[kɔled]				
watched	[wɔtʃed]				

Participant 10		Participant 11		Participant 12	
Verb	Transcription	Verb	Transcription	Verb	Transcription
stopped	[stɔpɪd]	asked	[æskɪt]	played	[pleɪed]
		stopped	[stɔped]	talked	[tɔlked]
		asked	[æsk]	stopped	[stɔped]
		helped	[hɛlped]	called	[kɔled]
		helped	[hɛlped]	asked	[æsket]
		talked	[tɔlked]	called	[kɔlɪd]
		watched	[wɔtʃɪed]	dressed	[drɛsɪd]
				dressed	[drɛsed]

Participant 13		Participant 14		Participant 15	
Verb	Transcription	Verb	Transcription	Verb	Transcription
passed	[pæsed]	stopped	[stɔped]	talked	[tɔwket]
cooked	[kʊked]	asked	[æsket]	played	[pleɪet]
called	[kɔled]	called	[kɑlɪd]	talked	[tɔlket]
watched	[wɔtʃɪed]	called	[kɑlɪd]		
		called	[kɑlɪd]		

Participant 16		Participant 17		Participant 18	
Verb	Transcription	Verb	Transcription	Verb	Transcription
played	[pleɪed]	played	[pleɪd]	asked	[æsket]
asked	[æsked]	stopped	[stɔpet]	called	[kɔwde]
called	[kɔld]	called	[kald]	cooked	[kʊket]
asked	[æsked]	called	[kɔld]		
helped	[hɛlpeɾ]	watched	[wɔtʃied]		
talked	[tɔlkeɾ]				
watched	[wɔtʃied]				

Participant 19		Participant 20		Participant 21	
Verb	Transcription	Verb	Transcription	Verb	Transcription
dropped	[drɔped]	died	[daɪd]	asked	[æsked]
		asked	[æsket[		
		stopped	[stɔped]		
		called	[kɑwd]		
		asked	[æsked]		

Participant 22		Participant 23		Participant 24	
Verb	Transcription	Verb	Transcription	Verb	Transcription
called	[kɔwd]	played	[pleɪed]	stopped	[stɔped]
called	[kɔwd]	asked	[æsket]	called	[kɔld]
called	[kɔwd]	called	[kɔld]	helped	[hɛlpt]
saved	[seɪvd]	called	[koʊld]	talked	[talkt]
called	[kɔwd]	called	[koʊld]	watched	[wɔtʃt]
		asked	[æsked]		
		watched	[wɔtʃit]		

Participant 25		Participant 26	
Verb	Transcription	Verb	Transcription
stopped	[stɔped]	played	[pleɪɛd]
called	[kɔladʒ]	turned	[tərned]
picked	[pɪked]		

Appendix I

Instructions for the Raters

1. General instruction: the focus of this study in on epenthesis produced to split the final cluster. Epenthesis produced after the final single consonants /t, d/ was not the focus of this study and should not be taken into account.

2. Instructions for text reading task:

- If there is no epenthesis, put an X in 'no epenthesis' and put an X in the line under your option if you think the participant produced an unreleased final consonant in the final clusters.
- If there is epenthesis, it is necessary to pay attention to the following: (1) if there is devoicing or palatalization of the final consonant /d/ or (2) if the verb is produced with epenthesis, but in the present tense, as in [mɪsedbʌz] for "*missed the bus"*, in which it is not possible to know if /d/ comes from the verb produced in past with epenthesis or if it comes from the article "the" pronounced with /d/ instead of /ð/. Then put an X in the item 'epenthesis production' and also in the items occurring together with epenthesis – devoicing, palatalization, or verb in the present tense.
- There might be changes in the consonants preceding -*ed* or in the consonants that form the clusters. If you identify such changes, other types of changes, put an X in 'cluster change'. Notice that you should check only 'cluster change' even if besides the change there is epenthesis as in [dʒʌdeged] for the verb *judged* or [laʊged] for the verb

laughed or [boʊmbed] for verb *bombed*. Pay attention on how /l/ is produced in *walked, talked, solved, helped, told, old* and *gold.* If /l/ is produced as /w/, consider it as 'cluster change'.

- If there is word substitution as in the case of substituting *danced* by *dancing*, put an X in "word substitution".

- If a word was not produced, put an X in 'not read'.

3 Instruction for the free-speech task:

- If there is no epenthesis, put an X in 'no epenthesis'. In this case consider if the final consonant was unreleased, and put an X also in 'unreleased final consonant'.

- If there was epenthesis, put an X in 'epenthesis' and also mark if there was devoicing or palatalization of the final consonant. Do the same as indicated above in case of 'cluster change'.

Appendix J

Material for the Second Rater

Participant ONE

PARAGRAPH READING TASK

list of words and texts	no epe	unreleas final C	yes epe	present tense	devoicing final C	palatal final C	cluster change	word substit	not read
Text one									
1 child									
2 cried									
3 told									
4 died									
5 killed									
6 passed									
7 prayed									
8 called									
9 touched									
10 last									
11 kissed									
12 slept									
Text two									
13 washed									
14 brushed									
15 missed									
16 wished									
17 saved									
18 tried									
19 walked									
20 fast									
21 worked									
22 hard									
23 end									
24 closed									

Text three									
25 best									
26 played									
27 gold									
28 watched									
29 end									
30 helped									
31 ranked									
32 reached									
33 stopped									
34 third									
35 cheered									
36 judged									
Text four									
37 third									
38 used									
39 mixed									
40 linked									
41 risked									
42 stopped									
43 prayed									
44 lived									
45 scared									
46 changed									
47 moved									
48 bombed									
49 claimed									
50 act									
51 find									
52 caused									
53 asked									

Test five									
54 liked									
55 planned									
56 trained									
57 climbed									
58 jogged									
59 rowed									
60 golfed									
61 surfed									
62 snowed									
63 worked									
64 played									
65 raised									
66 left									
67 hand									
68 talked									
69 danced									
70 laughed									
Text six									
71 used									
72 spend									
73 mapped									
74 camped									
75 jumped									
76 robbed									
77 shared									
78 friend									
78 solved									
79 filmed									
80 found									
Text seven									

81 searched									
82 made									
83 stored									
84 served									
85 dogged									
86 lift									
87 sound									
88 heard									
89 plugged									
90 text									
91 filed									
92 mailed									
Text eight									
93 last									
94 parked									
95 looked									
96 friend									
97 crossed									
98 called									
99 turned									
100 fact									
101 old									
102 friend									
103 just									
Text nine									
104 learned									
105 slowed									
106 stopped									
107 left									
108 phoned									
109 checked									
110									

fixed									
111 ranged									
112 made									
Text ten									
113 coughed									
114 stayed									
115 passed									
116 grabbed									
117 screamed									
118 miffed									
119 grasped									
120 hoped									
121 next									
122 skipped									
123 most									
124 last									
125 fact									
126 loafed									

FREE SPECHE TASK

word and picture	no epen	unreleased final C	yes epen	devoicing of final C	palatalization of final C
Picture two					
played					
Picture three					
asked					
asked					
Picture four					
called					
talked					
stayed					
watched					

Appendix K

Material for the Third Rater

Participant ONE

PARAGRAPH READING TASK

list of words/ texts	no epen	unrelease final C	yes epen	present tense	devoicing final C	palatal final C	cluster change	word substit	not read
Text one									
1 child									
2 told									
3 killed									
4 called									
5 touched									
Text two									
6 wished									
7 tried									
8 walked									
Text three									
9 gold									
10 watched									
11 helped									
12 judged									
Text four									
13 used									
14 linked									
15 caused									
Test five									

16 golfed									
17 talked									
18 laughed									
Text six									
19 solved									
20 filmed									
Text seven									
21 served									
22 filed									
Text eight									
23 looked									
24 crossed									
25 called									
26 turned									
27 old									
Text nine									
28 stopped									
Text ten									
29 grabbed									
30 screamed									
31 miffed									
32 grasped									

FREE SPEECH TASK

word and picture	no epen	unreleas final C	yes epen	present tense	devoicing of final C	palatal of final C
Picture two						
played						
Picture three						
asked						
Picture four						
called						
talked						
watched						

Appendix L

Lists of *-ed* Ending Words and *Contrastive Words*

List of tables with words ending in *-ed*.

Table 1: List of English monosyllabic words ending in *–ed* with stops in phonological context

CC clusters				CCC clusters	
/pt/	/bd/	/kt/	/gd/	/lpt, mpt, spt/	/rkt, skt, ŋkt/
stopped	robbed	cooked	plugged	helped	marked
dropped	grabbed	Liked	bagged	jumped	parked
skipped	probed	smoked	dogged	camped	worked
shaped	rubbed	baked	drugged	grasped	asked
hoped		talked	jogged		risked
mapped		checked			thanked
		kicked			linked
		knocked			ranked
		locked			

Table 2: List of English monosyllabic words ending in *–ed* with fricative in phonological context.

CC clusters					CCC clusters		
/fd/	/vd/	/st/	/zd/	/ʃt/	/rft, lft/	/rvd, lvd/	/nst, kst/
coughed	saved	missed	used	pushed	surfed	served	danced
laughed	shaved	crossed	closed	brushed	golfed	solved	mixed
miffed	moved	kissed	based	washed			fixed
loafed	proved	passed	caused	wished			relaxed
	loved	dressed	raised	crashed			
	lived	faced					

Table 3: List of English monosyllabic words ending in *–ed* with affricates in phonological context.

CC clusters		CCC clusters	
/tʃt/	/dʒd/	/rtʃt, ntʃt/	/ndʒd, rdʒd/
watched	judged	search	changed
matched	bridged	brunch	charged
touched	aged		ranged
reached	staged		

Table 4: List of English monosyllabic words ending in *–ed* with nasals or liquids in phonological context.

CC clusters		CCC clusters		CC clusters	
/md/	/nd/	/rmd, lmd/	/rnd/	/ld/	/rd/
dreamed	cleaned	formed	earned	called	stored
screamed	planned	termed	turned	spelled	shared
seemed	signed	filmed	burned	smiled	scared
climbed	trained		learned	filled	cheered
combed	joined			pulled	
bombed	rained			killed	
claimed	phoned			mailed	
				ruffled	
				filed	

Table 5: List of English words ending in *–ed* with vowels or diphthongs in phonological context.

/eɪd/	/oʊd/	/aɪd/
played	rowed	cried
prayed	slowed	tried
stayed	snowed	fried
	flowed	died
		lied
		tied

List of tables with *Contrastive Words*

Table 6: List of contrastive words ending in stop-stop clusters

Stop-stop cluster			
pt	bd	kt	gd
slept		affect	
attempt		reflect	
concept		act	
kept		fact	
accept		correct	
script		expect	
adopt		product	
swept		conduct	
inept		distinct	
Egypt		impact	
abrupt		conflict	
except		strict	
adapt		suspect	
opt		direct	

Table 7: List of *contrastive words* ending in fricative-stop clusters and affricate-stop clusters

Fricative-stop cluster					Affricate-stop cluster	
ft	vd	st	zd	sht	cht	gd
draft		best				
craft		past				
aircraft		last				
soft		fast				
shift		list				
lift		least				
left		West				
gift		East				
		exist				
		most				
		post				
		just				
		trust				
		lost				
		cost				
		coast				
		ghost				

Table 8: List of *contrastive words* for nasals and liquids

Nasal-stop cluster		Liquid-stop cluster	
md	nd	ld	rd
	second	bold	record
	thousand	told	board
	sand	sold	bird
	spend	gold	heard
	tend	old	hard
	land	held	word
	hand	build	third
	found	wild	card
	sound	child	backyard
	mind		tired
	find		forward
	kind		
	blind		
	friend		
	blond		
	beyond		
	England		
	island		

Table 9: List *of contrastive words* of the rhymes /eɪd, oʊd, aɪd/

/eɪd/	/oʊd/	/aɪd/
made	code	side
paid		guide
grade		pride
trade		

Appendix M

Participants' Profile

Participants' profile

Part	Age	Sex	1st studied English in	How old were you?	Stopped studying it	Lived abroad	Studied There
1	19	F	1998	12	2 years	England-1month Canada-1month	Yes
2	18	F	1994	8	1 year	No	-
3	68	M	1970	34	More than 1 year	California USA	-
4	20	F	2003	18	No	No	-
5	22	F	2000	17	2 years	No	-
6	23	M	2001	21	2 years	No	-
7	36	F	1975	7	10 years	No	-
8	18	M	1999	12	1 year	No	-
9	21	M	2000	16	2 years	Utah USA 4 months	Yes
10	20	M	1999	14	1 year	Hawaii USA - 1 ½ month	No
11	17	M	2001	13	1 ½ year	No	-
12	22	F	1996	14	4 years	No	-
13	25	F	1997	17	4 years	No	-
14	20	F	1996	12	3 years	USA - 3 months	Yes
15	34	F	2003	32	No	No	-
16	20	F	2000	15	1 year	No	-
17	23	F	1997	17	3 years	No	-
18	19	F	1997	11	No	No	-
19	23	M	1994	13	5 years	No	-
20	19	M	2000	14	1 year	No	-
21	15	M	2000	11	1 year	No	-
22	23	F	2001	20	2 years	No	-
23	23	M	1999	17	3 ½ years	No	-
24	22	M	1996	14	3 years	No	-
25	21	F	1996	12	2 years	No	-
26	17	F	2000	12	1 year	No	-