



## Deletion of voiced plosives in Chilean Spanish

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## Abstract

The following paper is a quantitative analysis of the influence of linguistic and social factors over the deletion of the voiced plosive series /bdg/ in Chilean Spanish, in order to determine whether the deletion of the series follows the same conditioning that has been described for its weakening. The study is based on a sample of ten informants native to Santiago in sociolinguistic interviews using four speech styles. Additionally, a careful procedure of spectrographic inspections and identification of non-deleted and deleted variants of the series was defined. After the coding and analysis, it is concluded that the voiced plosive series does not present a regular behaviour in the deletion of these segments in intervocalic contexts. Deletion of voiced plosives /b/ and /d/ was found mainly in reduced speech contexts, but style of speech was not a factor for /g/ deletion. Voiced plosive /d/ showed 65.6% of deletion, in addition to showing a stronger tendency to deletion in more linguistic contexts and across genders. Voiced plosive /b/ showed 37.6% of deletion, in similar linguistic contexts as for /d/, but more predominant in male speakers. Voiced plosive /g/ showed 5.8% of deletion, and its conditioning for deletion differed from /b/ and /d/ with regards to linguistic factors, and neither gender nor speech style were seen as factors involved in its deletion.

**Keywords:** deletion; voiced plosives; phonology; Chilean Spanish.

## 1. Introduction

In Spanish, voiced plosive consonants /b d g/ have been historically documented to be affected, when in intervocalic position, by the leniting process of spirantization (e.g. Harris, 1969; Lozano, 1979; Goldsmith, 1981; Mascaró, 1984). Spirantization is defined as a change in the manner of articulation that changes stop consonants into fricatives (Gurevich, 2011). However, recent phonetic work has shown considerable variation in the degree of constriction when observing lenition contexts (Hualde, Shosted, and Scarpace, 2011).

Additionally, some scholars have reported that some members of the voiced plosive group, specifically /d/, exhibit the complete loss of the segment, in specific phonological conditions: preceded by low vowel /a/ and followed by back vowel /o/, as part of a past participle suffix, and when forming part of an unstressed syllable (e.g. Navarro, 1983; Alba, 1999; Díaz-Campos and Gradoville, 2011).

Chilean Spanish also presents instances of leniting processes, similar to the ones described in the majority of Spanish-speaking varieties, as well as the complete loss of the intervocalic voiced plosive series /bdg/. However, these processes show slightly different patterns: /d/ and /b/ have been found to be more frequently elided. Regarding linguistic factors, the series presents higher rates of deletion after accented vowels and functioning as the onset of a stressed syllable (Poblete, 1995), and when they are part of suffixes, rather than as part of root morphemes (Cepeda, 1991).

Regarding extra-linguistic factors, the series shows a tendency for deletion in the most informal speech styles (Pérez, 2007), in young male speakers, and in the lower social classes (Poblete, 1995). These studies, however, might not be representative of the whole Chilean spectrum, since they have only used data collected in two cities from the south of the country (Concepción and Valdivia). Additionally, the vast majority of the studies on the voiced plosive series are not recent, and do not provide a very clear methodology, possibly due to not having the wide array of technological methods of study which are available nowadays.

The aim of this research is to revise the linguistic and social factors which have been found to play a role in the deletion of the voiced plosive series using data from the speech of people of Santiago, the Chilean capital city. Additionally, this research intends to test whether the linguistic factors which have been found to favour the weakening of the series in different varieties of the Spanish language correlate with the deletion of the same consonants, in the same environments.

This research will provide a literature review on work specifically related to Chilean Spanish in Chapter 2. In Chapter 3, a description of the methodology with descriptions of the speakers, tools, coding procedures, and linguistic and non-linguistic variables will be provided. Chapter 4 offers an illustration of the findings, and a discussion of these, accordingly.

Chapter 5 deals with the implications of the findings in this investigation, along with suggestions for further research.

## 2. Literature Review

### 2.1. Lenition and deletion in Chilean Spanish

Research specifically related to the behaviour of the voiced plosive series /bdg/ in Chilean Spanish is fairly recent. From a historical perspective, a number of studies mention different realisations of the consonantal repertoire of Chilean Spanish, including the voiced plosive series (e.g. Lenz, 1940; Silva-Fuenzalida, 1952). Oroz (1966) provides the seminal work for the subsequent studies on the phonetics, phonology, and sociophonetics of Chilean Spanish (e.g. Rodríguez, Véliz, and Araya, 1981; Lagos and Olivera, 1988; Cepeda, 1991; Contreras, 1993; Valdívieso, 1993; Borland, 2004; Pérez, 2007; Cid and Céspedes, 2008).

Regarding the voiced plosive series /bdg/ and its different realisations, the literature on Chilean Spanish is in harmony with the findings made in other varieties of Spanish. For example, Oroz (1966) reports that after a pause or a nasal consonant, /b/ is realised as a stop [b], but as fricative [β] and approximant [β̞] when intervocalic. With regards to voiced plosive /d/, Saavedra-Molina (1906) posits that /d/ is only realised as a stop after [n] and [l], a fact that would be later confirmed in Oroz (1966) and Cepeda (1991). These authors agree in that /d/ is realised as a stop [d] after nasal and lateral consonants, but they mention that the stop realisation of /d/ is also found in initial position. Additionally, these authors suggest that /d/ is realised as a fricative [ð] or approximant [ð̞] in any other position. Regarding voiced plosive /g/, Oroz (1966) and Cepeda (1991) report that /g/ is only realised as a plosive [g] after a nasal and in initial position, although realisations of /g/ as a fricative [ɣ] have also been found in initial position.

In a study of the speech of people in Santiago, Wigdorsky (1978) accounts for 14.5% of intervocalic deletion of /b/, and similar findings are mentioned in Cepeda (1991) for speakers in Valdivia. Regarding /d/, Wigdorsky (1978) also reports 30.6% of intervocalic /d/ deletion. Oroz (1966) and Cepeda (1991) account for the deletion of /d/ when part of words ending in *-ado*, as in *colocado* ‘placed’; *-edo*, as in *accedo* ‘I enter’, and *-ido*, as in *florecido* ‘flowered’, in addition for /d/ deletion in absolute final position, in words like *ciudad* ‘city’, and *merced* ‘mercy’.

Additionally, Poblete (1995) reports that /b/ and /d/ are deleted more frequently when functioning as the onset of an unstressed syllable, preceded by a stressed vowel, as also found in Puerto Rican Spanish (Navarro, 1983). Poblete (1995) further highlights that this deletion occurs when /d/ is part of a suffix rather than part of a root morpheme, as also found in Colombian and Argentinean Spanish (Díaz-Campos and Gradoville, 2011).

Moreover, Poblete (1995) also indicates social factors which might have a role in the deletion of the segments, including gender (higher deletion found in male speakers), age (higher in younger speakers) and social class (higher in working-class speakers).

Concerning /g/ deletion, Rabanales (1960) reports some cases of intervocalic /g/ deletion, but further details regarding the rates of deletion or the phonological conditioning for the segment to be deleted are not mentioned.

Recent work on the variation of the intervocalic series /bdg/ in Chilean Spanish has been done in the field of sociophonetics. Pérez (2007) studied the influence of style and the degree of weakening of the series using an oral corpus of recorded speech from Chilean news reporters, using spectrographic analyses in PRAAT (Boersma, 2001). In his study, the author created three labels in which the voiced plosive series was classified: as stops, approximants, and deleted realisations of the voiced plosives. Visual spectrographic aids were used in order to determine the labels of the /bdg/ series; the absence of vowel formants and the presence of the voicing bar alone would indicate a stop-like realisation of the voiced plosives, and the presence of vowel formants with some variation in their form and a noticeable decreasing trajectory in the intensity contour would indicate the presence of a less constricted form of the segments. Finally, visible unaffected variation in the vowel formants, in addition to no visible change in the intensity contour, would indicate a deleted realisation of the segments.

With regards to non-linguistic factors, Pérez (2007) follows the claims made in Labov (1983), which posit that speakers, in addition to following linguistic conditioning in their speech, are also conditioned by speech style: speakers change the way they speak according to the degree of formality or informality of the setting. Given that the author used a recorded corpus and, therefore, could not control for the social factor “style”, five labels for the analysis of speech register were created, from the most formal to the least formal, in accordance with the nature of the interactions.

The results in Pérez (2007) confirmed the claims in Cepeda (1991) and Wigdorsky (1978) with regards to the linguistic factors and the deletion of the /bdg/ series. Additionally, Pérez (2007) contributed with information regarding the social factors and the different lenition processes which voiced plosives undergo in Chilean Spanish. The author claims that the factor “style” does have an effect in the variation of different degrees of constriction on /b/ and /d/, but not for /g/: speakers exhibit approximant-like realisations of /b/ and /d/ in the most informal styles, while /g/ does not show constriction variations across style registers. Additionally, the author argues that /d/ exhibits the highest deletion rates in intervocalic contexts (24.1% of deletion), followed by /b/ (9.3% of deletion). Moreover, voiced plosive /g/ shows the lowest deletion rate (0.6% of deletion), and style register does not seem to have an effect on the deletion of the segment (Pérez, 2007: 253).

## 2.2. Research aim

The aim of this study is to test and try new variables which may be playing a role in reduced speech in Chilean Spanish. Specifically, this research intends to find out what phonological and social factors influence the deletion of the voiced plosive series in Chilean Spanish.

The following section will provide a detailed description of the methodology used in this study, comparing it to the methods used by different authors on reduced speech phenomena in Chilean Spanish and in Spanish in general, specifically concerning the voiced plosive series /bdg/.

## 3. Methodology

### 3.1. Contextualising the voiced plosives series in Chilean Spanish

As mentioned in Chapter 2, Wigdorsky (1978), Cepeda (1991), and Poblete (1995) posit that voiced plosive /d/ presents the highest rate of deletion of the series, followed by /b/, and some cases of /g/ deletion are also mentioned. These studies, except from Wigdorsky (1978), account for data and results obtained mainly from speakers in the south of Chile, specifically from the cities of Valdivia and Concepción. This study, on the other hand, gathered a new set of data, and all the speakers in this research are natives of the city of Santiago, the Chilean capital. Additionally, all the interviews were undertaken in June 2015. One of the aims of this research is to test whether the rate of deletion amongst the different voiced plosives in this group of speakers from Santiago shows differences with the data gathered in previous works.

Given lenition has been suggested to operate with different degrees of constriction in the intervocalic series /bdg/, different factors were taken into account in order to establish whether the deletion of the same segments functions in accordance with what has been described for the weakening of the series or rather to independent phonological conditioning. Therefore, in the following subsections, a detailed description of the methodology used in this research and comparisons between the methods used in this and previous work on Spanish and Chilean Spanish are provided.

### 3.2. The linguistic interview

A sociolinguistic interview was prepared in order to analyse the speech of ten native speakers of Chilean Spanish who are students living in Manchester, England, in four speech styles: a semi-guided conversation, very similar in structure to the one described in Labov (1984) and subsequently revised in Tagliamonte (2006), intended to elicit tokens of intervocalic voiced plosives in a semi-casual style.

Secondly, in order to obtain fully casual speech from the interviewees under investigation, a topic along the lines of the famous “oral narratives of personal experience” described

in Labov (2010) was prepared. In this case, the speakers were asked to describe the events during the 8.8 earthquake affecting the Chilean territory on February 27th, 2010. Using this technique, speakers are expected to overcome the “observer’s paradox” (Labov, 1973), which states that speakers change the way in which they normally speak when they know they are being systematically observed.

Thirdly, the reading of a story, with tokens of the voiced plosive series /bdg/ contained in different words, was prepared. The story contains intervocalic tokens of the voiced plosives in different phonological environments, including different surrounding vowels, as well as tokens with different word frequency and stress.

Finally, a set list of sixty words, all of them containing the voiced plosive series in intervocalic position, was prepared in order to elicit intervocalic voiced plosive tokens in the most formal context, and observe whether speakers would exhibit deletion of the segments even in this speech register.

As shown in Table 3.1, each speech style entails a different degree of formality, in similar fashion to the classification used in Pérez (2007).

**TABLE 3.1**

Degree of formality of each contextual speech style

SPEECH STYLE	DEGREE OF FORMALITY
Narrative (N)	Informal
Interview Style (I)	Less informal
Reading (R)	Less formal
Word list (W)	Formal

As table 3.2 shows, all of the speakers belong to the capital city of Chile, Santiago. Five of them are males and five of them are females, and they are all current students enrolled in different PhD programmes in universities in the city of Manchester, England.

### 3.3. The linguistic factors

#### 3.3.1. Stress

In this study, the role of stress in the deletion of the voiced plosive series will be revised in this new data set. Tokens of voiced plosives which occur in the onset of a stressed syllable will be labelled as “1”. Consequently, voiced plosives which appear as the onset of an unstressed syllable will be assigned the label “0”.

**TABLE 3.2**

Information of the speakers

SPEAKER	GENDER	CITY OF ORIGIN	PHD PROGRAMME
MA1	M	Santiago	Law PhD
MC2	M	Santiago	Immunology PhD
MD3	M	Santiago	Criminology PhD
ME4	M	Santiago	Politics PhD
MF5	M	Santiago	Biomolecular Sciences PhD
FB1	F	Santiago	Education PhD
FC2	F	Santiago	Business and Management PhD
FD3	F	Santiago	Management of Projects PhD
FM4	F	Santiago	Pharmacology PhD
FS5	F	Santiago	Neuroscience (Life Sciences) PhD

### 3.3.2. Preceding and following vowel

The preceding and following vowels surrounding the voiced plosive series will also be taken into account, and coded separately. In addition to the 5 vowel phonemes, all the Spanish diphthongs will be included in the study, in order to find out if they have a role in the deletion of certain segments. Therefore, the fourteen Spanish diphthongs, including the eight onglides /je/, /ja/, /jo/, /ju/, /wi/, /we/, /wa/, wo/, and the six offglides /ej/, /aj/, /oj/, /ew/, /aw/, and /ow/ (Whitley, 2002) will take part in this research.

### 3.3.3. Morpholexical factors

This research will test the findings in Poblete (1995), distributing the tokens of the voiced plosives series into four morpholexical categories: as part of a root morpheme (Group '0'), as part of a participle suffix (Group '1'), as part of a noun suffix (Group '2'), as part of a verb suffix (Group '3'), and as part of other suffixes (Group '4'). This division of suffix groups was chosen due to the fact that they all contain the voiced plosive series under investigation.

### 3.3.4. Word frequency

The collection database used in this study belongs to a Spanish word frequency corpus based on film subtitles coded in Cuetos, Glez-Nosti, Barbon, and Brysbaert (2011), which includes over 41.5 million words taken from contemporary movies and TV series. The frequencies of the written texts were obtained from Alameda and Cuetos (1995), and LEXESP (Sebastian-Gal-



les, 2000). According to Cuetos et al. (2011), recent work in linguistics has found that the word frequency estimates gathered from television and film subtitles have retrieved better results than the traditional word frequency estimates obtained from books and newspapers. Instead of using the frequency per million words, this paper uses the Zipf-scale as the standardised measure to match stimuli and word frequency, as suggested in Van Heuven, Mandera, Keuleers, and Brysbaert (2014).

### 3.3.5. Same/different surrounding vowels

A factor which has not been studied yet regarding the lenition or deletion of the voiced plosive series in Spanish is to observe whether there is an effect on the deletion/weakening of the segments if the vowels flanking the voiced plosives are identical or different.

## 3.4. Social factors

Given that the interviewees were all recorded in Manchester, England, it was not possible to code for the wide array of social factors that sociolinguistic work tends to include (e.g. age, social background, level of education). The only social factor which could be feasibly coded for is gender, although a discussion of social class can also be included to some extent.

### 3.4.1. Gender

With regards to Chilean Spanish and the deletion of voiced plosives, Poblete (1995) posits that the deletion of /b/ and /d/ is favoured amongst male rather than female speakers, at least in her sample gathered in Valdivia, and no effect of gender on the deletion of voiced plosive /g/ was reported. This research will test the role of gender in the deletion of the series, in the speech of Chilean speakers from Santiago.

## 3.5. Tools and equipment

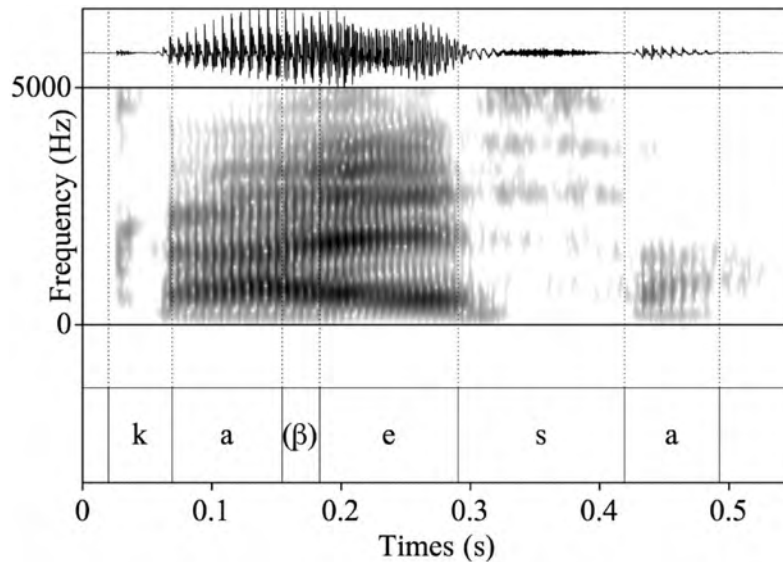
The interviews were recorded using a Sony PCM-M10 digital voice recorder and ranged from 60 to 90 minutes in duration. Subsequently, all the interviews were transcribed in PRAAT (Boersma, 2001). In order to establish the deletion of the voiced plosive series, all the tokens were examined using the intensity contour and visual aids of vowel formants provided by PRAAT, in a similar way to the one described in Hualde et al. (2011b) and Pérez (2007).

Due to the fact that the focus of this research is on the deletion of the voiced plosive series, instead of reporting the different degrees of constriction of the segments, this study reports “non-deletion” of the segments when a movement downwards in the intensity contour is evident, as well as interruption or variation in the vowel formants shown in the spec-

trogram. Subsequently, unaffected variation in the formants surrounding the voiced plosives, and no visible change in the intensity contour, will be reported as “deletion” of the segments, in a similar way in which Pérez (2007) classified deleted segments in his study. Figures 3.1, 3.2, and 3.3 below illustrate example tokens of voiced plosive /b/, showing non-deleted tokens with different degrees of constriction, and fully-deleted tokens.

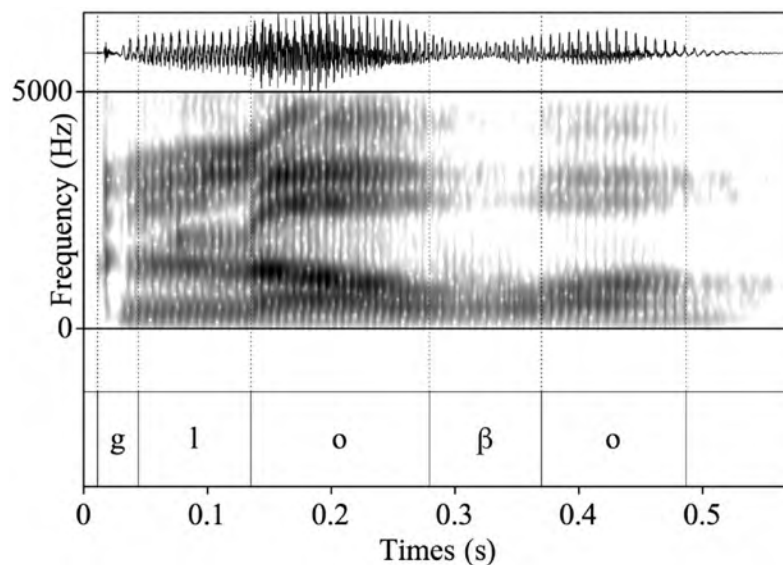
**FIGURE 3.1**

Example of a deleted token of voiced plosive /b/



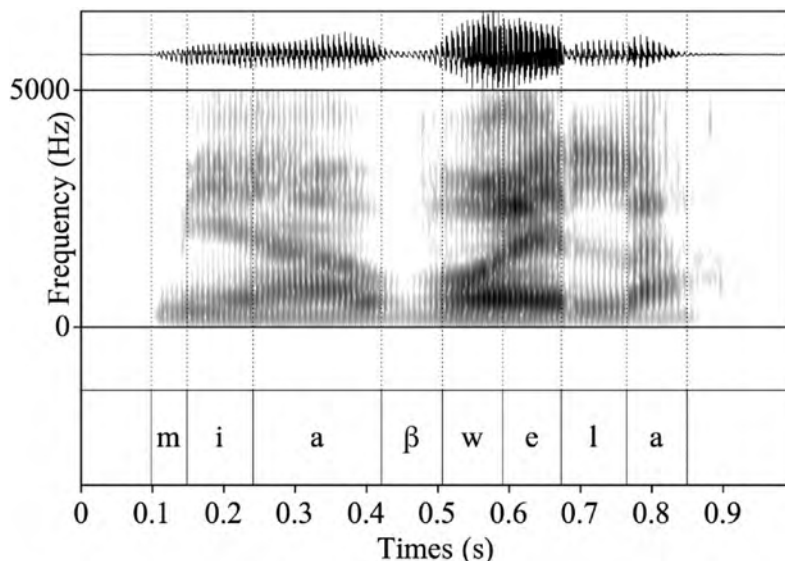
**FIGURE 3.2**

Example of an approximant-like token of voiced plosive /b/



**FIGURE 3.3**

Example of a fricative-like token of voiced plosive /b/



Segments presenting constriction of any degree will be regarded as “non-deleted” segments, and tokens which do not exhibit evidence of consonantal presence according to the aforementioned methods of inspection (intensity contour movement and change in the vowel formants) will be regarded as “deleted” segments.

The dependent variable ‘deletion of the segment’ and the independent variables concerning gender, place of articulation, stress, preceding vowel, following vowel, same/different surrounding vowels, style of speech, word frequency, and morphological factors were entered in the multivariate and statistical analysis software Rbrul (Johnson, 2008), in order to establish statistical significance of the role of the different independent variables on the deletion of the /bdg/ series, as well as for studying possible interactions between these independent variables and their role in the deletion of the segments using logistic regression analysis.

## 4. Results and discussion

### 4.1. Non-deleted and deleted tokens of the voiced plosive series

In considering the results, this research coded a total of 6385 tokens of underlying voiced plosives /bdg/ in intervocalic position. The tokens were then distributed according to whether the segments belonged to the non-deleted or deleted group, as shown below in Table 4.1.

Table 4.1 exhibits the resulting totals related to the retention and deletion of the /bdg/ series found in this research.

**TABLE 4.1**

Tokens of /bdg/ and their distribution according to gender, non-deletion and deletion

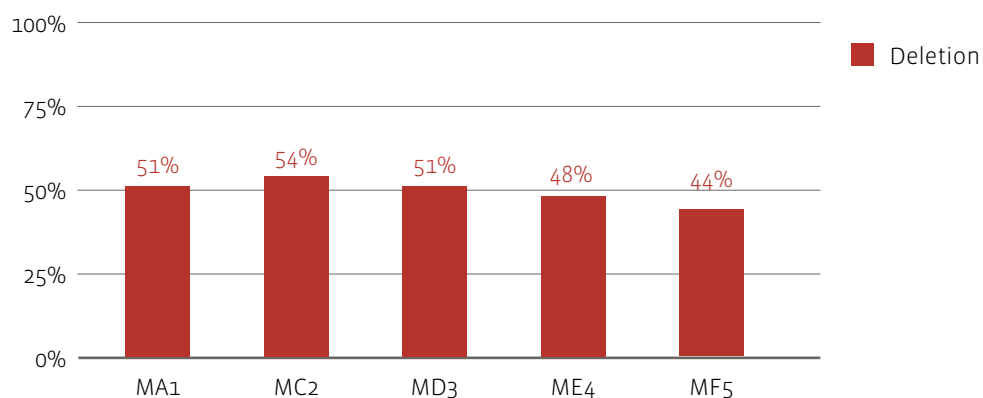
SPEAKER (MALES)	NON-DELETED	DELETED	TOTAL
MA1	268	273	541
MC2	294	345	639
MD3	427	440	867
ME4	336	313	649
MF5	371	291	662
<b>TOTAL (MALES)</b>	<b>1696</b>	<b>1662</b>	<b>3358</b>

SPEAKER (MALES)	NON-DELETED	DELETED	TOTAL
FB1	364	265	629
FC2	338	214	552
FD3	306	209	515
FM4	387	288	675
FS5	394	262	656
<b>TOTAL (FEMALES)</b>	<b>1789</b>	<b>1238</b>	<b>3027</b>
<b>TOTAL (OVERALL)</b>	<b>3455</b>	<b>2900</b>	<b>6385</b>

**FIGURE 4.1**

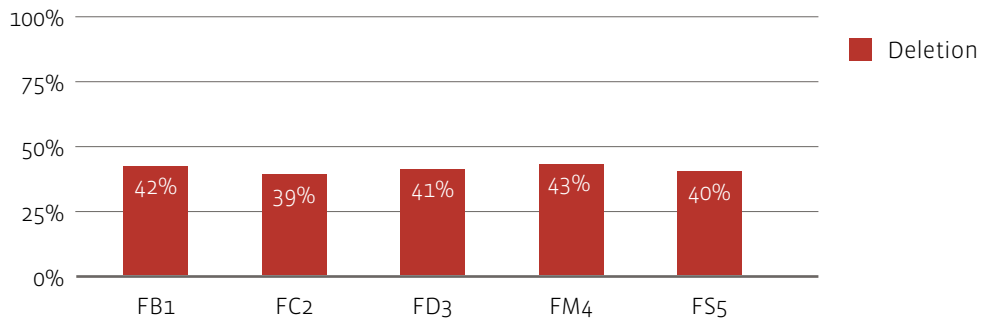
Deletion percentage found in male speakers



As can be seen in Figures 4.1 and 4.2 (below), the proportion of deleted and retained segments of the /bdg/ series is balanced amongst male speakers, with a slight tendency towards the deletion of the series. Female speakers, on the other hand, show a much stronger tendency towards the retention of the segments, as it was also observed in Poblete (1995).

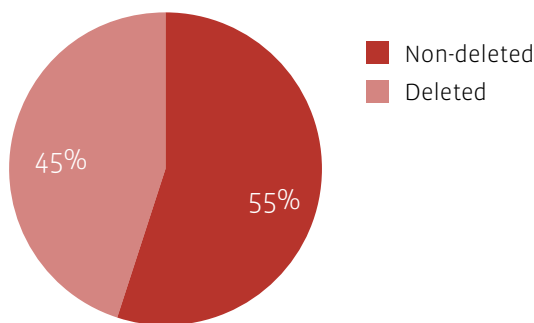
**FIGURE 4.2**

Deletion percentage found in female speakers



**FIGURE 4.3**

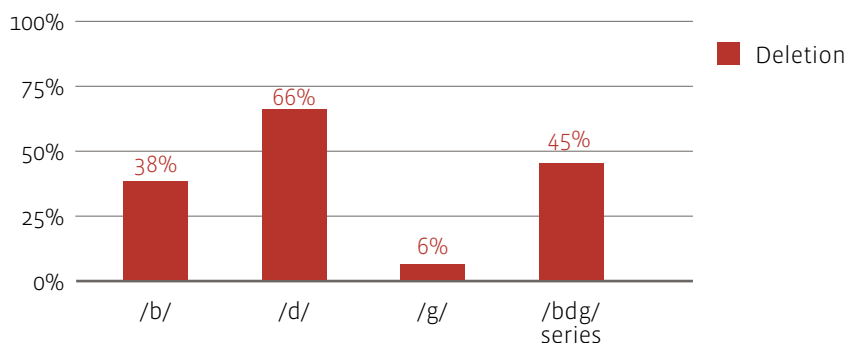
Percentage of non-deleted and deleted tokens of the /bdg/ series



The percentage distribution between deleted and non-deleted tokens of the series shown in Figure 4.3 illustrates a 55% of retention of the tokens, and a 45% of tendency towards deletion. These results do not completely match the findings reported in previous works. For example, in Pérez (2007), in spite of the fact that there is a further subdivision for non-deleted tokens (divided into two levels of constriction), the overall percentage of non-deleted tokens was 82.9%.

**FIGURE 4.4**

Deletion percentage of each member of the voiced plosive series, in addition to deletion of the series as a whole



As shown in Figure 4.4, voiced plosive /d/ exhibits the highest rate of deletion (65.6%), followed by /b/ (37.6%) and /g/ (5.8%). These results are similar to the ones reported in Pérez (2007). However, the numbers are substantially lower (24.1% of deletion for /d/, 9.3% for /b/, and 0.6% for /g/).

## 4.2. The linguistic variables

### 4.2.1. Stress and the voiced plosive series

Table 4.3 below illustrates the findings regarding the relationship between stress and the deletion of the voiced plosive series /bdg/, and Figure 4.5 illustrates the percentage distribution of deletion for each segment in stressed and unstressed syllables found in this research.

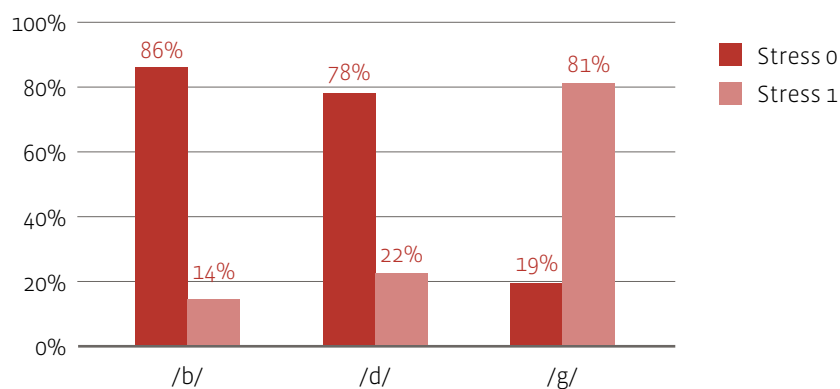
**TABLE 4.3**

Stress and its role in the deletion of the voiced plosive series /bdg/

VOICED PLOSIVE	STRESS	TOKENS	DELETION %	FACTOR WEIGHT
/b/	0	1145	86	0.61
/d/	0	2450	78	0.64
/g/	1	719	81	0.74

**FIGURE 4.5**

Percentage distribution of the role of stress in the deletion of /bdg/



As highlighted in Table 4.3 and Figure 4.5, voiced plosives /b/ and /d/ are more frequently deleted when they are located in the onset position of an unstressed syllable (86% and 78% of deletion, respectively), a similar tendency to the one described in Poblete (1995). However, this research finds an opposite effect for /g/ deletion: when deleted, the segment presents higher rates of deletion (81%) when they are located in the onset of a stressed syllable. This

finding is quite unusual, as stressed syllables are typically associated with fortition and/or lengthening of segments (Gordon, 2011).

#### 4.2.2. Preceding vowel and the voiced plosive series

Table 4.4 below illustrates the findings regarding the relationship between the preceding vowel and the deletion of the series /, and Figure 4.6 illustrates the percentages of deletion of the segments in relation to the preceding vowel.

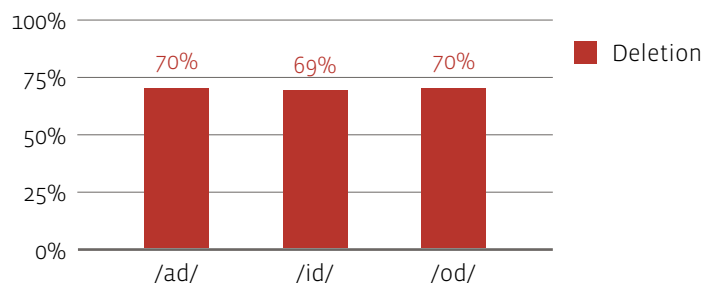
**TABLE 4.4**

The preceding segment and its role in the deletion of /bdg/

VOICED PLOSIVE	PRECEDING SEGMENT	TOKENS	DELETION %	FACTOR WEIGHT
/d/	/a/	1376	70%	0.70
	/i/	740	69%	0.68
	/o/	497	70%	0.60

**FIGURE 4.6**

Deletion percentage of the role of the preceding vowel and the deletion of /d/



As can be seen in Table 4.4 and Figure 4.6, the segment preceding voiced plosive /d/ does indeed play a role in its deletion. When /d/ is preceded by low vowel /a/, the segment is more likely to be deleted (70%), as also observed in Alba (1999) and Díaz-Campos and Gradoville (2011). However, this study also finds that a preceding high vowel /i/ and mid-back vowel /o/, as in *validarlo* ‘validate it’ and *modelo* ‘model’, would also favour the deletion of the segment (69% and 70% of deletion of the segment, accordingly).

#### 4.2.3. Following vowel and the voiced plosive series

Table 4.5 below illustrates the findings regarding the interaction between the following vowel and the deletion of /bdg/, and Figure 4.7 illustrates the percentages of deletion of the segments with respect to the following vowel.

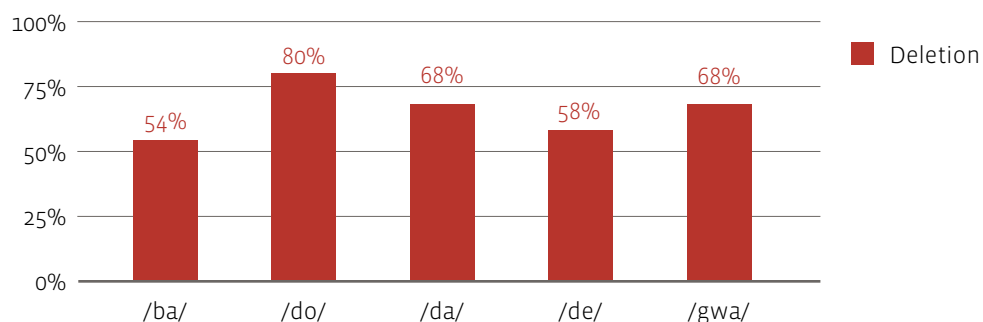
**TABLE 4.5**

The following segment and its role in the deletion of /bdg/

VOICED PLOSIVE	FOLLOWING SEGMENT	TOKENS	DELETION %	FACTOR WEIGHT
/b/	/a/	904	54	0.53
/d/	/e/	396	58	0.57
	/a/	1053	68	0.67
	/o/	1395	80	0.79
/g/	/wa/	124	68	0.70

**FIGURE 4.7**

Deletion percentage of the role of the following vowel and the deletion of /bdg/



As highlighted in Table 4.5 and Figure 4.7, this research reveals more tokens of /d/ deleted when followed by the mid-back vowel /o/ (80% of deletion), which has also been reported in Alba (1999) and Díaz-Campos and Gradoville (2011). However, this study also finds tokens of deleted /d/ when followed by the low vowel /a/ (68% of deletion), and mid-front vowel /e/ (58% of deletion). Additionally, this research finds an effect of a following low vowel /a/ in the deletion of the voiced plosive /b/ (54% of deletion).

Regarding /g/ deletion, a following diphthong /wa/ seems to favour the elision of the segment (68% of deletion), as in *igual* 'equal'. An explanation for this might have to do with the place of articulation: since the glide /w/ in the onglide diphthong /wa/ presents two places of articulation (velar and labial), the shared velar place of articulation between /g/ and /w/ might facilitate the elision of the voiced plosive.

#### 4.2.4. Same/different surrounding vowels and the voiced plosive series

The inclusion of this factor aims to observe if the deletion of the voiced plosive series is conditioned by whether or not the surrounding vowels are the same. As mentioned in Chapter 3, this is a factor which has not been included in previous research.



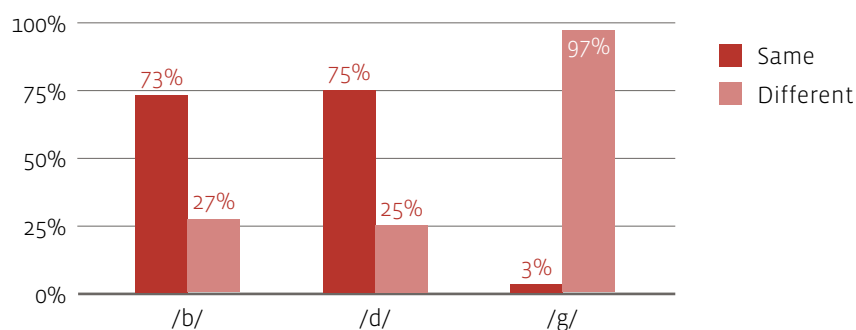
**TABLE 4.6**

Type of vowel environment and its role in the deletion of /bdg/

VOICED PLOSIVE	SAME/DIFFERENT ENVIRONMENT	TOKENS	DELETION %	FACTOR WEIGHT
/b/	Same	860	73%	0.92
/d/	Same	721	75%	0.91
/g/	Different	1145	97%	0.94

**FIGURE 4.8**

Percentage distribution of deletion amongst tokens of the /bdg/ series in same and different surrounding vowels



As shown in Table 4.6 and Figure 4.8, the voiced plosive /g/, once again, shows a different behaviour than the rest of the series. Segment /g/ is more commonly deleted when surrounded by different vowels (97%), whereas /d/ and /b/ show the complete opposite. In the case of /b/ and /d/, both segments favour deletion when surrounded by vowels /a/, /e/, /i/, and /o/ (73% and 75%, respectively).

#### 4.2.5 Style of speech and the voiced plosive series

The role of the style of speech in the deletion of the voiced plosive series /bdg/ and the findings of this research are shown in Table 4.7 and Figure 4.9 below.

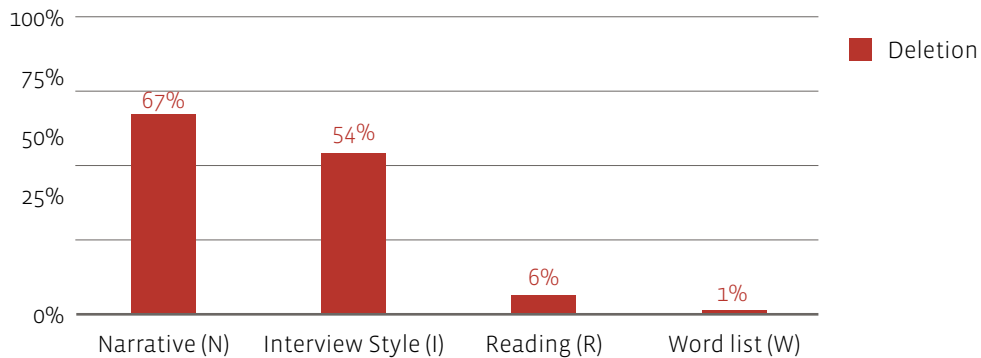
**TABLE 4.7**

Speech style and its role in the deletion of the voiced plosive series /bdg/

FACTOR	TOKENS	DELETION %	FACTOR WEIGHT
Narrative (N)	581	54	0.96
Interview Style (I)	4596	67	0.93
Reading (R)	669	6	0.05
Word List (W)	539	1	0.001

**FIGURE 4.9**

Deletion percentage of the role of speech style in the deletion of /bdg/



As can be seen in Table 4.7 and Figure 4.9 above, there is a tendency for speakers to delete more tokens of the voiced plosive series while speaking about the 8.8 earthquake in Chile, in the “narrative” style (67% of deletion). Additionally, a slightly lower but subsequently high rate of deletion of the voiced plosive series was found in the semi-guided conversation of the interview style (54% of deletion). Significantly lower rates of deletion were found in the reading style (6% of deletion), and almost no deletion of the voiced plosive series was accounted for in the word list reading (1% of deletion).

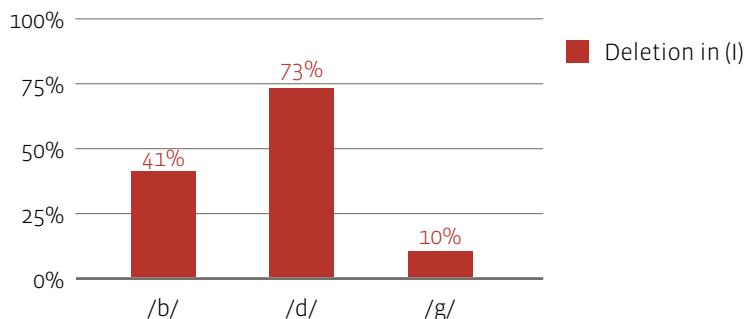
**TABLE 4.8**

Speech style and its role in the deletion of voiced plosives /b/ and /d/

VOICED PLOSIVE	STYLE OF SPEECH	TOKENS	DELETION %	FACTOR WEIGHT
/b/	Narrative (N)	203	66	0.82
/d/	Narrative (N)	289	85	0.80
	Interview Style (I)	2684	73	0.84

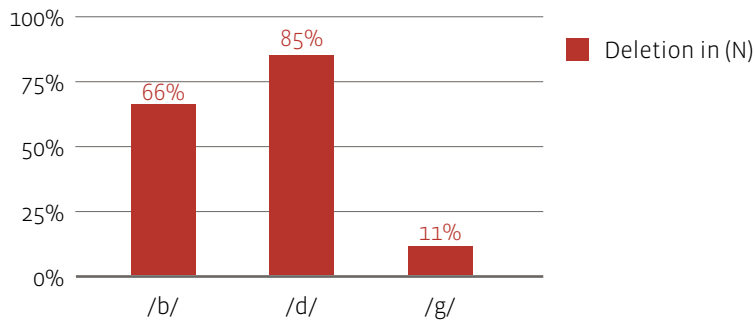
**FIGURE 4.10**

Deletion of the voiced plosive series /bdg/ in the interview style (I)



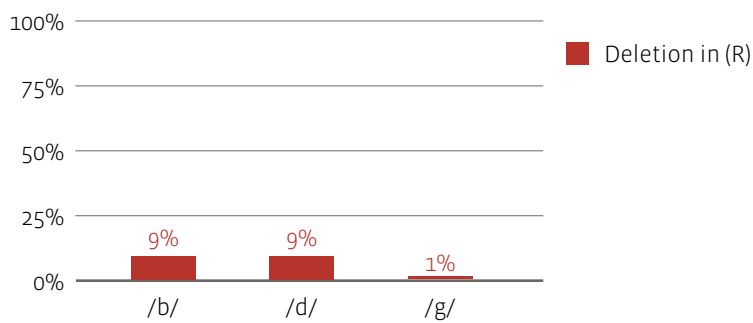
**FIGURE 4.11**

Deletion of the voiced plosive series /bdg/ in the narrative style (N)



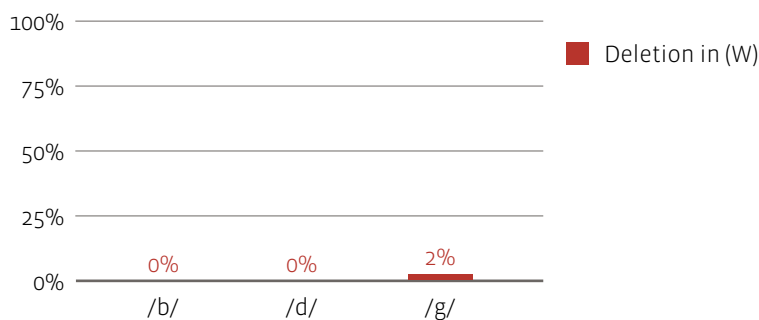
**FIGURE 4.12**

Deletion of the voiced plosive series /bdg/ in the reading style (R)



**FIGURE 4.13**

Deletion of the voiced plosive series /bdg/ in the word list style (W)



According to Table 4.8 and Figures 4.10, 4.11, 4.12, and 4.13 above, deletion of /b/ is higher in the narrative style (66% of deletion), whilst deletion of /d/ was found to exhibit high deletion rates both in the narrative (85% of deletion) and the interview style (73% of deletion). Slightly different results were obtained with regards to /g/, but these are not considered statistically significant, due to the fact that a further revision of the data showed that the only word that

presented /g/ deletion in both the reading style “S” and the word list style “W” was *aguacate* ‘avocado’. These results are in accordance with the results found in Pérez (2007): speech style does play a role in the variants of /b/ and /d/, but not for /g/.

#### 4.2.6. Word frequency and the voiced plosive series

Table 4.9 and Figure 4.14 below illustrate the results found in this study for word frequency and its interaction with the voiced plosive series /bdg/.

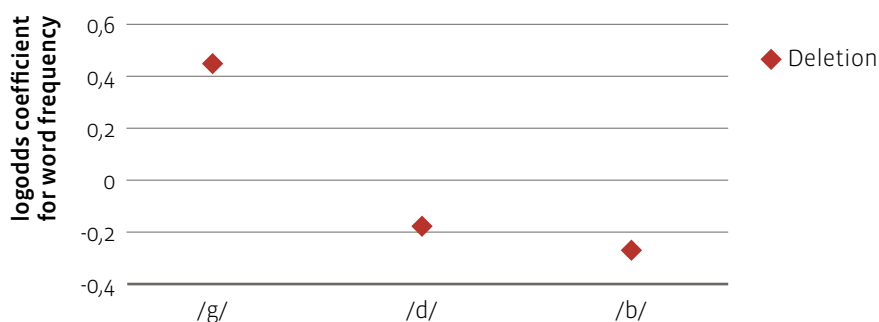
**TABLE 4.9**

Word frequency and its role in the deletion of the voiced plosive series /bdg/

VOICED PLOSIVE	LOGODDS COEFFICIENT
/g/	0.448
/d/	-0.178
/b/	-0.270

**FIGURE 4.14**

The effect of word frequency on the deletion of the voiced plosive series /bdg/



Because word frequency is a continuous variable, logodds, instead of factor weight, are reported. Positive logodds entail, in this case, that the higher the word frequency, the more likely it is for the token to be deleted. With regards to the figures reported in Table 4.9, the further the logodds are from 0, the stronger the effect of the factor word frequency is on the deletion of the token. The results in Table 4.9 and Figure 4.14 show that /g/, in high-frequency words, is more likely to be deleted.

However, the results in this research report the opposite effect for /d/, and especially for /b/: word frequency does not seem to play a significant role in the deletion of /d/, but the reverse effect appears as a factor for /b/ deletion. For example, tokens of /b/ were found more likely to be deleted in low frequency words. A further revision of these tokens en-

countered high rates of deletion of /b/ in words such as *inhabitables* ‘uninhabitable’, which report a word frequency of 0.47, or in the case of the proper noun *Irarrázabal*, with a word frequency of 0.41 (the numbers correspond to the Log10 measurements, see subsection 3.2.4 on *word frequency*).

Similar findings regarding infrequent words and the lenition of segments were reported in a study in Colombian Spanish (File-Muriel, 2010) with regards to the weakening of sibilant /s/. These findings differ to the ones reported in Eddington (2011) with regards to the weakening of the voiced plosive series and its relationship with word frequency. Eddington (2011) proposes that word frequency has an effect on voiced plosive /d/: the higher the word frequency, the more likely it is for /d/ to present weaker forms. In addition, the author argues that word frequency does not have an effect on voiced plosives /b/ or /g/.

#### 4.2.7. Morpholexical factors and the voiced plosive series

Table 4.10 and Figures 4.15 and 4.16 below show the findings regarding morpholexical factors and the deletion of the voiced plosive series in this research.

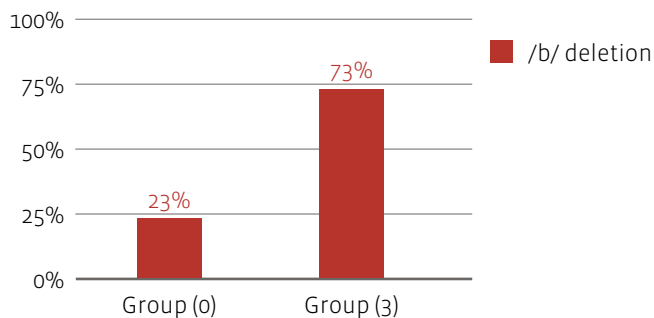
**TABLE 4.10**

Morpholexical factors and their role in the deletion of /bdg/

VOICED PLOSIVE	MORPHOLEXICAL FACTOR	TOKENS	DELETION %	FACTOR WEIGHT
/b/	Verb suffix (3)	477	73	0.70
/d/	Participle suffix (1)	825	91	0.85
	Noun suffix (2)	382	85	0.80
	Root (0)	2173	53	0.60

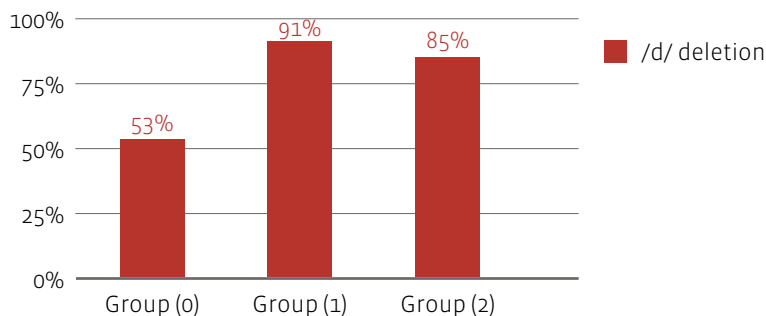
**FIGURE 4.15**

Morpholexical factors and their role in the deletion of voiced plosive /b/



**FIGURE 4.16**

Morpholexical factors and their role in the deletion of voiced plosive /d/



As shown in Table 4.10 and Figures 4.15 and 4.16, morpholexical factors seem to play a role in the deletion of the series, at least in the case of /b/ and /d/. In this study, tokens of /b/ and /d/ are more likely to be deleted when they form part of a suffix, rather than when they form part of a root morpheme. Tokens of /b/ were reported to be deleted more frequently when they formed part of a verb suffix (73% of deletion), in particular, the past tense suffix *-aba*.

With regards to /d/, this research found that tokens of /d/ forming part of the past participle suffix *-ado* and *-ido*, along with their feminine forms *-ada* and *-ida*, showed a high tendency to be deleted (91% of deletion), in accordance with what is reported in Alba (1999), Cedergren (1979), Poblete (1995), and Díaz-Campos and Gradoville (2011). However, this research also reports high rates of /d/ deletion in tokens forming part of noun suffixes (85% of deletion). In this case, noun suffix *-dad*, as in *dualidad* ‘duality’, and its plural form *-dades*, as well as in the noun suffix *-dor*, and its female form *-dora*, showed high rates of /d/ elision. Deletion of /d/ in root forms was also observed, although at a lower rate than as part of a suffix, but still statistically significant (53% of deletion). Morpholexical factors did not report to have a role in the deletion of /g/, perhaps due to the fact that intervocalic suffixes containing /g/ are not very common.

### 4.3. Social factors

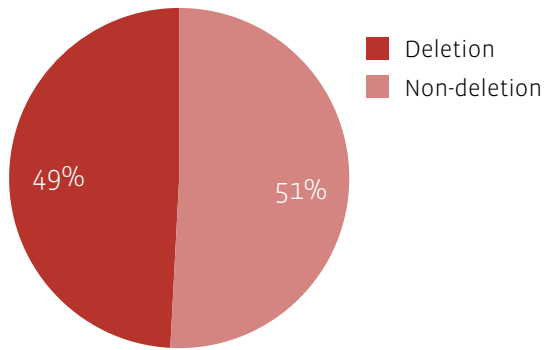
#### 4.3.1. Gender and the voiced plosive series

Figures 4.17 and 4.18 below illustrate the percentage of deletion by male and female speakers, respectively.

As shown in this Figures, although the retention of the voiced plosives is still preferred across genders, this research found that male speakers present higher deletion of the voiced plosive series than female speakers do. When considering male speakers, the difference between non-deleted and deleted segments is very narrow (49% of deletion). Female speakers,

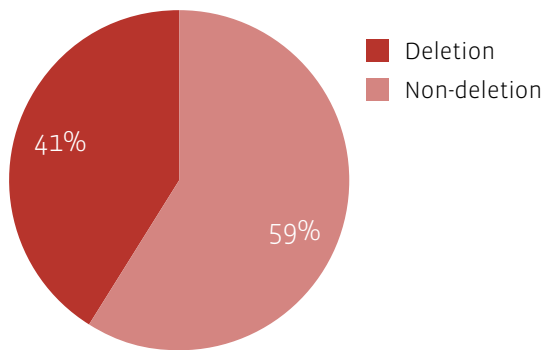
**FIGURE 4.17**

Deletion and non-deletion of the voiced plosive series /bdg/ in male speakers



**FIGURE 4.18**

Deletion and non-deletion of the voiced plosive series /bdg/ in female speakers



on the other hand, exhibit deleted segments: 41% of the tokens produced by female speakers were found to be deleted. A similar tendency is reported in Poblete (1995): the deletion of the segments is more commonly observed in male speakers.

A further regression in Rbrul was needed in order to obtain more precise information about the role of gender in the deletion of the voiced plosive series. In this case, interactions between the role of gender and each member of the voice plosive group were explored.

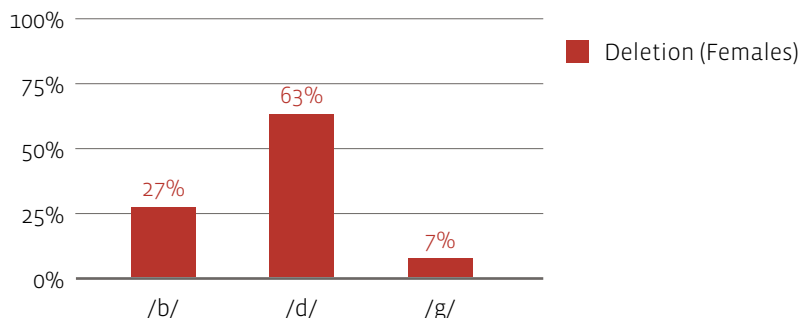
**TABLE 4.11**

Gender and its role in the deletion of the voiced plosive series

VOICED PLOSIVE	GENDER	TOKENS	DELETION %	FACTOR WEIGHT
/b/	Males	805	51	0.51
/d/	Males	1812	68	0.68
	Females	1570	63	0.62

**FIGURE 4.19**

Percentage distribution of the deletion of /bdg/ in female speakers



**FIGURE 4.20**

Percentage distribution of the deletion of /bdg/ in male speakers

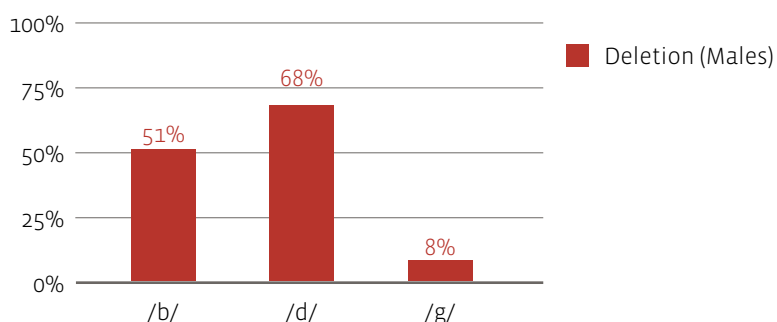


Table 4.11 and Figures 4.19 and 4.20 show that the only social factor included in this research, gender, also seems to play a role in the deletion of some of the members of the voiced plosive series, particularly when observing /b/ deletion: male speakers show a higher tendency to delete the segment than female speakers (51% of /b/ deletion, compared to 27% by female speakers). These results differ slightly from the ones mentioned in Poblete (1995), given that the author reports that deletion of both intervocalic /b/ and /d/ is found mainly in the speech of male speakers.

The findings of this research can be summarised as follows:

Voiced plosive /b/ is deleted more often in unstressed syllables (86%), followed by low vowel /a/ (54%), when the surrounding vowels are identical (73%), in the narrative style (N) (66%), in low-frequency words, when part of a verb suffix (73%), and in the speech of male speakers (51%).

Voiced plosive /d/ is deleted more often in unstressed syllables (78%), preceded by vowels /a/ (70%), /i/ (69%), and /o/ (70%), followed by vowels /a/ (68%), /e/ (58%), and /o/ (80%), when the surrounding vowels are identical (75%), in both narrative (N) (85%) and interview style (I)



(73%), mainly as part of participle suffixes (91%), but also as part of noun suffixes (85%) and root forms (53%), and in the speech of both male (68%) and female speakers (63%).

Voiced plosive /g/ is deleted more often in stressed syllables (81%), followed by diphthong /wa/ (68%), when the surrounding vowels are different (57%), and in high-frequency words.

## 5. Conclusions

This research aimed to define the linguistic and social factors which might play a role in the deletion of the voiced plosive segments /b/, /d/, and /g/ in Chilean Spanish in both reduced and careful speech. The intent was to confirm and compare the findings of previous work on the topic to the ones presented in this study.

The results and discussion in section 4 showed that the members of the voiced plosive series /bdg/ exhibit different conditioning for their deletion, especially when focusing on reduced speech. Therefore, it can be argued that deletion might operate rather independently from the mechanisms which have been observed to be involved in the weakening of the same segments, at least in Chilean Spanish. Each segment and the factors which favour deletion are described below.

Voiced plosive /d/ is the segment which presents the highest deletion, as shown by several other studies (e.g. Rabanales, 1960; Wigdorsky, 1978; Cepeda, 1991). This research was able to confirm that voiced plosive /d/ is sensitive to deletion in more contexts than the other members of the voiced plosive series. Regarding linguistic factors, the segment is more likely to be deleted in unstressed syllables, in agreement with what is reported in Cepeda (1991), and when preceded by low vowel /a/, as reported in previous research (e.g. Alba, 1999; Díaz-Campos and Gradoville, 2011). However, this research also found that preceding vowels /i/ and /u/ might also favour /d/ deletion.

Moreover, this research found a tendency for deletion of /d/ when it is followed by mid-back vowel /o/, also reported by Alba (1999) and Díaz-Campos and Gradoville (2011). In addition, this study also reported favourable deletion with following vowels /a/ and /e/, and when the vowels flanking the segment are identical, a factor which has not been explored before. The segment also presents high rates of deletion when observing morpholexical factors: /d/ is more likely to be deleted when forming part of a participle suffix, as observed in several studies (e.g. Cedergren, 1979; Alba, 1999). However, this study also reports deletion of /d/ as part of noun suffixes.

The segment was also observed to be deleted when forming part of a root morpheme; although, in lower rates, it was still statistically significant. Word frequency did not report important implications in the deletion of the segment (a slightly reversed effect was ob-

served, albeit not statistically significant). This is opposed to what is reported by Eddington (2011) concerning the weakening of the segment, which exhibited weaker realisations of /d/ in high-frequency words.

Concerning speech style, /d/ also exhibits a higher probability of deletion in more speech styles: high rates of deletion were detected in the narrative style, and in the semi-guided conversation, similar to what was observed in Pérez (2007). Finally, with regards to the social factor under investigation in this research (gender), segment /d/ was the only member of the voiced plosive series which reported a tendency for deletion across genders. This consisted of male speakers showing a slightly greater tendency to delete the segment than female speakers, in accordance with what is reported in Poblete (1995) for Chilean Spanish, and found in other varieties of Spanish, such as Caracas Spanish (Avizia, 2014) and Malagan Spanish (De La Cruz Lasarte, Villena, Díaz, and Ávila, 2011).

Voiced plosive /b/, on the other hand, presented 37.6% of its tokens undergoing deletion. In the same way as was observed for voiced plosive /d/, higher rates of deletion were found when /b/ was the onset of an unstressed syllable. This confirms the findings reported in Poblete (1995). However, /b/ did not report the same contextual sensitivity to deletion as shown by segment /d/.

Amongst the other linguistic factors which reported a role in /b/ deletion, a preceding high back vowel /u/ and a following low vowel /a/ is reported to be statistically significant in the elision of the segment. This was also shown to be the case if the vowels flanking /b/ were identical (as in the case of /d/ deletion). Word frequency reported a reverse effect in the deletion of /b/: less frequent words containing /b/ reported higher rates of deletion of the segment, in opposition to what is reported in Eddington (2011), in which the author found that word frequency does not have a weakening effect on /b/. With regards to morpholexical factors, the segment reported a tendency for deletion when forming part of a verb suffix, in accordance to what is suggested in Poblete (1995).

Concerning speech style, /b/ deletion was mostly favoured in the “narrative” context, in accordance with what is reported in Pérez (2007). Finally, when observing the social factor under study (gender), this research observed that male speakers favour /b/ deletion, but not female speakers. This is in opposition to segment /d/, which reported high rates of deletion across genders, a finding which would help to explain why male speakers report higher deletion of the voiced plosive series in Chilean Spanish.

Finally, /g/ showed the lowest rate of deletion (5.8%), as has also been observed in previous studies (e.g. Rabanales, 1960; Wigdorsky, 1978; Cepeda, 1991; Pérez, 2007). Regarding linguistic factors, stressed syllables containing /g/ reported higher deletion of tokens, as opposed to segments /b/ and /d/, which favour deletion in unstressed syllables. Moreover, the preceding segment did not report taking part as a factor for /g/ deletion, as opposed

to what has been reported in several studies (e.g. Cole et al., 1999; Ortega-Llebaria, 2004; Simonet et al., 2012). These studies claim that a preceding low vowel would favour weaker realisations of /g/. However, this study reports deleted tokens of the segment when followed by diphthong /wa/.

Furthermore, voiced plosive /g/ favoured deletion when the surrounding environments were different, as opposed to segments /b/ and /d/. Regarding word frequency, tokens of /g/ in high frequency words were more likely to be deleted, as opposed to what is reported in Eddington (2011), which posits that word frequency is not a factor for /g/ weakening. Morphological factors and gender did not prove to be statistically significant in the deletion of the segment, as found by Poblete (1995) and Pérez (2007).

With regards to social class, Poblete (1995) posits that deletion is produced mainly by low-class speakers. However, this research gathered data from highly-educated speakers, and was able to report high rates of deletion of the voiced plosive series nonetheless. Additionally, this research found higher rates of deletion than the ones reported in Pérez (2007). It is the author's intuition, as a native speaker of Chilean Spanish, that the deletion of the voiced plosive series may be a change in progress (Labov, 2001). Nevertheless, much more work would have to be done in order to validate such a claim.

Consequently, further research should include a wider range of speakers, belonging to different social classes, educational backgrounds, ages, as well as including perception tests, attitudinal questionnaires, and the inclusion of tokens across word boundaries. This is in order to observe other non-linguistic factors which might play a role in the deletion of the segments, and to establish whether the phenomena relate only to word-medial segments or also across word boundaries. Additionally, future research may need to consider the phonetic properties of the linguistic factors that were found to play a role in the deletion of the segments, and explain the reason why they operate differently within each member of the voiced plosive series /bdg/ in Chilean Spanish.

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