

The Pennsylvania State University

The Graduate School

Department of Spanish, Italian, and Portuguese

**THE PHONETICS AND PHONOLOGY OF
RHOTIC DURATION CONTRAST AND NEUTRALIZATION**

A Thesis in

Spanish

by

Travis G. Bradley

© 2001 Travis G. Bradley

Submitted in Partial Fulfillment
of the Requirements
for the Degree of

Doctor of Philosophy

December 2001

We approve the thesis of Travis G. Bradley.

Date of Signature

John M. Lipski
Professor of Spanish and Linguistics
Head of the Department of Spanish, Italian
and Portuguese
Thesis Adviser
Chair of Committee

Barbara E. Bullock
Associate Professor of French and
Linguistics

B. Richard Page
Associate Professor of German and
Linguistics

Philip H. Baldi
Professor of Linguistics and Classics and
Ancient Mediterranean Studies

Almeida Jacqueline Toribio
Associate Professor of Linguistics and
Spanish Linguistics

ABSTRACT

THE PHONETICS AND PHONOLOGY OF RHOTIC DURATION CONTRAST AND NEUTRALIZATION

December 2001

Travis G. Bradley, M.A., Ph.D., The Pennsylvania State University

Thesis Adviser: John M. Lipski

A number of the world's languages exhibit a phonological duration-based contrast between an extra-short coronal tap and a sustainable multiple-cycle trill. The post-SPE generative literature has focused almost entirely on the distribution of rhotics in Iberian Romance, and Spanish in particular. The main empirical goal of this dissertation is to demonstrate how Iberian Romance fits in among a broader typology of rhotic patterns. Relevant data from Spanish, Catalan, European Portuguese, Basque, Sebei, Kaliai-Kove, Kairiru, Palauan, Kurdish, and Ngizim suggest an implicational hierarchy of the form intervocalic < word-initial < elsewhere (word-final, pre- and postconsonantal), where rhotic duration contrast in a given position entails contrast in positions to the left. Further generalizations are uncovered with respect to patterns of neutralization. The theoretical goal of this dissertation is to develop a comprehensive analysis of the complete rhotic duration typology.

Chapter 1 introduces the analytical framework of phonetically-based Optimality Theory, focusing specifically on Correspondence Theory, the Dispersion Theory of

contrast, Segmental Autonomy, and Licensing by Cue, and then gives a preview of the proposed analysis.

Chapter 2 demonstrates how contemporary generative accounts have consistently invoked syllable structure and/or sonority in attempts to explain the distribution of the tap and trill in Spanish. Data are then presented from languages beyond Spanish in order to show that not all aspects of the behavior of these rhotics can be adequately captured with reference to syllable structure alone, thereby setting the stage for the phonetically-based Optimality-theoretic analysis.

Chapter 3 develops an account of the rhotic duration typology, with Spanish serving as the primary example. On this account, phonetic and phonological constraints interact directly to determine the surface distribution of rhotics without reference to syllable boundaries. Since reference to syllable structure is unnecessary, the analysis does not face the same difficulties as existing prosodic accounts when data beyond Spanish are taken into consideration.

Chapter 4 presents an empirical survey of languages beyond the Iberian Romance family and documents several heretofore unnoticed generalizations regarding the positional neutralization of rhotic duration contrast. These generalizations are then shown to follow straightforwardly as a consequence of constraint interaction under the phonetically-based OT analysis developed in Chapter 3.

Finally, Chapter 5 treats issues of phonological representation by focusing on the ambiguous nature of the surface trill, which patterns sometimes as a single unit and sometimes as a cluster of taps. Specifically, it is argued that a morphologically-derived

sequence of taps is neutralized to trill by dint of a targeted constraint enforcing coalescence of adjacent rhotics. Chapter 5 concludes by summarizing the main results of the dissertation and by outlining some issues for future research.

TABLE OF CONTENTS

LIST OF FIGURES	x
LIST OF TABLES	xii
ACKNOWLEDGMENTS	xiii
Chapter 1 Introduction	16
1.1 A Typology of Rhotic Duration Contrast and Neutralization	17
1.2 Theoretical Background and Assumptions	20
1.2.1 Optimality Theory	21
1.2.2 Evolving Conceptions of Phonological Contrastiveness	24
1.2.2.1 Correspondence Theory	27
1.2.2.2 Dispersion Theory	29
1.2.3 Consonantal Phonotactics Without The Syllable	32
1.2.3.1 Syllable-based Neutralization	34
1.2.3.2 The Segmental Autonomy Hypothesis	37
1.2.4 Constraint Hierarchies and Licensing by Cue	41
1.2.5 Summary	46
1.3 Analysis of The Rhotic Duration Typology: A Preview	47
1.3.1 Contrast Maintenance Constraints	48
1.3.2 Articulatory Markedness Constraints	50
1.3.3 Typology of Constraint Rankings	51
1.4 Overview of Dissertation	54
Chapter 2 Against Syllable-based Accounts of Spanish Rhotics	55
2.1 Distribution	55
2.2 Previous Accounts	59
2.2.1 Harris (1983)	59
2.2.2 Núñez Cedeño (1988, 1994)	62
2.2.3 Lipski (1990)	67
2.2.4 Morales-Front (1994)	72
2.2.5 Bakovic (1994)	78
2.2.6 Bonet and Mascaró (1997)	87
2.2.7 Summary	89

2.3	Problematic Data from Other Languages	91
2.3.1	Trill as A Single Phonological Unit	92
2.3.1.1	Vowel Length Restrictions in Ngizim.....	92
2.3.1.2	Reduplication and Consonant Clusters in Kaliai-Kove	95
2.3.1.3	Syllable Structure in Kairiru	96
2.3.2	Trill as A Phonological Geminate Tap.....	97
2.3.2.1	Liquid Assimilation in Palauan.....	98
2.3.2.2	Passive Affixation in Kurdish	99
2.3.3	Sonority and Neutralization to Trill in Basque and Kaliai-Kove.....	99
2.3.4	Syllable Position and Neutralization to Trill in Kairiru and Ngizim ...	102
2.4	Conclusion.....	105
Chapter 3 A Phonetically-based Optimality-theoretic Analysis of Spanish Rhotics ..		106
3.1	Phonetic Properties of Coronal Tap and Trill.....	106
3.1.1	Tap.....	107
3.1.1.1	Perception.....	107
3.1.1.2	Articulation.....	112
3.1.2	Trill.....	120
3.1.2.1	Perception.....	120
3.1.2.2	Articulation.....	122
3.1.3	Perceptibility Scale for Rhotic Duration Contrast.....	124
3.2	Constraints of The Analysis	126
3.2.1	Contrast Maintenance.....	127
3.2.2	Articulatory Markedness	128
3.2.2.1	Representations	128
3.2.2.1.1	Evidence for Tap as Aperture Contour	132
3.2.2.1.1.1	Lenition as Spreading of Aperture.....	133
3.2.2.1.1.2	Fortition as Delinking of Aperture.....	135
3.2.2.1.2	Comparison with Bakovic (1994).....	136
3.2.2.2	Constraints on Coronal Transitions.....	137
3.2.2.2.1	Place/stricture-sharing in Homorganic Clusters	138
3.2.2.2.2	Phrase-initial Fortition	142
3.2.2.3	Constraint on Coronal Constrictions.....	143
3.3	Analysis of Spanish Rhotics	147
3.3.1	Intervocalic Contrast	148
3.3.2	Neutralization to Trill.....	150
3.3.2.1	Lexical Conservatism.....	152
3.3.2.1.1	Lexically Listed Forms	153
3.3.2.1.2	Lexical Conservatism Constraints	155
3.3.2.2	Lexical Conservatism Effects on Word-initial Rhotics.....	157
3.3.2.3	Word-initial Geminate Stops in Swiss German	160

3.3.3 Neutralization with Variation	165
3.3.3.1 Lexical Conservatism Effects on Word-final Rhotics.....	174
3.3.3.2 Word-final Prevocalic Tap as The Emergence of The Unmarked.....	179
3.3.4 Lexical Conservatism Effects on Word-medial Rhotics in Dominican Spanish	181
3.3.4.1 Blocking of Hypercorrective /s/-epenthesis.....	182
3.3.4.1.1 Comparison with Correspondence Theory	186
3.3.4.1.2 An Alternative Analysis Based on Phonotactic Restrictions	192
3.3.4.2 Devoicing and Preaspiration	194
3.3.5 Neutralization of Postlexical Rhotic Clusters	199
3.3.5.1 Rhotic Cluster Neutralization and Phonotactic Constraints.....	200
3.3.5.2 Rhotic Cluster Neutralization and Targeted Constraints	202
3.4 Comparison with Syllable-based Accounts.....	210
3.4.1 Neutralization of Postlexical Rhotic Sequences.....	211
3.4.2 Rule Ordering and Word-final Prevocalic Tap	213
3.4.3 Structure Preservation and Hypercorrection	217
Chapter 4 Typological Predictions Beyond Iberian Romance.....	221
4.1 Typology of Constraint Rankings.....	224
4.2 Pattern I: Intervocalic Contrast.....	229
4.2.1 Basque	231
4.2.1.1 Observations.....	232
4.2.1.2 Analysis.....	234
4.2.2 Sebei	236
4.2.2.1 Observations.....	237
4.2.2.2 Analysis.....	237
4.3 Pattern II: Intervocalic and Word-initial Contrast.....	240
4.3.1 Kaliai-Kove	241
4.3.1.1 Observations.....	241
4.3.1.2 Analysis.....	242
4.3.2 Palauan	244
4.3.2.1 Observations.....	244
4.3.2.2 Analysis.....	246
4.4 Pattern III: Contrast Intervocalically, Word-initially, and Elsewhere.....	249
4.4.1 Kairiru.....	249
4.4.1.1 Observations.....	250
4.4.1.2 Analysis.....	251
4.4.2 Ngizim	253
4.4.2.1 Observations.....	255
4.4.2.2 Analysis.....	257

4.4.3 Kurdish	266
4.4.3.1 Observations.....	267
4.4.3.2 Analysis.....	268
4.4.3.3 Word-initial Neutralization and Harmonic Incompleteness.....	269
4.5 Comparison with Syllable-based Alternatives	271
4.5.1 Sonority and Neutralization to Trill in Basque and Kaliai-Kove.....	272
4.5.2 Syllable Position and Neutralization to Trill in Kairiru and Ngizim ...	275
4.5.3 Summary.....	281
Chapter 5 Representational Issues and General Conclusions.....	282
5.1 Trill as A Single Phonological Unit	283
5.1.1 Vowel Length Restrictions in Ngizim.....	284
5.1.2 Reduplication and Consonant Clusters in Kaliai-Kove.....	285
5.1.3 Syllable Structure in Kairiru.....	287
5.2 Trill as A Phonological Geminate Tap	288
5.2.1 Liquid Assimilation in Palauan	288
5.2.2 Passive Affixation in Kurdish	290
5.3 Analysis of The Ambiguous Nature of Surface Trill.....	290
5.3.1 Neutralization of Postlexical Rhotic Clusters in Iberian Romance.....	292
5.3.2 Neutralization of Morphologically Derived Rhotic Clusters	294
5.3.3 Summary.....	302
5.4 Concluding Remarks	303
5.4.1 Summary of Main Results	303
5.4.2 Issues for Future Investigation	305
5.4.2.1 Phonetic Variation in The Cross-dialectal Realizations of Rhotics	305
5.4.2.2 Perceptibility Conditions on The Surface Distribution of Coronal Tap.....	308
BIBLIOGRAPHY.....	313

LIST OF FIGURES

<i>Figure 1–1</i> : The standard (representational) treatment of contrastiveness (from Kirchner 1998:60).....	25
<i>Figure 1–2</i> : A constraint-ranking treatment of contrastiveness (from Kirchner 1998:63).....	29
<i>Figure 1–3</i> : Alignment of positional CONTRAST(voi) constraints to the perceptibility scale for distinctive obstruent voicing.....	46
<i>Figure 1–4</i> : A phonetically-based OT model in which phonetic and phonological constraints interact directly without underlying representation (from Steriade 1997:3).....	47
<i>Figure 3–1</i> : Intervocalic tap in Spanish <i>fuera</i> 'were'	108
<i>Figure 3–2</i> : Svarabhakti vowel fragment in Spanish <i>muerte</i> 'death'	110
<i>Figure 3–3</i> : Svarabhakti vowel fragment in Spanish <i>ayer</i> 'yesterday'	111
<i>Figure 3–4</i> : Non-peripheral timing of tap and V ₁ gestures produces svarabhakti vowel fragment in Spanish <i>muerte</i> 'death'	115
<i>Figure 3–5</i> : Peripheral timing of tap and V ₁ gestures results in perceptual masking of svarabhakti vowel fragment in Spanish <i>muerte</i> 'death'	116
<i>Figure 3–6</i> : Non-peripheral timing of tap and V gestures produces svarabhakti vowel fragment in Spanish <i>ayer</i> 'yesterday'	117
<i>Figure 3–7</i> : Peripheral timing of tap and V gestures results in perceptual masking of svarabhakti vowel fragment in Spanish <i>ayer</i> 'yesterday'.....	118
<i>Figure 3–8</i> : Full vowels ensure flanking sonority in Spanish <i>fuera</i> 'were'	119
<i>Figure 3–9</i> : Perceptually salient acoustic structure of intervocalic trill in Spanish <i>mediterráneos</i> 'Mediterranean'	121
<i>Figure 3–10</i> : Articulatory trajectories of the tongue tip in coronal tap versus trill (from Catford 1977:134).....	123

<i>Figure 3–11</i> : Passive vibration of tongue tip produces inherently salient acoustic structure of trill in Spanish <i>mediterráneos</i> 'Mediterranean'	124
<i>Figure 3–12</i> : Schematic relative duration of A _t constriction in tap versus trill	131
<i>Figure 3–13</i> : Fortition of phonemic tap as delinking of aperture (cf. Inouye 1995:136).....	135
<i>Figure 3–14</i> : Comparison of aperture-theoretic representations of coronal tap and trill	136
<i>Figure 3–15</i> : Sequence of tap + two-contact alveolar trill yields an acoustic representation consisting of three interruptions of surrounding vocalic aperture	204
<i>Figure 3–16</i> : Single prolonged, three-contact alveolar trill yields an acoustic representation consisting of three interruptions of surrounding vocalic aperture	204
<i>Figure 5–1</i> : Sequence of tap + tap yields an acoustic representation consisting of two interruptions of surrounding vocalic aperture	296
<i>Figure 5–2</i> : Single two-contact alveolar trill yields an acoustic representation consisting of two interruptions of surrounding vocalic aperture	296

LIST OF TABLES

<i>Table 1-1: A typology of word-level rhotic duration contrast and neutralization</i>	18
<i>Table 1-2: Cues to obstruent voicing in different segmental contexts (based on Steriade 1997:6-7)</i>	45
<i>Table 3-1: Summary of phonetic properties of coronal tap and trill</i>	125
<i>Table 3-2: Rhotic distribution in Spanish</i>	148
<i>Table 4-1: Typological survey of languages with a contrast between coronal tap and trill</i>	222
<i>Table 4-2: A typology of word-level rhotic duration contrast and neutralization</i>	222
<i>Table 4-3: Word-level distribution of rhotics in Spanish</i>	230
<i>Table 4-4: Rhotic distribution in Basque (Hualde [H] 1991; Saltarelli [S] 1988)</i>	232
<i>Table 4-5: Rhotic distribution in Sebei (O'Brien and Cuypers 1975)</i>	237
<i>Table 4-6: Rhotic distribution in Kaliai-Kove (Counts 1969)</i>	241
<i>Table 4-7: Rhotic distribution in Palauan (Josephs 1990)</i>	244
<i>Table 4-8: Rhotic distribution in Kairiru (Wivell 1981)</i>	250
<i>Table 4-9: Rhotic distribution in Ngizim (Schuh 1981)</i>	254
<i>Table 4-10: Rhotic distribution in Kurdish (Abdulla and McCarus [AM] 1967; McCarus [M] 1997)</i>	267

ACKNOWLEDGMENTS

First and foremost, I would like to thank John Lipski for being my thesis adviser. His extensive knowledge of even the most minute empirical facts of Spanish dialects and of other Romance varieties has proven to be an invaluable asset. I am also indebted to the other members of my committee, Barbara Bullock, Richard Page, Phil Baldi, and Almeida Jacqueline Toribio. Their careful reading of my work, their probing questions, and their many thought-provoking comments and suggestions have undeniably improved the final product of such a long academic endeavor.

My graduate career at Penn State has provided me with numerous opportunities to work with and learn from many different scholars. Thanks to Barbara Hancin-Bhatt, my first phonology instructor, for turning me on to phonology and phonetics and for being the first to suggest that I look at the work of researchers such as Patricia Keating and Donca Steriade on the relationship between phonology and phonetics in the grammar. I am also grateful to Jorge Guitart, Holly Nibert, and Phil Baldi for nourishing my interest and sharing their expertise with me in subsequent courses. Special thanks are due to Barbara Bullock for the countless hours we have spent in her office mulling over every twist and turn of my latest analysis or conference paper. I also thank Marc Authier, Lisa Reed, and Ana Teresa Pérez-Leroux for teaching me GB and Minimalist syntax, as well as James Lantolf and Steve Thorne for the opportunity to work with language technology at the Center for Language Acquisition. Finally, many thanks to the participants of the

PSU Linguistics Discussion Group meetings for critiquing so many practice talks over the years.

This dissertation would not have seen the light of day were it not for Eric Bakovic, who has been and continues to be a mentor, as well as a source of guidance and inspiration. Many, if not most, of the ideas appearing in this dissertation stem directly from the interactions I had while under his tutelage at Penn State. His ability to extract the crucial points of vaguely stated ideas and to transform meandering exposition into coherent argumentation has benefited me enormously.

I also wish to thank audience participants at LSA 2001, LSRL 28, LSRL 29, LSRL 30, LSRL 31, NELS 31, and the UNC Linguistics Colloquium 2000. Their comments have, in one way or another, helped to shape many of the ideas found in this dissertation. For their willingness to interact face-to-face and/or over email, I am particularly grateful to Rafael Núñez Cedeño, Paul de Lacy, Chip Gerfen, James Harris, Dylan Herrick, Eric Holt, José Ignacio Hualde, Ellen Kaisse, Patricia Keating, Robert Kirchner, Linda Lombardi, Fernando Martínez-Gil, Joan Mascaró, Jean-Pierre Montreuil, Ric Morris, Janet Pierrehumbert, Carlos Piñeros, Donca Steriade, Bernard Tranel, Leo Wetzels, and Erik Willis. Also, special thanks to Susan Banner Inouye for much email correspondence about her dissertation work.

Thanks to the following individuals for friendship, support, and overall fun times during my years at Penn State: Juan Contreras, Jason Duncan, Matt Eastburn, Doug Fisk, Hélène Gresso, Stasie Harrington, Tammy and Jay Hertel, Brian Jara, Edwin Lamboy, Meredith Lamm, Lara Lomicka, Gillian Lord, Melanie Manzer, Javier Marina, Gregg

Mauroni, Lisa Moody, Derek Morr, Erin O'Rourke, Felipe Pieras, Tim Reed, Anne Scott, Amanda Silliker, Gretchen Sunderman, Rosa Tapia, Brent Teasdale, Lawrence Williams, Tim Woolsey, and Mark Zurbuchen. My apologies to anybody whom I have forgotten to mention.

Finally, I would like to dedicate this dissertation to my entire immediate family, who have provided much love and support over the years: Larry, Vicki, Cameron, Graham, H.B., Leartis, Pat, Phillip, and Bea, as well as Sammy (R.I.P.), Tinkerbell, and Otis J.

This dissertation has been brought to you by the letters *r* and *rr*!