Abstract: The phonetic underpinnings of prosodic conditioning

1 The typology of prosodic conditioning

Prosodic structure influences a large number of phonological processes. Most of these processes involve either **(1)** the durational enhancement of segments within the domain of stress (e.g. stressed vowel lengthening in Italian, D'Imperio and Rosenthall (1999)) ; post-tonic gemination in Gualavía Zapotec, Ted E. Jones (1977)), or **(2)** enhancements of the prominence of the stressed vowel (neutralization to high sonority vowels in the stressed nuclei in Zabiče Slovene, Crosswhite (1999)). These processes have been analyzed as being triggered by grammatical constraints requiring that metrically strong positions be prominent (Hayes (1995); Gordon (2006); Bye and de Lacy (2008)). In optimality theoretic terms (Prince and Smolensky (1993)), *metrical prominence* (Π) is enforced by two markedness constraints, Π_{dur} and Π_V. The grammars of languages differ in whether they enforce only one (e.g. Finnish: ✓Π_{dur}, ✗Π_V) or both these requirements (e.g. Italian: ✓Π_{dur}, ✓Π_V). A third kind of processes is found within the stressed domain, which is less straightforwardly linked to metrical prominence: these are **(3a)** the blocking of certain neutralization processes (e.g. assibilation in Finnish verbs, Anttila (2006)), and **(3b)** the presence of *phonetic fortitioning* of stress-adjacent consonants (e.g. emphatic bursts in the onset of stressed syllables in Maori, Bauer (1993)) of consonants adjacent to stressed vowels.

Gonzalez (2003) presents a thorough survey of the consonantal alternations which are either blocked or triggered in the vicinity of stress: they are all extremely similar, since they all involve laryngeal properties of the sounds such as the intensity and the loudness of the burst. This picture is problematic for standard phonological analyses which have accounted for prosodic conditioning in terms of Positional Faithfulness to phonological features within the domain of stress (Beckman (1998); Smith (2002)).

2 Proposal

In this paper we *first* propose a unified analysis of the processes of the 3rd kind: we claim that (3a) and (3b), though apparently distinct, are both indirect effects of the aerodynamic mechanisms employed to satisfy Π_{dur} and Π_V. We claim that these stress conditioned processes arise indirectly from the specific aerodynamics of stress, and their acoustic effects on the phonetic realization of neighboring segments. They are not enforced by constraints that directly appeal to prosodic constituents. The finite number of the acoustic effects of stress restricts the nature of the processes which can be conditioned by stress, thus explaining the very limited cross-linguistic variation. This prediction is not made by direct metrical analyses of such processes.

Second, building on studies on the aerodynamics of stress (Ladefoged (1967); Ladefoged and Loeb (2002); Lehiste (1970); Sluiter and van Heuven (1996)), we propose a model of the interaction between stress and phonological processes, (1) to (3), that *(a)* can derive the typology of prosodically conditioned changes and *(b)* is crucially sensitive to the specific realization of stress in different languages.

Third we present experimental results from acoustic and perceptual studies on Italian and Finnish, showing that modulations in subglottal pressure aimed at increasing the prominence of a stressed vowel affect the realization of neighboring consonants, which have shaped the distribution of consonantal alternations in these languages (velar palatalization and assibilation, respectively).

Finally, the model is formalized within the framework of Dispersion Theory (Flemming (2004); Flemming (2005); Flemming (2008)).

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