Variable h-epenthesis in the interlanguage of francophone ESL learners

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A Thesis

in the

Department

of

Education

Presented in Partial Fulfillment of the Requirements
for the Degree of Master of Arts (Applied Linguistics) at
Concordia University
Montreal, Quebec, Canada

February 2006

Your file Votre référence
ISBN: 0-494-14168-9
Our file Notre référence
ISBN: 0-494-14168-9

Abstract

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This thesis investigates variable h-epenthesis by francophones in English (e.g., "I hurt my [h]ankle" vs. "my _ankle"). Speech samples from 15 francophones were analyzed via the statistical program GoldVarb. Since epenthetic segments are by definition absent from (and hence unfaithful to) input, h-epenthesis hypothetically results from the high ranking in interlanguage (IL) of the markedness constraint ONSET, which is commonly associated with consonant epenthesis. The finding of greater h-epenthesis in more formal speech, however, contradicts this analysis given that, cross-linguistically, the more formal the speech, the higher ranked the faithfulness constraints (Oostendorp, 1997). The solution lies in an output-output faithfulness constraint adapted from Bradley (to appear): MAX-OO-[h] ("An output [h] in native speaker (NS) English has an output correspondent in francophone IL output"). In this form of output-output correspondence, the output is generated not from the speaker's own input, as is usual, but from the prestige-variety NS output that the learner tries to duplicate, particularly in more formal contexts. Francophones strive to emulate NS output due to two realizations: they realize 1) that, given their pervasive h-deletion, a discrepancy exists between their own and NS output; and 2) that this discrepancy stems from the unreliability of their input forms, which lack underlying *h* due to francophones' (at least initial) inability to construct a phonemic representation for this non-native segment (Brown, 1997, 1998). Hypercorrect h-epenthesis is then generated because, rather than accurate NS output forms, speakers access an overly permissive *output generalization*.

Acknowledgements

First, I owe a huge debt of gratitude to my supervisor *hors pair*, Walcir Cardoso, who has provided me with invaluable guidance and incalculable support at every level of the research and thesis-writing process. Generous and dedicated almost beyond belief, certainly beyond the bounds of what is necessary or expected, Walcir has shared with me his insight and experience in phonological research, guiding me and encouraging me to participate fully in the academic community of applied linguistics. Due to his encouragement, I have attended a number of conferences, presenting and publishing the results of my research. I remember him patiently receiving me at his house one Sunday morning to help me hone a presentation scheduled for the next day at Laval University. He also rose the following day at four in the morning to drive Claudia Escartin, his other Master's student, and myself to the conference in Quebec City (the return in near-blizzard conditions!). In sum, infectiously enthusiastic in his research and in his teaching, Walcir Cardoso is nothing short of remarkable; I frankly do not know how to thank him enough. More prosaically, I would also like to acknowledge the financial support I received as a research assistant to Walcir Cardoso from an FQRSC grant (NC-96880).

Next, there are many other professors at Concordia I am sincerely grateful to. The department is blessed with extraordinary faculty members, who have made my time there truly pleasurable and enriching. I would like to extend heartfelt thanks first to the members of the thesis committee, Joanna White, Pavel Trofimovich and Denis Liakin, who read the proposal and thesis, and who gave invaluable feedback and continued encouragement. I am grateful to Elizabeth Gatbonton, who has been enthusiastic and generous of her time, always being available for an enjoyable and thought-provoking

discussion. Ahlem Ammar deserves high praise for the simply stellar job she did of initiating me and my fellow students into the mysteries of Research Methods. Her course in the first semester provided me with a solid base from which to embark on research, and I am eternally grateful to her for this. Finally, one of my main reasons for entering the Master's program at Concordia after the TESL certificate was the outstanding teaching of Laura Collins, particularly in Language Acquisition – one of my few regrets at the Master's level is that I have not had the chance to take another course with her.

I would like to express my gratitude also to Randall Halter in the SAGE lab, who is always willing to offer his good-natured help, to Isabelle Lapointe, who helped me with the French translations of the call for participants and the consent form, to Dennis Divsic, for showing me dictations by his ESL students with inserted and omitted *h*'s, and to Dawn Cleary for insight into Newfoundland English. I would also like to extend thanks to my 15 participants, some of whom are friends and acquaintances – without you, this thesis truly would not have been possible!

For comments and suggestions, I am grateful to the audience at the 19th *Journées de linguistique*, at SPEAQ 2005, at SPEAQ Campus 2006, and at the 20th *Journées de linguistique*, and to those who discussed with me the posters of my research that were shown at the 5th International Symposium on Bilingualism and the CSLP Fair 2005.

On a more personal note, I would like to thank my wife, Ying Su, without whom this thesis would also not have been possible, not least because of her invaluable technical support on all things computer-related. Ying has offered immeasurable support and understanding, all the while patiently giving up evenings and weekends with her husband to the all-consuming thesis. She is herself an inspiration, having overcome

considerable obstacles with a matchless determination that I admire and respect. But most of all, I thank her simply because she makes life worth living.

Finally, I would like to thank my parents, Brian and Margaret John, who provided me as a child with boundless love and emotional support, as well as with an intellectual seedbed in which to develop. They are truly remarkable human beings and wonderful parents, who continue still to offer me unconditional support and encouragement, and who in many ways make the world a better place.

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Introduction

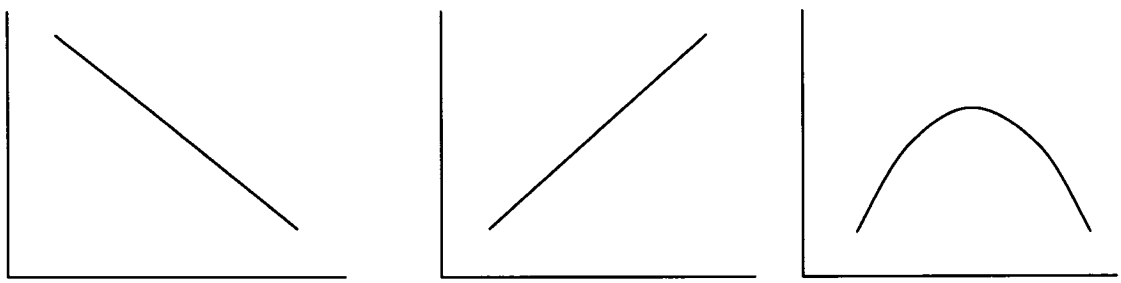
The phoneme *h* is notoriously problematic for francophone ESL learners. Absent from the first language (L1) inventory of phonemes, *h* is typically deleted by learners in the early stages of acquisition and beyond, as it is in English loanwords to French (Paradis & LaCharité, 2001). Eventually, many or most francophone learners learn to produce *h*. Even at the higher levels of proficiency, however, production remains variable: h-deletion may diminish considerably with increased proficiency, but only rarely does it cease completely. Remarkably, once learners develop the ability to produce the elusive segment, they also start to produce instances of epenthetic *h*. H-epenthesis refers to the insertion of an *h* into the onset of a vowel-initial syllable, as in "I hurt my [h]ankle."[1] It is this process of intrusion of a non-underlying segment in the interlanguage (IL) of francophone ESL learners that is the object of the research study presented here.

The process of h-epenthesis is variable. Casual observation reveals that at no stage in IL development do all vowel-initial syllables categorically receive an inserted *h*. Under the assumption that variation (whether in an IL or an L1) is systematic, the primary aim of the current study is to probe the systematicity of variable h-epenthesis, that is, to explore the blocks and triggers that condition the process probabilistically. More specifically, the goal is first to identify the linguistic and extralinguistic factors that influence the frequency of h-epenthesis and then to provide a principled account of this variable process within the framework of Optimality Theory (Prince & Smolensky, 1993).

[1] Usually when referring to the segment, I put *h* in italics; where greater precision is required, I indicate underlying (phonemic) /h/ between slashes thus, and surface (phonetic) [h] between square brackets.

One assumption underpinning the study is that IL is not simply a deficient, error-riddled and random version of the target L1, but is itself a bona fide and systematic language which shares features with fully-fledged natural languages. Across the stages of its development, IL is also a *dynamic* system that to varying degrees incorporates elements of the learner's L1, elements of the L2, and elements that are derived neither from the L1 nor the L2 and that may be termed developmental. To account for this systematic dynamism, Major (2001) has proposed an Ontogeny Phylogeny Model of language acquisition and change.[2] In terms of second language acquisition (SLA), the model posits that learners progress from an *initial IL stage* with a prevalence of L1 features, to a *final stage* with a prevalence of L2 features, via *medial stages*, during which L1 features gradually decline, L2 features gradually rise, and developmental features steadily rise, peak and then fall again. These patterns are illustrated in Figure 1, with the horizontal axis representing time, and the vertical axis, frequency.

Figure 1: The Ontogeny Phylogeny Model (Major, 2001)



[2] The Ontogeny Phylogeny Model is a revised version of the Ontogeny Model (Major, 1987).

With regard to *h* in francophone IL, over time (i.e., with increasing proficiency due to greater exposure to the L2), the L1 tendency to delete *h* is expected to diminish, and the L2 tendency to produce underlying *h* is expected to increase. H-epenthesis, which does not occur in either the L1 or the L2 (with the exception of the non-target varieties discussed in the forthcoming section 2.3), is best designated a developmental feature. As such, with developing proficiency, epenthesis rates should initially rise to an apex of frequency and subsequently decline.

Developmental features such as h-epenthesis are remarkably similar across different learners' ILs, appearing in very similar (and even identical) sequences, in some cases apparently regardless of L1 (e.g., Pienemann, Johnston, & Brindley, 1988). They are also frequently found to be features of natural languages. Specifically, they are often unmarked features which reflect language universals, a situation suggestive of access to Universal Grammar in SLA. In Optimality Theory the process is referred to as the "Emergence of the Unmarked" – that is, unmarked forms, which can be accounted for neither by the L1 nor the L2 grammar, appear in the IL, sanctioned by constraints that surface in the process of acquisition. As a consequence, the question concerning h-epenthesis in the IL of francophone ESL learners is: Can the phenomenon be attributed to one or more universal markedness constraints which, although not necessarily active in either the L1 or the L2, emerge in the process of constraint re-ranking that takes place during language acquisition?

In terms of the markedness constraint(s) behind the process of h-epenthesis, it will be argued in chapter 3 that ONSET ("Syllables have onsets"), which is responsible for the cross-linguistic preference for syllables to start with a consonant, is a promising

candidate. The constraint can be observed in both English and French (although it does not, of course, lead to h-epenthesis in these languages). In English, ONSET accounts for the tendency for a word-final consonant to link up with an ensuing vowel-initial word, that is, to resyllabify as an onset (e.g., *far‿away*) (Labov, 1997), as well as for the tendency for speakers to epenthesize a glottal stop in vowel-initial words preceded by a pause (e.g., [ʔ]*actually, she was*...) (Dilley, Shattuck-Hufnagel, & Ostendorf, 1996), and to insert a glide in hiatus position (e.g., *tru*[w]*er* or ri[j]*ot*). In French, onsetless words are also frequently subject to cross-word resyllabification processes, including liaison, elision, suppletion, and enchaînement, that effectively fill the empty onset (Tranel, 1995; 1996).[3] Francophone ESL h-epenthesis may, therefore, be an innovative IL strategy for satisfying a constraint operative in both the L1 and L2.

The rest of this thesis is organized as follows. Chapter 1 examines the issue of francophone acquisition of *h* in terms of perceiving – and developing a phonemic representation for – a segment that is absent from the L1. Consideration of the perception and acquisition of *h* provides a backdrop for an analysis of the process of h-epenthesis, which constitutes the particular focus of the current study. Chapter 2 presents the findings of the only previous study of h-epenthesis (Janda & Auger, 1992), which interprets the phenomenon as a form of qualitative hypercorrection. Chapter 3 provides an overview of

[3] Liaison refers to the pronunciation of latent word-final consonants, such as in the final /t/ in *petit* "little," which is unpronounced when the word is spoken on its own *petit* [pə.ti] or before a consonant-initial word as in *petit bateau* [pə.ti.ba.to] "little boat," but which surfaces before a vowel-initial word, as in *petit ami* [pə.ti.t̲a.mi] "little friend" (with the periods indicating the syllable breaks in each case). The most common instance of elision involves the suppression of the vowel in the definite article *le* or *la* before a vowel-initial word, as in *l'ami* [l̲a.mi] "the friend." An example of suppletion is the replacement of the feminine possessive pronoun *ma* with masculine *mon* before a vowel-initial word, as in *mon amie* [mɔ.n̲a.mi] "my friend." Enchaînement refers to the linking up or resyllabification of a fixed word-final consonant with a following vowel-initial word (such as in the final /t/ of *petite* "little" – feminine form – which is pronounced when the word is spoken on its own or before a consonant-initial word), as in *petite amie* [pə.ti.t̲a.mi] "little friend." All four processes serve to fill the empty onset of the vowel-initial word.

Optimality Theory (OT) as a generative theory of output and looks at three different OT accounts of consonant epenthesis: the first account based on the ONSET constraint, the other two on different types of output-output correspondence constraints. How OT handles variation and language acquisition is also discussed. Chapter 4 presents the methodology of the current study, including a regrouping of all the hypotheses formulated in the initial chapters (4.1), as well as a description of the participants (4.2) and of the data collection (4.3) and data analysis procedures (4.4). Briefly, for the analysis of second language variation in the study presented here, data collection and data analysis procedures have been adopted from sociolinguistics, including the data analysis program GoldVarb (Robinson, Lawrence, & Tagliamonte, 2001), which determines the probabilistic weight a contextual factor contributes to the applicability of a process (i.e., to the epenthesis of an *h* into an onsetless syllable). Chapter 5 provides a synopsis of the results, including a discussion of the results and of how to account for them within the OT framework. Finally, chapter 6 explores some classroom implications and applications of the findings. The combination of SLA, sociolinguistics and phonological theory makes this a particularly thorough and multifaceted research study.

Chapter 1. The Problem of Acquiring a Non-Native Phoneme

Being absent from francophone ESL learners' L1 inventory of phonemes, *h* represents a novel phoneme that needs to be acquired. This process of acquisition involves developing the ability both to perceive and eventually to produce *h*. In the following sections, the focus is primarily on the issue of perception: first on perception in general, along with what it means exactly to perceive speech (section 1.1); and then on specifically the perception and acquisition of L2 phonemes (section 1.2), as well as the differing degrees of difficulty the acquisition of non-native phonemes can represent (section 1.3). Finally, we consider the distribution of *h* in English (section 1.4), since part of the difficulty that *h* in particular represents hinges on acquiring the English system of varying production, suppression and optional production of underlying *h*.

1.1 Speech perception

Speech perception can operate on one of three levels: acoustic, phonetic or phonemic (Werker & Logan, 1985). Acoustic perception of speech is quite rare: in theory speech perception can of course function on the acoustic level, in the sense that it is sometimes possible to tune in to linguistically irrelevant acoustic properties of the speech signal such as minor differences in pitch or loudness between two utterances, but normally the signal is not processed in this manner. Usually speech perception is either phonetic or phonemic: in the case of adults processing speech, perception almost always functions automatically on the phonemic level, which facilitates lexical decoding; conversely, as shown in a number of head-turn experiments, infants automatically respond to the whole range of phonetic contrasts employed in natural languages (Jusczyk,

1985). Interestingly however, infants respond only to phonetic changes in the speech signal, not to non-phonetic acoustic variation (Werker & Lalonde, 1988). Newborns are, therefore, somehow hard-wired to register those (phonetic) properties of speech that are potentially relevant to linguistic processing, regardless of whether these features are actually employed by their L1. Over the course of an infant's first year, with exposure to L1 and incipient construction of L1 phoneme categories, the capacity to perceive phonetic distinctions not pertinent to L1 processing rapidly diminishes (Werker & Tees, 1984). As a result of this early decline in phonetic acuity, adults often find it difficult, or even impossible, to detect non-native contrasts. A prime example of this difficulty is the /r, l/ contrast for Japanese learners of English, which the learners perceive as a single phoneme (Brown, 1998).

Both infants and adults, therefore, exhibit perceptual categorization of speech, but infants' categories are (initially, at least) phonetic, whereas adults impose more broadly phonemic categories onto the speech signal, filtering out certain details. Adult perception normally ignores any phonetic variations that are irrelevant to distinguishing phoneme categories in their L1 and hence to lexical processing. For instance, the standard North American realization of English /t/ is quite radically different in the words *tab*, *stab*, *bat*, and *batter* (represented phonetically as [t^h], [t], [t˺], and [ɾ] respectively); nonetheless a native English speaker is generally oblivious to this variation and automatically associates each variant with the single phoneme category /t/. An important aspect of L1 acquisition then is the development of the ability to process the auditory signal as a series of discrete phonemic units and to associate disparate stimuli with a single phonemic representation. For the acquisition of L2 phonemes such as *h* by francophones, therefore,

the learner no longer has easy access to the infant's innate sensitivity to phonetic contrasts, which has been supplanted by L1 phonemic categorization.

1.2 The perception and acquisition of non-native phonemes

What happens then in SLA, when an adult learner encounters a non-native phoneme such as *h*? The answer, at least at first, seems overwhelmingly to be that learners assimilate the phoneme to a native category. Thus anglophones learning French tend to perceive (and produce) French /y/ (as in *tu* or *déjà-vu*) as the English phoneme /u/ (as in *too*). Likewise when francophone ESL learners come across non-native /θ/ in *think* and /ð/ in *that*, they associate the sounds with native /t/ and /d/ respectively and realize the segments as such in speech.[4] Of course, the L2 phoneme may not be perceived as truly identical to native realizations of the L1 phoneme to which it assimilates. That is, there may be some sense of the novel phoneme being an unorthodox variant of the L1 phoneme, but it is nonetheless processed and stored in the mental lexicon in terms of the native category. This assimilation process is apparently governed by phonological closeness, with closeness possibly determined by the number of featural changes required to adapt the non-native phoneme to the native phoneme representation (Paradis & LaCharité, to appear).

Francophone ESL learners, however, do not assimilate *h* to a native phoneme category, as evidenced by their tendency to delete it in their speech and never to substitute another phoneme for *h*. Deletion as opposed to substitution is a very unusual

[4] At least they do in Quebec; in France, the association is with /s/ and /z/. Why there should be this differential substitution by speakers of two variants of the same language is currently the subject of research for a PhD thesis (Brannen, to appear).

strategy for L2 learners to apply to a novel phoneme. Deletion is also very rare in loanword adaptations: Paradis and LaCharité (2001) found that among 4,499 segmental malformations of loanwords identified in three large corpora of spoken French, only *h* is never subject to substitution. That is, even though substitution is, according to the authors, by far the preferred repair strategy for other foreign segments (96 % of the time), the strategy of choice in borrowed words ranging from *hamburger* to *hippie* to *hold-up* is to delete the *h*. The authors attribute h-deletion to the absence in French of the Pharyngeal node, the articulator which assigns place to *h*, arguing that this lack blocks *h* from being treated phonologically (i.e., undergoing the featural changes necessary for substitution).[5]

Regardless of how the blocking process operates, however, what is important is that *h* tends to be deleted rather than replaced in loanwords to French and in francophone IL alike. Apparently *h* cannot be assimilated to any native phoneme category of French. We may well wonder then whether *h* is heard at all, since it may simply be filtered out. That is, although it is surely possible for *h* to be registered phonetically (but not phonemically), often *h* may not be noticed whatsoever. Moreover, if *h* is not associated with a phoneme category, no mental representation of it can be stored and later accessed for speech production and lexical recognition.

Without a mental representation, *h* for francophones may be analogous to the glottal stop for anglophones: the glottal stop is not phonemic in English, but it is variably

[5] There is some debate among exponents of Feature Geometry as to whether *h* is actually specified for place in English. According to Underspecification Theory (e.g., Avery & Rice, 1989), because *h* does not contrast with any other guttural in English, its place of articulation is superfluous and consequently left unspecified in the phonemic representation. Paradis and LaCharité (2001), however, argue that *h* must be specified for place in English, since it is systematically deleted rather than adapted (i.e., substituted) in loanwords to languages (e.g., French, Italian and Portuguese) that do not employ the Pharyngeal node; if *h* were not specified for place, hypothetically it would be assigned least marked coronal place and be assimilated to /t/.

inserted at the beginning of vowel-initial words without English speakers being particularly aware of its presence (Dilley et al., 1996). It is not that English speakers cannot hear the glottal stop if they pay particular attention to it or if it is pointed out to them, but because glottal stops are not used contrastively in English, listeners tend to be impervious to their presence in the auditory signal. Interestingly enough, both the glottal stop in England and *h* in some varieties of Quebec French can be used as a phone (i.e., phonetic variant) of a native phoneme. In England, many speakers use the glottal stop [ʔ] intervocalically as a surface realization of /t/ as in *butter* [bʌʔə] (Harris & Kaye, 1990); in Quebec, in the Drummondville and Joliette areas and parts of the Beauce, [h] is a possible variant of both /ʃ/ and /ʒ/ such that *changer* /ʃãʒe/ may be pronounced [hãhe] (LaCharité & Paradis, 2005). In both cases, [ʔ] and [h] are clearly perceived, even by speakers who do not use these surface variants, but the sounds are phonologized as /t/ and /ʃ, ʒ/ respectively. When [ʔ] and [h] are not used as phones of /t/ and /ʃ, ʒ/, however, they tend not to be perceived and cannot be processed phonemically.[6]

At the beginning stages of ESL acquisition, therefore, francophone learners probably do not even notice the presence of *h* in the stream of speech. Even if they are aware of *h* in the orthography of a word, moreover, they are unlikely to attribute any particular significance to the grapheme, since French itself employs *h* in spelling without *h* having any phonemic or phonetic value.[7] If learners do not perceive *h*, they cannot form

[6] I can attest to the accuracy of this claim where glottal stop perception is concerned. Living in England for a period as a child, I learned to produce the glottal stop intervocalically and processed it as a variant of /t/. Nonetheless, I find it difficult to pick out epenthetic glottal stops in my own or others' speech, despite glottal stops being bona fide phonemes in many (e.g., Semitic) languages.

[7] Orthographic *h* in French influences pronunciation only in the somewhat marginal case of *h-aspiré* words, where the *h* has no actual phonetic realization but simply blocks such processes as liaison and elision that

a phonemic representation for it, simply leaving it out of the mental lexicon such that *hear* and *ear* are both stored as /ir/.[8] If such is the case, note that we cannot really say that *h* is deleted in learners' speech; *h* is in fact already absent from the underlying representation of words.

In SLA, many non-native phonemes are of course eventually acquired and no longer assimilated or deleted. Hypothetically, as learners become (re)attuned to phonetic differences and develop an awareness that a phonemic contrast is indeed present in such minimal pairs as *thanks* and *tanks* or *hear* and *ear*, they build a phonemic representation to mentally encode this insight. In terms of production, learners do not appear to have a breakthrough moment when they suddenly "get" the new phoneme and after which they are able to produce it with near-native accuracy. The process may be one of gradual spreading or diffusion across different phonological environments, with, for example, /ð/ being produced earlier when preceded by a vowel or a voiced continuant than when preceded by a voiceless stop (Gatbonton, 1978). In terms of perception and mental representations, it is equally plausible that the new phoneme spreads across the lexicon as a function possibly of word frequency and saliency due to phonological environment. Regardless of the reasons, however, what is important is that perception and underlying representations for *h* need not be an all-or-nothing affair but may develop gradually.

It seems fairly certain that those advanced learners who exhibit native-like h-production (with no or little h-deletion or epenthesis) must have developed a mental

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normally apply to vowel-initial words (see footnote 3 for a more detailed account of these processes). For example, the *h-aspiré* word *les haricots* "the beans" is pronounced [le.a.ri.ko] rather than *[le.z̲a.ri.ko] (with liaison of the latent /z/ in *les*), and *le héros* "the hero" is rendered [lə.e.ro] rather than *[le.ro] (with elision of the /ə/ in *le*).

[8] Empirical verification of francophone ESL learners' perception of *h* and of their mental representations for *h* could be an engaging topic for future research, but it is beyond the scope of the current study.

representation for *h*. Moreover, this mental representation consists of an entirely new phoneme category and not an L1 phoneme category to which *h* is assimilated. At this stage then, learners' underlying forms for words such as *hate*, *heat* and *hurt* would be native-like /het/, /hit/ and /hərt/. When learners delete *h* in speech, on the other hand, the situation is less clear: either *h* is absent from the underlying representation, or it is present but unable to surface, its production being somehow blocked. In the case of categorical deletion, *h* is probably absent from mental representations such that the underlying forms for *hate*, *heat* and *hurt* are /et/, /it/ and /ərt/. With variable h-deletion, on the other hand, representations of *h* may be either absent from some words or, I would like to propose, insufficiently robust to surface with any consistency.

I know of no other account of phonemic representation that suggests representations may be insufficiently robust to surface; usually representations are assumed to be either present or absent. It seems to me, however, that specifically in SLA, some representations of non-native phonemes may be *murky* or *murkily specified* for certain features at some point in the acquisition process. Non-native phonemes that resist assimilation to native categories could be subject to murky specification when learners become aware of the presence of a segment but the precise features of the segment elude them. In other words, when francophone learners encounter *h* in the speech signal, they may register the presence of a segment but be unable to assign it to a phoneme category. Furthermore, they may even be able to reproduce the sound via imitation without constructing a representation (Markham, 1997). In this case the onsets of the h-initial words *hate, heat* and *hurt* would be murkily specified with, say, a question mark: /ʔet/, /ʔit/ and /ʔərt/. Regarding the identity of the segment, all that is clear for learners is that it

is not equivalent to and hence cannot be replaced by a known phoneme The murkily specified segment /?/ would thus either be successfully realized as [h] or at times be left unrealized. The notion of murky specification as a stage of incipient L2 phonemic categorization requires, of course, further investigation, but I propose the analysis as a potentially promising means of accounting for certain SLA processes involving non-native phonemes.

But how does h-epenthesis fit into the puzzle? Epenthetic *h*, by definition, does not appear in the underlying representation yet is present at the surface. Hypothetically, learners who epenthesize *h* may have developed a mental representation of *h* without having entered *h* into the underlying representations for all words, or the representations may be insufficiently robust to surface consistently (due to murky specification); in either case, it may be that epenthesis derives from an attempt to fill the gaps, but the strategy misfires.

Finally, on a related note, Brown (1998) mentions the intriguing possibility that Japanese ESL learners may at times be able to accurately produce the non-native /r, l/ contrast without the usually requisite underlying representations for these phonemes. In ESL classes in Japan, much emphasis is placed on the articulation of /r, l/ (which are variants of the same phoneme in Japanese), such that learners may develop the ability to control /r, l/ production. Consequently, drawing on orthographic knowledge, they may be able to correctly differentiate between the two phonemes in their speech without ever developing an accurate phonemic representation – a case of accurate production despite an inability to perceive the phonemic distinction. [9] It is possible, therefore, that

[9] Presumably such a performance, which goes against the natural grain of language production, is hard to maintain and is subject to such factors as degree of attention brought to pronunciation.

francophone ESL learners also do not base their (variable) production of *h* on a mental representation but develop the ability to access an orthographic representation that sometimes cues production. On the other hand, the results of Lacharité and Prévost (1999) (discussed in detail in the next section) suggest that learners, at least at the upper levels of proficiency, do construct a phonemic representation of *h* which can be accessed in perception to identify lexical items. Nonetheless, the issue of orthographic cues playing a role in h-production deserves mention and could form the basis for future research.[10]

1.3 The degree of difficulty in acquiring a non-native phoneme

Unarguably, some non-native phonemes are more difficult to acquire than others. Various theories have been put forward about what determines the degree of difficulty of a given non-native phoneme or phonemic contrast. According to the Perceptual Assimilation Model (Best, McRoberts & Sithole, 1988; Best, 1994), for example, a non-native contrast that is assimilated to two separate native phonemes (such as /θ, ð/ for francophones) is relatively easy to distinguish; whereas a non-native contrast that assimilates to a single native category (such as /r, l/ for Japanese native speakers) is difficult to perceive and acquire although the degree of difficulty is lower if one member of the pair is less similar to the native phoneme. Finally, if the discrepancy between the non-native contrast and native phonemes is too great for assimilation to occur, according to the model, the contrast may be relatively easy to detect, as long as the phonetic

[10] One participant in the current study pronounced the orthographic *h* in *hour* during his informal interview; also, a francophone student in an ESL class I was teaching expressed surprise when I told him that there is no /h/ in *hour*. Orthography probably plays some role in the acquisition of *h*, therefore, although possibly only a minor one.

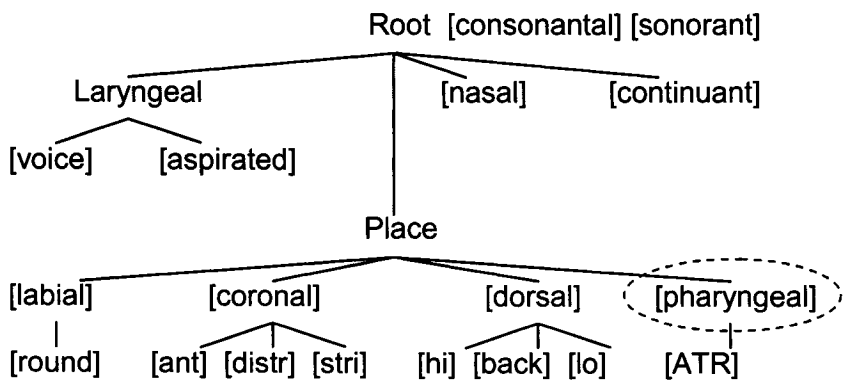
contrast is sufficiently clear – such was found to be the case, for instance, with English speakers distinguishing Zulu clicks (Best, McRoberts & Sithole, 1988).[11] We should be cautious of such a claim, however: adults may be able to perceive non-native contrasts when a task permits phonetic discrimination to be accessed, but not when phonemic discrimination is required. Specifically, when the contrast is presented at a 500 msec interval, phonetic information apparently can be used to perceive a discrepancy in the signal, but when a 1500 msec interval occurs between the stimuli, the contrast can be perceived only if a phonemic representation is available (Werker & Tees, 1984). Phonetic perception of a distinction, therefore, is not necessarily encoded phonemically in a mental representation, and without such a representation, we cannot say that acquisition has been successful.

Where is the acquisition of *h* situated in the Perceptual Assimilation Model? *H* is clearly too discrepant from French phonemes for assimilation to occur. On the other hand, acquisition of *h* does not involve discerning a contrast with another similar phoneme in English, since *h* stands alone in the guttural category of phonemes. In the case of *h*, then, it is not a matter of acquiring a non-native contrast, but of acquiring a single inassimilable phoneme and of being able to detect its presence, distinguishing presence from absence. In a sense, rather than assimilating *h*, francophones treat *h* as equivalent to Ø. The challenge with *h* then is to develop an entirely new phoneme category, not just to detect a novel contrast.

[11] Flege's (1995) Speech Learning Model adopts an altogether different point of view. According to this model, non-native phonemes that are very similar to native phonemes, and hence perceived (and by extension produced) in terms of the native phoneme category, are considered difficult to acquire, in the sense of being acquired accurately. Phonemes which are dissimilar to native categories, on the other hand, are more readily acquired because they are treated as distinct phoneme categories that need to be acquired.

According to Brown (1997, 1998), the degree of difficulty in developing a new phoneme category is determined by the feature needed to distinguish the phoneme from others in the inventory. Learners more readily acquire a new phoneme if the distinguishing feature in question is also operative in the L1. The explanation is grounded in Feature Geometry (e.g., Clements, 1985), which posits that the mental representation of segments is organized hierarchically into branching structures of distinguishing features. The precise nature of some of the features and of their organization is the subject of ongoing debate, but the hierarchy in Figure 2 (borrowed from LaCharité & Prévost, 1999) is representative of the approach. The Pharyngeal node, which is said to distinguish English *h* (Paradis & LaCharité, 2001), is circled.

Figure 2: Hierarchy of Segmental Features

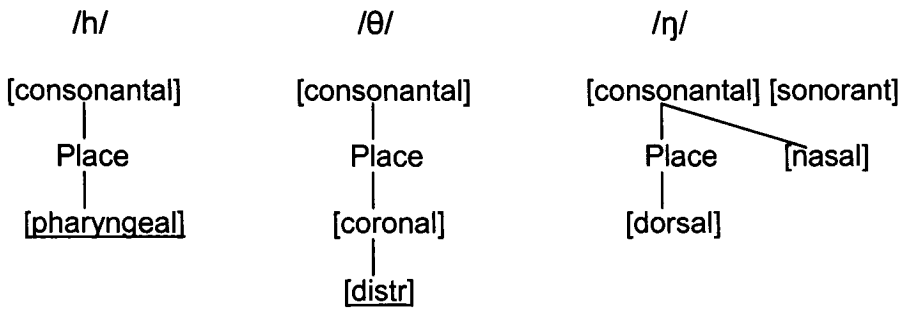


[ant] = anterior; [distr] = distributed; [str] = strident; [ATR] = advanced tongue root

LaCharité and Prévost (1999) adopt Brown's (1997, 1998) proposal that it is not foreign phonemes *per se* that are difficult to acquire, but foreign features. Thus L2 segments composed of features active in certain L1 segments are presumed to be more readily acquired than segments containing features absent from the L1. Furthermore,

LaCharité and Prévost posit that features lower down in the hierarchy (e.g., [round] or [ant]) are easier to acquire than those higher up (e.g., [labial] or [pharyngeal]). They test this hypothesis in a pilot study of the perception of the English sounds /h/ (as in *horse*), /θ/ (as in *thin*) and /ŋ/ (as in *sing*) by Quebec francophones. The three phonemes contain the following features (with those absent from the inventory of French underlined):

Figure 3: Features for /h/, /θ/ and /ŋ/



Briefly, French exploits (albeit not within a single phoneme) both of the features that comprise English /ŋ/: French segments /k/ and /g/ employ the Dorsal node, and French /n/ and /m/ include the feature [nasal]. Thus /ŋ/ should be relatively easy to perceive and acquire. French also employs the Coronal node (the place node for French /t/ and /d/, for example) needed for /θ/, but the terminal feature [distr.], lower down in the hierarchy, is absent from French phonemes. Consequently, /θ/ should be more difficult to acquire than /ŋ/. Finally, the Pharyngeal node (situated higher up in the hierarchy) that is required for /h/ does not appear in any French segments, so /h/ should be more difficult to acquire. As a result, the following hierarchy of perceptual and acquisitional difficulty is anticipated: /h/ > /θ/ > /ŋ/.

The results partially support their hypothesis of a hierarchy of difficulty. The participants (who were quite advanced learners – prospective ESL teachers who had taken a course in phonetics) completed an AX discrimination task and an ABX identification task targeting /h/, /θ/ and /ŋ/. On the perceptual discrimination task, participants listened to pairs of words such as *eat/heat* and *heat/heat* and indicated whether these were the same or different. The 500 msec interval between words in each minimal pair permitted participants to access phonetic discrimination. In the ABX test, participants were presented with written minimal pairs and then heard one of the members of the pair and had to identify which word they had heard. The identification task tested whether participants had constructed a phonological representation for the non-native phonemes.

In the AX task, the accuracy rates for phonetic discrimination of all three non-native phonemes were high (over 68 %), but the accuracy rate for /h/ was lower than for /θ/, which was lower in turn than the rate for /ŋ/. Only the difference between /h/ and /θ/-/ŋ/ was found to be significant, however; the difference between /θ/ and /ŋ/ proved not to be significant. In the ABX task, identification scores were again very high, close to the native speaker controls. Scores for /h/ were lower than for /θ/ and /ŋ/, but the difference was found not to be significant. The hypothesis of a hierarchy of difficulty for phoneme acquisition is, therefore, only partially confirmed.[12] Importantly, however, the study suggests that learners can in fact construct phonological representations of L2 phonemes that employ features inoperative in the L1.

[12] Differential phonetic perception and phonemic identification rates for the three phonemes might show up more clearly with less advanced (and "phonologically naïve") learners.

The fact that learners apparently can develop phonological representations for *h* does not, on the other hand, mean that their underlying representations at all stages of IL development necessarily contain *h*. The representation for the phoneme *h* is something that must be acquired, possibly passing through a stage of murky specification where featural specifications are incomplete or indistinct; also, individual items throughout the lexicon need each to be specified for *h*. What is not yet clear from any of the studies considered here is whether h-deletion occurs because of a deficient underlying representation or despite an accurate one. More importantly for the current study, it is not clear whether h-epenthesis is associated with deficient underlying representations. Furthermore, even if learners are able to form an accurate representation for *h* across the lexicon, they still encounter the added difficulty of knowing when *h* surfaces in English. To the confusion of many a learner, not every *h* that is present underlyingly is actually pronounced in the output. The next section considers this issue of the surface distribution of *h* in English.

1.4 The distribution of h *in English*

In English, *h* appears only in onsets and generally only as a singleton.[13] Not all instances of underlying *h* are actually pronounced, moreover: in Standard English, *h* is almost always pronounced word-initially, regardless of whether the syllable is stressed or not; word-internally, on the other hand, *h* is pronounced only in stressed syllables, with *h* in unstressed syllables being deleted. Consider, for example, the word *historic*, where *h* is pronounced word-initially in an unstressed syllable (the stressed syllable is underlined),

[13] In a small set of words, [h] may appear with the glide [j], as in *huge* [hjudʒ] and *human* [hjumən]. Also, for some varieties of English or for some individuals, [h] may appear in combination with the glide [w] in words such as *when* [hwɛn] and *where* [hwɛr].

and *prohibit*, where word-internal *h* in a stressed syllable is also pronounced. In the words *pre(h)istoric* and *pro(h)ibition,* however, where *h* appears word-internally in an unstressed syllable, *h* does not surface.[14] In connected speech, finally, *h* is frequently deleted from function words (notably *he/him/her/his* and auxiliary *have*), particularly when preceded by a consonant and particularly in less formal (as well as more rapid) speech. As a result of this variable deletion of *h* in function words, as well as of the general greater tendency for content words to undergo processes of phonological reinforcement such as epenthesis, the following hypothesis has been formulated.

Hypothesis 1 – *H-epenthesis should be more frequent in content than in function words.*

Davis and Cho (2003), however, point out that the account of h-distribution outlined above fails to account for certain exceptional cases of surface *h*.[15] As a solution, they offer an analysis of the parallel distribution of *h* and aspirated stops [p^h t^h k^h] in English based on a foot alignment constraint that accounts neatly for all instances of surface *h*. The constraint in question belongs to a larger family of OT constraints that seek to align positions of prominence (such as word- or foot-initial position) with the feature [sg] (spread glottis), which is shared by both aspirated stops and the phoneme *h*.[16] In

[14] There is of course a limited set of orthographically h-initial words in which the *h* is silent – *hour, heir, honest,* and *honour* – as well as a few words with variably silent *h* – *herb, homage* and *hotel,* notably. In these cases, however, there is no underlying *h* in the representation.

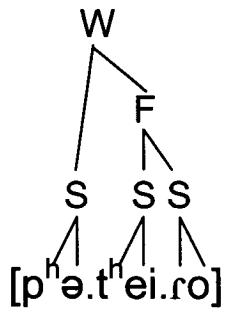
[15] Their own account is not quite exhaustive either, however – specifically, connected speech phenomena are not accounted for.

[16] Spread glottis is a feature that describes aspiration, and that distinguishes the glottal fricative from the glottal stop, which is characterized by constricted glottis.

addition, the explanation relies crucially on the notion of the superfoot, adopted from Jensen (2000).

In order to explain their analysis, a description of English foot structure is first required. In brief, feet in English are trochaic (one stressed followed by one unstressed syllable, i.e., 'S.S). A monosyllabic word is parsed as a truncated ("degenerate") foot, lacking in the optional unstressed syllable. In polysyllabic words, syllables that are not part of the trochee (such as the final syllable in a word such as *cinema* or *juniper*, or the initial syllable in *condition* or *potato* – with stress on the underlined syllable) have traditionally been treated as extrametrical. Such extrametrical syllables, rather than attaching to the immediately superior foot level in the prosodic hierarchy, are treated as attaching directly to the higher-up prosodic word level, as shown in Figure 4 for *potato*.[17]

Figure 4: Prosodic Tree for *potato*



S = syllable; F = foot; W = prosodic word

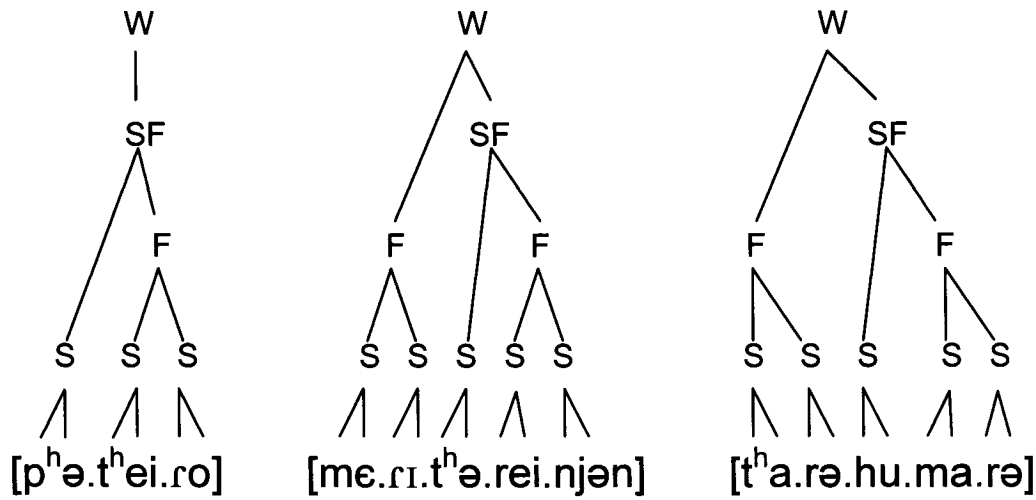
[17] The prosodic hierarchy (e.g., Nespor & Vogel, 1986) includes, among others, the following levels:

Prosodic Word
|
Foot
|
Syllable

If one accepts this representation of English foot structure, a two-part explanation is required to account for the distribution of spread glottis (i.e., aspiration): (1) [sg] aligns with word-initial position; and (2) [sg] aligns with the initial position of all stressed syllables, including those that are word-internal. But this explanation does not account for rare non-word-initial occurrences of [sg] in unstressed syllables such as the aspirated [t^h] in *Mediterranean*, the aspirated second [p^h] in *peripatetic*, and the [h] in *Tarahumara.* To account for these exceptions, a third part must be added to the explanation: (3) word-internally, [sg] aligns with the initial position of unstressed syllables that follow another unstressed syllable.

The explanation is much simpler, on the other hand, if one adopts the notion of the superfoot (SF): a superfoot is comprised of an unstressed syllable followed by a regular trochaic foot. In this case, word-initial unstressed syllables (as in *condition* or *potato*) as well as the unstressed syllables with [sg] in *Mediterranean*, *peripatetic* and *Tarahumara*, are foot-initial, as are all stressed syllables. The foot analyses for *potato*, *Mediterranean* and *Tarahumara* are shown in Figure 5.

Figure 5: Prosodic Trees with Superfeet



SF = superfoot

A consequence of this analysis with superfeet is that the distribution of [sg] can be accounted for quite succinctly with the constraint: AlignL (Ft,[sg]) ("Align the left boundary of the foot with the feature spread glottis"). This one constraint accounts for all instances of [sg] and neatly underlines the parallel distribution of aspiration and [h] in English.

One criticism that can be levelled at Davis and Cho's (2003) argument is that the notion of the superfoot is somewhat ad hoc and has not been widely adopted. There are however further arguments in favour of the superfoot representation. First, in contrast with the traditional representation in Figure 4, the superfoot analysis satisfies the Strict Layer Hypothesis (Selkirk, 1984; Jensen, 2000), which states that all units of each layer of the prosodic hierarchy are exhaustively parsed into the immediately superior layer, such that all syllables, for instance, must be attached to a foot. Second, the phenomenon of expletive infixation (McCarthy, 1982), exemplified by the expression *fan-fuckin-tastic,* provides

further evidence for the hypothetical superfoot.[18] Native speakers of English normally insert expletives only immediately preceding the boundary of a foot, but in a word such as *Mediterranean*, a vulgarity may be epenthesized not only before the uncontested trochaic foot (*Medite-fuckin-ranean*), but also before the less well-recognized superfoot (*Medi-fuckin-terranean*). Indeed, the latter insertion strikes this native speaker's ears (as well as the ears of other native speakers consulted) as the more natural of the two. Finally, any other place of insertion is simply odd and sounds awkward. The same pattern of expletive infixation applies to *peripatetic* and *Tarahumara.*

The acquisition process for francophone learners of English would appear to involve, therefore, at least in part, the re-ranking in the IL grammar of the markedness constraint AlignL (Ft,[sg]), so that *h* (as well as aspirated stops) can surface accurately in the output and also be suppressed accurately. Initially, *h* does not surface at all or is absent underlyingly (h-deletion); at some point in L2 development, it surfaces where it does not belong (h-epenthesis). If epenthetic *h* aligns with the left edge of the foot, it suggests that AlignL (Ft,[sg]) emerges in the IL grammar without the necessary complementary constraint (active in L1 English) that limits h-production to underlying *h* – a likely candidate for limiting surface *h* is the constraint DEP-IO ("Output segments have input correspondents," hence "no epenthesis"). It may also be that another universal constraint emerges in the IL, aligning [sg] with some other prosodic constituent (the stressed syllable or the prosodic word, for instance). An added difficulty for francophones concerning the constraint AlignL (Ft,[sg]) of course is that, in order for the constraint to generate accurate output, learners need accurate representations of English stress patterns and foot structure.

[18] Other, less offensive, expletive infixes are also conceivable (*fan-bloody-tastic*), but the expletive chosen here is more common and is used by McCarthy.

This is no mean feat for francophones given that their L1 lacks lexical stress, only stresses word-final syllables, and employs iambic rather than trochaic feet. One of the aims of the present study is to elucidate the IL system by establishing a distribution pattern for h-epenthesis, which hypothetically (see below) is subject to an alignment constraint.

Hypothesis 2 – *H-epenthesis is expected to be subject to an alignment constraint, aligning with the left edge of either the prosodic word, the foot (including both trochaic and superfeet) or the stressed syllable.*

1.5 Summary

In review, in contrast with infants, L2 learners are no longer automatically sensitive to the full range of phonetic contrasts that may be employed cross-linguistically; instead they tend to process speech in terms of L1 categories, assimilating L2 phonemes to L1 categories both in perception and production. For francophones, however, *h* is inassimilable and cannot be processed phonologically. At the beginning stages of ESL acquisition, *h* appears to be ignored or not even noticed in the speech signal; consequently, no representation for *h* is present in underlying forms. If underlyingly absent, *h* clearly cannot surface in output either. Eventually, however, many or most francophone ESL learners start to produce *h*, and those learners who exhibit perfectly native-like h-production doubtless have developed an accurate phonemic representation for *h*, as well as grasping the pattern of English h-distribution. But what about those francophones who produce obligatory (foot-initial) *h* only variably and who sometimes epenthesize unnecessary *h*'s? Their underlying representations are unlikely to be accurate in terms of *h*. Unlike learners at the very initial stages, however, their representations

may be murkily specified for a segment with elusive features – a kind of incipient IL categorization of an inassimilable L2 phoneme. If such a representation indeed exists, presumably it is insufficiently robust to surface with any consistency and hence inadequate to ensure accurate h-production. Moreover, specifying *h* in underlying representations is only part of the challenge for ESL learners; once *h* is specified, they must still learn to navigate the waters of English h-distribution, sometimes producing *h*, at others suppressing it, and at still others producing it only optionally as a function of style level and rapidity of speech.

Given the difficulty of developing a representation for *h* and then determining when this form corresponds to a surface form, it is perhaps not surprising that francophone ESL learners sometimes overstep the mark and insert an epenthetic *h*. In the next chapter, we consider more closely this process of h-epenthesis, reviewing the results and interpretation of the only other study that focuses on francophone insertion of non-underlying *h*.

Chapter 2. H-Epenthesis and Hypercorrection (Janda & Auger, 1992)

In the only previous study of h-epenthesis by francophone ESL learners, Janda and Auger (1992) consider the phenomenon a form of hypercorrection.[19] The aim of their article is twofold: i) to argue for a distinction between two forms of hypercorrection, namely *quantitative* and *qualitative*; and ii) via their empirical research on h-epenthesis, to apply quantitative methods to the study of qualitative hypercorrection, specifically in order to uncover certain stylistic and linguistic variables that condition the process. In the first section here (2.1), the phenomenon of hypercorrection in general is examined, along with Janda and Auger's distinction between quantitative and qualitative hypercorrection in particular. An alternative explanation to that offered by Janda and Auger as to why *h* is prestigious for francophone ESL learners is also presented.

In the next section (2.2), the results of Janda and Auger's empirical study are reviewed. Briefly, the study found that h-deletion rates decreased with increased level of formality; depending on the speaker, however, h-epenthesis rates either increased or decreased as a function of increased formality. The only exception involved the most formal task (reading aloud of word-pairs) on which all six participants were 100 % target-like, registering zero deletion and epenthesis rates across the board. With regard to the two patterns observed for epenthesis rates, Janda and Auger state that they expected to find only a decrease in epenthesis with greater task formality. Their expectation was based on the assumption that speakers should be more target-like in more formal styles, an assumption that is not well founded, as I will argue in due course. Finally, the zero deletion and epenthesis rates in the word-pairs task are presented by Janda and Auger as

[19] The sociolinguistic term *hypercorrection* is similar to *overgeneralization*, as used in second language acquisition, except that hypercorrection has a prestige connotation, whereas overgeneralization of the *-ed* ending to an irregular verb such as *go/goed*, for example, does not.

evidence for the accuracy of learners' underlying representations in terms of *h*. I will argue, however, that this conclusion does not necessarily hold up to careful scrutiny.

The final section (2.3) examines h-epenthesis as an L1 process among speakers of h-dropping varieties of English, a phenomenon that shows h-epenthesis to be a cross-linguistic language process that can apply to both ILs and L1s.

2.1 Quantitative vs. qualitative hypercorrection

In a nutshell, hypercorrection involves the overproduction in one speech variety of an element that is adopted from another variety and that is highly valued according to some criterion. A well-known example of hypercorrection concerns the rates of production of post-vocalic *r* in the speech of New Yorkers of different social classes (Labov, 1972). Post-vocalic *r* is variably deleted in the speech of all New Yorkers, but generally less so for people from the upper levels of society. As a consequence, post-vocalic *r* has developed into a prestige marker associated with the distinguished speech of the educated and the upper classes. Interestingly, however, Labov found greater frequency of post-vocalic *r* by lower-middle-class speakers than by upper-class speakers in more formal styles of speech. Such overproduction of the prestige marker in the speech of those who do not normally speak the prestige variety is what is termed hypercorrection.

The essential condition for hypercorrection to take place is that two speech elements in the standard or prestige variety must be realized as only one in the non-standard, non-prestige, and generally stigmatized variety. The two basic patterns of hypercorrection are as follows: i) two phonemes in the prestige variety (hypothetically,

for instance, /t, d/) are realized as one (/t/) in the non-prestige variety, such that *bat/bad* are both pronounced [bæt]; or ii) an alternation in the prestige variety between a phoneme and Ø is lost in the non-prestige variety, such that for instance *spar/spa* are both pronounced [spɑ]. In either case, a contrast characterizing the prestige variety is absent or has been lost over time from the non-prestige variety. Hypercorrection results when speakers attempt to emulate the prestige forms by introducing or re-establishing the contrast. Typically such effort is associated more with formal contexts, where the standard variety is deemed more appropriate and where speakers consequently are more inclined to try to imitate it and are more able to monitor their speech. In attempting to emulate prestige forms, however, speakers overshoot the mark in one of two ways: either they produce more instances of the prestige element in the appropriate context than do speakers of the prestige variety themselves, or they produce the element in contexts where it should not appear. H-epenthesis clearly fits the second pattern, an element that surfaces where it should not.

Janda and Auger (1992) propose the terms *quantitative* and *qualitative hypercorrection* to distinguish between these two patterns. One important difference between the two forms is that only qualitative hypercorrection is "ungrammatical," so to speak. In other words, in quantitative hypercorrection, speakers produce the prestige marker in the same contexts as speakers of the prestige variety, only at a higher frequency; whereas, in qualitative hypercorrection, speakers extend the contexts of use of the prestige marker, producing it where a speaker of the prestige variety never would, hence "ungrammatically." The former would include the greater rate of post-vocalic *r* in the formal speech of the lower-middle classes in New York; the latter, the illicit

epenthesis of an *h* at the beginning of a vowel-initial word in English (e.g., [h]*ankle*). In contrast with quantitative forms, qualitative hypercorrection is generally quite a low-frequency phenomenon, with the marker produced in fact quite rarely in the innovative contexts of use.

In certain cases, the two forms of hypercorrection may co-occur in a speech variety. In New York, for example, quantitative hypercorrection involving post-vocalic *r* co-exists with instances of so-called intrusive *r* in expressions such as *law*[r] *and order* or *the idea*[r] *of it*. Similarly, it seems quite probable that, alongside qualitatively hypercorrect h-epenthesis, francophone ESL learners may sometimes exhibit quantitative hypercorrection in their rate of production of optional *h* in words such as *he*, *him*, *his*, *her*, and auxiliary *have*. That is, francophone ESL learners may show higher rates of *h* production in phrases such as "that he had eaten his lunch," where native speakers variably delete or preserve the three *h*'s in more rapid speech. Such behaviour on the part of francophones is to be expected mainly in more formal styles and probably only at a certain level of proficiency (neither at the lowest, when *h* is virtually always deleted, nor at the very highest levels, when h-production should be virtually native-like). Quantitative hypercorrection involving *h* is not addressed either in Janda and Auger or in the present study but could be the subject of future research.

A final distinction between the two forms of hypercorrection is that quantitative hypercorrection occurs only when a linguistic variable (such as *h*) alternates with Ø in the target variety; only in this case is there the potential for greater frequency of production of the variable in appropriate contexts of use. Qualitative hypercorrection, on the other hand, can occur both when the linguistic variable alternates with Ø and when two

phonemes in the target variety are realized as one phoneme in the non-prestige variety. For example, in areas of the north of England, the vowels /ʌ, ʊ/ as in *cup* and *could* are both realized as [ʊ], such that *much* and *such* are pronounced like the first syllable in *butcher* (Knowles, 1978; Wells, 1982). When trying to speak "correctly," northerners sometimes overuse /ʌ/, producing it not only in words such as *cup* and *much* and *such*, where it is appropriate, but also in *butcher*, where it clearly is not.

One of the preconditions for the occurrence of hypercorrect forms is that the speech element in question must be a prestige marker, that is, a feature associated with a prized speech variety that speakers of a more-or-less stigmatized variety wish to imitate. The vowel /ʊ/ in the north of England and post-vocalic *r* in New York clearly meet this requirement by virtue of their association with a higher level of education and with social status. In the case of h-epenthesis, on the other hand, what is being imitated is not the speech variety of a higher social class but that of native English speakers. In what way is *h* a prestige marker for francophone ESL learners? Janda and Auger (1992) point to the criterion of intelligibility as determining prestige value (i.e., it is more prestigious to speak English intelligibly by not deleting *h*). Intelligibility, however, is not an entirely satisfactory explanation. For one thing, the degree to which h-deletion results in incomprehension or ambiguity is open to dispute, since contextual clues are virtually always sufficient to disambiguate h-less utterances. For example, there can be little doubt about the meaning of the sentence, "I (h)ate getting up in the morning," without the *h*. A listener is unlikely to hesitate over whether the verb form *hate* or *ate* is intended. Moreover, if h-deletion were potentially so confusing, frequent breakdowns in

communication in exchanges involving speakers of h-dropping varieties in England would be expected, a state of affairs not attested in the literature.

Rather than the criterion of intelligibility, then, a better explanation for the prestige accorded the phoneme *h* by francophones is first that h-deletion is stigmatized, as a source of embarrassment being occasionally the subject of jokes, and second that h-retention is prized because it is more prestigious to speak English like a native speaker. Clearly not all francophones wish to pass for being a native speaker of English,[20] but the majority would probably prefer to minimize h-deletion since it is one of the most salient and least favourable features of their accent.

2.2 The results of the study

Matters of root causes for hypercorrect *h* aside, the explicit aims of Janda and Auger's (1992) empirical study of h-epenthesis are twofold: i) to quantify variation between *h* and Ø in francophone ESL speech by establishing insertion and deletion rates for *h*; and ii) to uncover the stylistic and linguistic variables which condition the process. The independent variables examined are, however, relatively limited: level of formality (style), word category (function versus content words, a variable considered only for deletion rates), proximity with other instances of *h*, and individual participants (a comparison of rates among the speakers).[21] Six francophone participants,[22] described as

[20] The extent of their desire is doubtless partly a function of the degree of their integrative and instrumental motivation (Gardner & Lambert, 1972) as well as their sense of group identity (e.g., Auer, 1998; Bell, 1984).

[21] One of the aims of the study that forms the base for this thesis is to cover a much wider range of variables.

[22] The small number of participants is a limitation of the study. It is difficult to be sure, for instance, that any patterns observed are truly representative of the wider population.

relatively advanced learners of English, performed five tasks involving different levels of formality: a casual conversation and four reading-aloud tasks of increasing formality (a connected text, individual sentences, a word list, and a set of minimal-word pairs).

The pattern for deletion was the same for all six participants: frequency of h-deletion decreased as a function of increased level of formality, with higher deletion rates for function words than for content words (a finding that was to be expected, given that *h* variably deletes in function words – *he, him, his, her* and auxiliary *have* – in English). Overall, h-epenthesis rates were low, with insertion occurring on average for each speaker across the tasks in less than 2 % of vowel-initial words. One speaker was practically native-like, with virtually no instances of h-epenthesis. [23] Among the remaining five speakers, the authors identify two distinct patterns:

1) Two participants showed decreased rates of hypercorrection as a function of increased formality.
2) Three participants showed increased rates of hypercorrection as a function of increased formality.[24]

Surprisingly, the researchers state that they expected to find only the first pattern, with a decline in hypercorrection (epenthesis) accompanying the decline in incorrection

[23] There is some confusion as to the precise number: in Table 3, *two tokens* of epenthesis are recorded in the *conversation task* for this participant, and none in the other tasks; on the following page, however, the authors state that with this participant "we observe the total absence of any hypercorrection from all her styles except *text-reading*, where she had only *one token* of an extra [h]" (p. 221) (italics added). In either case, of course, the information to be retained is that the participant's h-production is almost perfectly target-like.

[24] The two patterns are not in fact so clear in the actual findings. For example, the rates for the participant Albert, who is described as showing decreased rates of epenthesis as a function of increased formality, are recorded as follows across the five tasks (ordered from least to most formal): 0.53 %, 2.77 %, 3.0 %, 0 %, 0 %. Furthermore, since the results are expressed as percentages, it is impossible to know whether the tendencies observed are statistically significant.

(deletion) as style became more formal. They based their expectation on the assumption that oral production should be more target-like with greater formality. If, however, qualitative hypercorrection behaves like quantitative hypercorrection (such as post-vocalic *r* in New York), higher rates of epenthesis should be predicted for more formal styles. Furthermore, it would be expected that a higher frequency of correct forms (due to a lower deletion rate) would be accompanied by a higher frequency of hypercorrect forms, since the source of the two forms is the same: the desire to sound like a native speaker. The effort to achieve this desired result is probably more readily furnished in more formal styles, which are more conducive to self-monitoring of speech. Part of the aim of the study carried out for this thesis is to determine whether, for a larger group of participants, level of formality can be found to exert a statistically significant influence on frequency of epenthesis, as stated formally in the following hypothesis.

Hypothesis 3 – *H-epenthesis should be more frequent in more formal styles of speech.*

Another issue that Janda and Auger examine is the extent to which h-epenthesis results from the proximity of a vowel-initial word with other words containing an *h*. The view that proximity with other instances of *h* plays a role in h-epenthesis is widely held without the link having been fully established.[25] The question is whether epenthesis can be attributed entirely to an interference effect triggered by the presence of other *h*'s in the same linguistic unit (such as the intonation group). Janda and Auger ultimately establish,

[25] For example, Paradis, LaCharité and Brault (1999) mention the likelihood of a proximity effect in h-epenthesis; likewise, when I spoke to a francophone colleague about the subject of my research, she spontaneously expressed the view that h-epenthesis occurs in the vicinity of other *h*'s (M. Plomer, personal communication, December 10, 2004).

however, that while proximity may influence the process, not all of the instances of hypercorrection in their data could be attributed to it, since some occurred with no *h* in proximity. One of the aims of the current study is to investigate the degree to which *h* in proximity can be found to influence rates of h-epenthesis, as stated in the following hypothesis.

Hypothesis 4 – *H-epenthesis should be more frequent given the presence of other h's in proximity.*

Knowles (1978), whom Janda and Auger discuss, distinguishes between hypercorrection due to a proximity effect and hypercorrection due to lexical confusion. The former is characterized by the occurrence of a "sensitive" element twice in the same intonation group. In the case of h-epenthesis, this means an alternation between words starting with the sensitive elements *h* and Ø, an explanation that Janda and Auger show to be incapable of accounting for all instances of hypercorrect *h*. Lexical confusion refers to a situation where a speaker is unsure of the phonological composition of a word. For example, a northern English speaker may be uncertain of whether certain words are pronounced with [ʊ] or [ʌ] in the standard variety, or a francophone ESL learner may be unclear about which words start with an *h* or about which *h*'s in the orthography are pronounced or not.[26] The notion of lexical confusion, therefore, attributes hypercorrection to the inaccuracy of speakers' underlying representations. Janda and Auger argue, however, that the fact that their participants were 100 % target-like on the word-pairs task

[26] Fellow Master's student Dennis Divsic has shown me dictations written by his 10-year-old francophone ESL students in which a number of them write *hankle* for *ankle*, one writes *ham* for *am*, and another writes *his* for *is*. *H* is also at times omitted: *happened* is written *oppenned*; *had* is written *add*.

indicates that the participants' underlying representations are accurate. Consequently, Janda and Auger state that an alternate explanation to those offered by Knowles is required, although they do not explicitly provide one.

Janda and Auger may not, however, be justified in the conclusion they draw from the word-pairs task results. The participants' performance is not necessarily irrefutable evidence of accurate underlying representations. It could also be claimed that the results show that relatively advanced ESL learners are able to do the task, that is, they are able to perform a set of repeated alternations between *h* and Ø of the form *eat/heat*, whether their underlying representations are accurate or not. In other words, the performances could be a product of the task, and specifically of the fact that *h* and Ø were the only thing distinguishing the words – as a consequence, orthographic indicators may have been sufficient to cue flawless performances. Lexical confusion, therefore, should perhaps not be so readily dismissed as an explanation for hypercorrection. The previous chapter already addressed the issue of the difficulty francophones have in perceiving and in constructing a phonemic category for *h*, and it seems unlikely that Janda and Auger's participants (four of whom had deletion rates of between 30 % and 55 % in conversation) have acquired native-like representations for *h*. Furthermore I proposed that learners who produce *h* only variably and who occasionally epenthesize *h* may in fact have murkily specified representations for *h*. The issue of lexical confusion, along with the question of the content of learners' underlying representation (which strikes me as pivotal), will be revisited in the next and periodically in subsequent sections.

2.3 H-deletion and epenthesis in Great Britain

> *I ought in all fairness to acknowledge that no American fault comes up to the revolting habit ... of dropping or wrongly inserting the letter h. Those whom we call 'self-made men' are much given to this hideous barbarism.... Few things will the English youth find in the after-life more profitable than the right use of the aforesaid letter.* (Oliphant, 1873, p. 226; quoted in Milroy, 1983, p. 40)

H-epenthesis is not restricted to the IL of francophone ESL learners. It is also a natural language phenomenon, occurring occasionally in the speech of people in Great Britain who drop their *h*'s, and it is well attested in the literature (Crowley, 1989; Crystal, 2004; Fennell, 2001; Häcker, 2002; Johannesson, 2000; Matthews, 1970; Milroy, 1983, 1992; Mugglestone, 2003; Phillipps, 1984; Tollfree, 1999). Attitudes are perhaps less strident than in Oliphant's day (quoted above), but *h* continues nonetheless to serve as a kind of a shibboleth of social position in England. For instance, as a way of stressing the humble origins of his mother's side of the family, twentieth-century English writer V.S. Pritchard declared that his mother's relatives did not "have an aitch to their name" (Collini, 2004).

Mugglestone (2003) in particular has unearthed numerous examples in nineteenth- and twentieth-century novels of h-deletion and insertion being used to indicate a character's social class. The low social position of the servant Clara Peggotty in *David Copperfield*, for example, is underscored by her h-dropping: "'there's the sea; and the boats and ships; and the fishermen; and the beach; and Am to play with—.' Peggotty meant her nephew Ham... but she spoke of him as a morsel of English Grammar" (quoted in Mugglestone, 2003, p. 107). H-epenthesis, on the other hand, is associated more with the lower-middle or middle classes (Oliphant's "self-made men")

than with the lower classes. In other words, it is associated with those who harbour "social [h]aspirations," as it were. Indeed, a lower-middle-class h-dropping character in a nineteenth-century novel by Anthony Trollope exhibits h-epenthesis – "We're hexpensive and we're haccurate" (1994, p. 222) – while in conversation with a social superior, an upper-class barrister, whom he is apparently trying to emulate in speech. The implication is that h-epenthesis in varieties of English has the same source as francophone ESL epenthesis: first of all, in a tendency to delete *h*, and second, in h-deletion being stigmatized.

To the extent that the numerous instances of omission and insertion of *h* in Middle-English manuscripts are reliable indicators of pronunciation, h-deletion apparently has a long history in England (Milroy, 1983). H-dropping was not, however, always considered vulgar; according to Milroy (1983), it may in fact have been a preferred way of speaking after the Norman Conquest in 1066 because of its association with Norman French and Norman-accented English. In other words, after the Normans supplanted the Anglo-Saxon aristocracy, it became prestigious to drop one's *h*'s like a Norman.[27] This is not to say that h-deletion was necessarily a direct result of English-French language contact – Johannesson (2000) makes a case for the tendency to drop *h* predating the Norman invasion – but once the Normans came to power in England, their pronunciations became the prestige variety, thus hastening a process of h-loss that was already underway.

Of course, if Milroy (1983) is right and h-lessness was prized after the Norman Conquest, there would have been no motivation to insert hypercorrect *h* at the time;

[27] See Häcker (2002) for an opposing view, namely that Norman French did not lack *h* at the time and that it is not responsible for h-loss in England.

however, Middle-English manuscripts contain not only variable omissions but also non-etymological insertions of *h*. Milroy's explanation is that *h* must have disappeared from underlying forms at the time, although traditionally *h* appeared in orthographic forms. In other words, scribes knew that some words were spelled with *h*, but because the scribes lacked any underlying representation for *h*, they were uncertain about which words *h* should appear in. Thus, while h-deletions in writing may have been motivated by pronunciation, h-insertions merely reflect scribes' uncertainty about spelling, particularly acute in this period of pre-orthographic standardization.

According to Milroy (1983), then, omissions and insertions of *h* in Middle-English manuscripts are due to what Knowles (1978) terms lexical confusion, resulting from inaccurate underlying representations. As discussed in the previous section, Janda and Auger (1992) reject this explanation, arguing that underlying forms are accurate. We will return to this issue in later sections. For the moment, the two opposing positions need simply be noted: on the one hand, h-epenthesis (whether in speech or in writing) is ascribed to deficient underlying forms; on the other, h-epenthesis is considered hypercorrect overproduction of a prestige form, despite accurate underlying forms. If the former position is adopted, it should be pointed out, h-deletion effectively ceases to be a production issue: since *h* is already absent from underlying forms, there is nothing left to delete at the surface.

If manuscript evidence points to early h-deletion (the result of h-less speech being prized) but not to h-epenthesis (because *h* was not prestigious, there was no reason for its overproduction), at what point did *h* become a prestige marker and start to be epenthesized? From the citation from Oliphant at the beginning of this section, it is clear

that by the nineteenth century h-dropping was stigmatized and h-epenthesis had emerged; moreover Milroy (1983) argues that this situation was in fact already in place in the eighteenth century. The change in attitude toward h-less speech, which eventually led to the emergence of h-epenthesis, appears to be a by-product of orthographic standardization. Samuel Johnson and other eighteenth-century lexicographers opted to maintain etymological *h* in standardized spellings, despite the widespread loss of *h* in standard varieties of speech. Then, at some point afterwards, it apparently became popular among the upper classes for people to display their literacy by reproducing orthographic *h* in their speech. Pronunciation of *h* gradually spread across speakers in the upper classes, as well as across the lexicon with only a handful of h-initial words resisting the trend (witness current h-less pronunciations of *hour, honour, honest, heir* and sometimes *herb* and *homage*). Consequently, h-ful speech became prestigious, h-deletion was socially stigmatized, and h-epenthesis emerged in speech.

If we take Milroy's (1983) account to its logical conclusion, we must state then that *h* was reintroduced into the speech of the educated and the upper classes in Great Britain based on an orthographic model. Eventually, the underlying representations of speakers of the h-ful variety must have come to include *h*; certainly children who learned the variety as a first language would have had *h* in their underlying forms. Lower- and middle-class varieties remained predominantly h-less, both in surface and underlying forms. Then as now, speakers of h-less varieties of English who wished to adopt the more prestigious variety (but who were insufficiently familiar with the target variety or insufficiently literate to draw on orthographic cues) would occasionally insert *h* where it did not belong.

2.4 Summary

In brief, h-epenthesis is not just an IL phenomenon; it is also a natural language process. Furthermore, the key recurring issue appears to be whether h-epenthesis occurs despite underlying forms being essentially accurate or whether the absence of *h* in underlying representations is in fact an essential precondition for epenthesis. Janda and Auger (1992) consider h-epenthesis, whether by francophone ESL learners or by speakers of h-dropping varieties of English, to be a form of qualitative hypercorrection originating primarily in the stigma attached to h-deletion: this stigmatization of h-deletion instigates efforts to emulate the prestigious h-ful variety, which lead to the hypercorrect extension of the phoneme's surface realization to innovative contexts of use. In Janda and Auger's analysis of their results, the total lack of h-deletion in the word-pairs task indicates that *h* is in fact present in their participants' underlying representations, in which case h-epenthesis would occur despite accurate representations for *h*. But h-epenthesis is also stigmatized, and it is difficult to envisage why learners who have accurate underlying representations of *h* would fail to limit h-production to words with underlying *h*. Lexical confusion (i.e., the uncertainty of which words in fact have an *h* in their underlying forms) seems then to be a more likely explanation for h-epenthesis.

Finally, Janda and Auger do not fully elaborate a satisfactory grammar to account for h-epenthesis. Based on the assumption that underlying forms are essentially h-ful, they do posit an IL h-deletion rule, so presumably they consider h-epenthesis as resulting from an IL insertion rule. But no explanation is provided as to when or why this variable rule would apply in francophone IL. In contrast, one of the central aims of this thesis is to provide a principled account of h-epenthesis within an OT framework, which can explain

linguistic processes more adequately than do rule-based accounts. Various instances of consonant epenthesis have already been analyzed elsewhere using OT. The next section introduces OT as a generative theory of output and presents three OT analyses of consonant epenthesis that could potentially elucidate the process of variable h-epenthesis.

Chapter 3. Optimality Theory and Consonant Epenthesis: An Overview

Grammatical rules such as SPE-type[28] rules provide an accurate *description* of phonological processes, but no real *explanation*, that is, no indication of the fundamental universal properties of language that trigger or block phonological processes. Consequently, links between processes within the same language or from one language to another are obscured. For instance, the rule Ø → [h]/ __σV or Ø → [h]/ __#V ("Ø becomes [h] at the left edge of a vowel-initial syllable or word") adequately describes h-epenthesis, but it supplies no insight into why epenthesis occurs where it does nor why *h* is the segment selected for epenthesis – both the site and identity of the epenthetic segment are arbitrary stipulations of the rule. Optimality Theory (Prince & Smolensky, 1993; and, in terms of Correspondence Theory, McCarthy & Prince, 1995), on the other hand, is based on universal constraints that illuminate the fundamental interconnectedness of linguistic processes. An OT description of epenthesis can account for both the site of epenthesis and the identity of the epenthetic segment.

Because OT is not widely known in the field of applied SLA, an overview of the major components of the theory is in order. In the first of the following sections (3.1), the general principles of OT as a generative theory of output are presented, along with an example of a possible OT explanation for h-epenthesis based on the ONSET constraint; the second section (3.2) examines two further OT analyses of epenthesis that are based on output-output constraints and that could be used to provide an account of h-epenthesis; the next section (3.3) examines the various proposals for handling variation within the OT

[28] SPE refers to *The sound pattern of English* (Chomsky & Halle, 1968).

framework; then the final section (3.4) focuses on the implications of OT for explaining first and particularly second language acquisition phenomena.

3.1 OT – A generative theory of output

An OT grammar comprises a hierarchy or ranking of violable universal constraints on output (i.e., surface forms). In OT, input forms (i.e., underlying representations) are unconstrained and, according to the principle termed Richness of the Base, theoretically limitless. In essence, then, OT is a generative theory of output, and an OT grammar accounts for specific output forms by identifying the operative constraints and the ranking which licenses the output in question. Output forms may be faithful to the input or, alternatively, they may contain deletions, substitutions or epenthetic elements (including, of course, *h*). Constraints are frequently in conflict, such that output cannot respect all constraints in a grammar at all times. By necessity, then, constraints are *violable*. If constraints A and B conflict, whether constraint A or constraint B is violated in the output is determined entirely by their relative ranking within a language-specific hierarchy. If constraint A is ranked higher than constraint B, the output that conforms to A rather than B will be selected as most harmonious with the grammar.

In theory, OT constraints are universal;[29] what is specific to an individual language (and what accounts for variability between languages above and beyond differences in lexicon) is the ranking of these universal constraints. Despite their universality, some constraints may be ranked so low in a given language that they never make their influence felt. Conversely, some constraints may be so highly ranked in a

[29] Most constraints are presumed to be universal, but OT does admit the possibility of language-specific constraints (e.g., Cardoso, 2003; Pater, 1996).

language that they are never dominated (i.e., outranked) by any conflicting constraints. In between, and comprising by far the largest category, are those constraints that at times exert an influence on output and that at others are violated. While all constraints are potentially violable, they are only minimally so; that is, a constraint is violated only to the extent needed to satisfy a higher ranked constraint.

OT divides constraints into two overarching and frequently conflicting categories: faithfulness constraints and markedness constraints. In essence, faithfulness constraints campaign against any transformation of the input in the output, whereas markedness constraints exert pressure on surface forms to respect universal principles of well-formedness. Consider, for example, the following segmental faithfulness constraints:

(1) OT Faithfulness Constraints

DEP-IO	Every segment of the output has a correspondent in the input – i.e., no epenthesis.
MAX-IO	Every segment of the input has a correspondent in the output – i.e., no deletion.

And the following syllabic markedness constraint:

(2) OT Markedness Constraint

ONSET	Syllables have onsets.

As will be illustrated, given these three constraints, a language with both a high ranking of ONSET and a ranking of DEP-IO below MAX-IO would tend to epenthesize a consonant

in the initial position of any V or VC syllable; if MAX-IO is ranked below DEP-IO, vowel-deletion is selected over consonant epenthesis to satisfy ONSET.

Kager (1999), for instance, accounts for t-epenthesis in Axininca Campa with the constraint ranking: ONSET, MAX-IO >> DEP-IO (i.e., ONSET and MAX-IO are not crucially ranked with regard to one another, but both outrank DEP-IO). Hypothetically, the same ranking can account for h-epenthesis in francophone IL. For example, given the input form /æpəl/ "apple", the output form with an epenthetic *h* (a) is selected over both the form with a deleted vowel (b) and the fully faithful form (c) in (3).

(3) H-Epenthesis in Francophone IL

Input: /æpəl/	**ONSET**	**MAX-IO**	**DEP-IO**
☞ (a) [hæpəl]			
(b) [pəl]		*!	
(c) [æpəl]	*!		

In an OT *tableau* (the conventional OT term for tables such as the one above), the lowest ranked constraints are to the right, violations of a constraint in the potential output are indicated with an asterisk (fatal violations, which rule out the candidate, with an exclamation mark), and the hand on the left points to the output selected by the grammar. Furthermore, a solid line between constraints indicates crucial ranking, whereas a dotted line indicates that the two constraints are not crucially ranked with regard to one another. Finally, the shaded area indicates constraints and their violations (actual or potential) that are superfluous to candidate selection. In the tableau in (3), output form (a) [hæpəl] (which satisfies ONSET) is selected over (b) [pəl] (which also satisfies ONSET), since the

latter violates the higher-ranked MAX-IO constraint, whereas the former violates only the lower-ranked DEP-IO. The third and fully faithful candidate (c) [æpəl] fatally violates highly ranked ONSET.

For any given input, OT posits two mechanisms, GEN (generator) and EVAL (evaluator), which, together with the hierarchical set of constraints in CON, determine the form that surfaces in the output. For any given lexical input item, the function GEN generates a set of output candidates, which appear in the left-hand column of the tableau. For reasons of practicality, an OT analysis normally limits itself to a set of plausible candidates, with plausibility determined by the known patterns recurring in natural languages, but the candidate set is, in theory at least, limitless. EVAL evaluates each potential candidate against the constraint hierarchy in CON, identifying constraint violations and selecting as optimal for output the candidate that is most harmonious with the hierarchy. Harmony consists of the candidate violating only a less highly ranked constraint or constraints in comparison with the other candidates, as was seen in the tableau in (3). In a situation where one candidate has a single violation of a given constraint and another candidate two or more violations of the same constraint, the candidate with fewer violations will be considered more harmonious. Note that in (3), the violation is necessary in order to comply with higher ranked ONSET. Were the ranking of MAX-IO and DEP-IO, reversed in (3), giving the ranking ONSET, DEP-IO >> MAX-IO, the process of deletion would be preferred over epenthesis as the means of satisfying ONSET – in which case (b) [pəl] would be selected as most harmonious. Thus, in an OT analysis, two quite different processes (epenthesis and deletion) can be shown to be based in

different rankings of identical universal constraints. One of the strengths of OT is precisely this ability to lay bare the fundamental unity of diverse linguistic phenomena.

The hypothetical tableau for francophone IL in (3), based on Kager's (1999) account of t-epenthesis in Axeninca, is intended as a fairly simple illustration of how an OT analysis of epenthesis might work. It is by no means the only possible OT explanation for epenthesis: depending on the situation, other constraints may be involved, and the explanation may be considerably more complex. Nonetheless, it is worth noting that the markedness constraint ONSET is commonly implicated in the process of epenthesis. ONSET is associated, for example, with Arabic glottal stop insertion (Prince & Smolensky, 1993), with glide formation in Madurese (McCarthy & Prince, 1995) and Picard (Cardoso, 2003), and with glide and glottal stop insertion in Slavic languages (Rubach, 2000). The constraint may also play a role, therefore, in the process of francophone h-epenthesis. The likelihood of ONSET being involved in the process is particularly high if, as expressed in hypothesis 5 below, h-epenthesis proves to be more frequent in vowel-initial words preceded by a vowel or a pause than by a consonant.

Hypothesis 5 – *H-epenthesis should be more frequent in vowel-initial words preceded by a vowel or a pause than by a consonant.*[30]

The high ranking of ONSET in the tableau in (3) can only explain, however, the site of epenthesis; it does not account for the specific segment that is selected. Since

[30] The hypothesis is expressed in terms of vowel-initial words rather than syllables for the simple reason that, within words, vowel-initial syllables preceded by a consonant that does *not* syllabify into onset position are virtually non-existent, limited in English to examples involving the nasal /ŋ/ (which can only appear in coda position) as in "singer" [sɪŋ.ɚ] and "singing" [sɪŋ.ɪŋ]. Furthermore, as reported later in section 5.1, as it turns out in fact that no instances of word-internal h-epenthesis were observed in the data.

epenthetic segments are by definition absent from the input, they cannot derive their identity from the input via faithfulness. Necessarily, then, their composition should be determined by considerations of markedness. The epenthetic segment should be a default, least marked segment of the language in question.

In Paradis and Prunet (1991), a case is made for coronal being the least marked place of articulation. In Axininca, therefore, part of the explanation for [t] being selected as the epenthetic consonant may be that [t] is a coronal consonant. The explanation does not hold, however, for epenthetic *h*, which is a glottal consonant (i.e., pharyngeal rather than coronal). On the other hand, Lombardi (2002) argues that glottal is in fact the least marked place of articulation, ranked below coronal. Cross-linguistically, glottal stop [ʔ] is the preferred epenthetic segment, with a coronal consonant being selected only when other high-ranking constraints in a language block access to glottal stops. In English, glottal stops appear variably in word-initial position before a vowel, particularly with a preceding pause (as in [ʔ]*I see*, [ʔ]*I see*...). While it is possible, then, that the glottal fricative *h* is the default unmarked segment of francophone IL, the scenario is rather improbable. First, matters of place markedness aside, it strikes me as intuitively unlikely that a segment which gives learners such difficulty, which typically is deleted in their speech, and which is absent from their L1 should emerge as the unmarked default segment in their IL. Second, while Lombardi (2002) cites numerous languages that employ epenthetic [ʔ] in onsets, the few examples of epenthetic [h] mentioned are all in codas. H-epenthesis in onset position is unusual behaviour, rather than unmarked. Some other explanation for the identity of the epenthetic segment is needed.

Although languages frequently select a least marked segment for epenthesis, being the least marked consonant is not an absolute requirement. It is not strictly necessary, then, for *h* to be the least marked consonant in francophone IL in order for it to be available for epenthesis. Many languages, in fact, employ both default and other segments for epenthesis. While glottal stop is the default consonant of English, for example, speakers of varieties of English that delete post-vocalic *r* (e.g., in the New York City and Eastern Massachusetts areas) frequently exhibit epenthetic or so-called intrusive-r. As discussed in section 2.1, intrusive-r differs from the quantitatively hypercorrect post-vocalic *r* studied by Labov (1972) in that intrusive-r appears in contexts without any underlying *r*. Intrusive-r is a form of qualitative hypercorrection occurring (variably) in hiatus position following the vowels [ɑ, ɔ, ə] as in *law*[r] *and order* or *the idea*[r] *of it*. The question of how to account for intrusive-r is the subject of heated debate among phonologists (see for instance Bakovic, 1999; Gick, 1999; Halle & Idsardi, 1997; McCarthy, 1993; Orgun, 2001; Ortmann, 1998; Uffmann, to appear; and Vogel, 1986), but there is no need to detail all the intricacies of the debate here. What is important to retain is that an epenthetic segment need not be the least marked segment of a language. But if an epenthetic segment is not a default segment, the question remains: what determines the identity of the epenthetic segment? The next section examines two possible explanations, both based on output-output correspondence constraints.

3.2 Epenthesis and output-output correspondence

Kitto and de Lacy (1999) note that where an epenthetic segment is not a default segment, it is often a copy of another nearby segment in the output. Some languages

employ both copy and default epenthesis, or even a mixture of the two, in which case the epenthetic segment derives some features by default and others through copying. In brief, in the case of copy epenthesis, the segment copied may be either to the right or left of the epenthetic segment and the proximity of the two segments varies – sometimes the copied and epenthetic segments are adjacent, sometimes not. One way of accounting for copy epenthesis is through the process of feature sharing; Kitto and de Lacy, however, propose to account for it via an output-output version of Correspondence Theory (McCarthy & Prince, 1995). Whereas output is usually in a relation of correspondence to input representations (that is, output is generated from input), epenthetic segments may at times correspond to other output segments in a process analogous to reduplication (where an affix is a copy of all or part of the stem it attaches to).

Reduplication and some forms of epenthesis can be accounted for via the following structurally related output-output faithfulness constraints:

(4) Output-Output Faithfulness Constraints

BR-IDENT-F	Reduplicant segments and their Base correspondents have identical values for feature F.
BE-IDENT-F	Epenthetic segments and their Base correspondents have identical values for feature F.

Both epenthesis and reduplication involve the reproduction in output of another element of the output. The difference between epenthesis and reduplication is that epenthesis always inserts a single segment and does so usually for reasons of phonotactics (such as

the requirement that well-formed syllables have an onset), whereas reduplication involves the insertion of a morphemic element, often composed of more than one segment.

Virtually all of the examples Kitto and de Lacy (1999) give involve vowel rather than consonant epenthesis. For example, the hypothetical example in (5) of input /an/, which requires an epenthetic vowel to satisfy the markedness constraint *CODA ("Syllables do not have codas"), demonstrates how the epenthetic vowel derives its identity via output-output correspondence.

(5) Vowel Epenthesis with Input /an/

/an/	***CODA**	**BE-IDENT-F**
(a) [ann]	*!	
(b) [ani]		*!
☞ (c) [ana]		

In (5), epenthesis is triggered by *CODA, and the identity of the epenthetic segment is determined by the faithfulness constraint BE-IDENT-F. Candidate (a), in which the epenthetic segment corresponds to the preceding consonant, is not selected by EVAL for the simple reason that it fails to satisfy *CODA; candidate (b) satisfies *CODA by inserting a vowel that resyllabifies the illicit coda as an onset, but the default unmarked vowel [i] is used rather than a copy segment, resulting in a violation of BE-IDENT-F. Candidate (c), on the other hand, satisfies both *CODA and, by copying the vowel in the preceding syllable, BE-IDENT-F.

The only example of copy epenthesis involving a consonant examined by Kitto and de Lacy is that of glide epenthesis in Faroese, which is triggered by ONSET. Glides [j]

and [w] are epenthesized into hiatus position when [i] or [u] respectively are present in output as either the first or the second vowel of the hiatus. In the case of glide formation, whether in Faroese, English or other languages, the epenthetic consonant is only a partial copy of the adjacent vowel, but a copy nonetheless in that it preserves as many features of the vowel as possible. Front unrounded [i] in Faroese gives way to an epenthetic front unrounded [j]; rounded [u] gives way to rounded labial [w]. In sum, the identity of the epenthetic segment may be determined by the surrounding output rather than by markedness constraints.

Given the examples of copy epenthesis provided by Kitto and de Lacy, it is pertinent to ask whether h-epenthesis could also be a form of copy epenthesis, with the epenthetic *h* corresponding to another *h* in proximity in the output. The presence of other *h*'s in proximity is widely believed to be a trigger for h-epenthesis, and we have already hypothesized that an *h* in the vicinity of a vowel-initial syllable may contribute to the frequency of h-epenthesis. If we were to find then that h-epenthesis only occurs in the event of *h* in proximity, copy epenthesis could provide an explanation for the identity of the epenthetic segment.

There are two important objections to the notion of h-epenthesis being a form of copy epenthesis, however: 1) Janda and Auger (1992) found that not all instances of h-epenthesis occurred in the presence of other *h*'s in the output; and 2) in the case of another *h* in proximity, with in proximity meaning in the same intonation group, the distance travelled between the presumed base and copy in most cases would greatly surpass that found by Kitto and de Lacy, where the base is either immediately adjacent to its copy (glide epenthesis) or is in an adjacent syllable (vowel epenthesis). The first

objection is fairly straightforward in that epenthetic *h* cannot be considered a copy in the absence of a base. The second deserves more careful examination.

The constraint that requires adjacency is BE-ADJACENCY ("The base and the epenthetic copy are adjacent"), and the ranking of the constraints COPY-LEFT and COPY-RIGHT determines the direction of copying. Where an epenthetic segment cannot copy an immediately adjacent segment, as in the example of vowel epenthesis given in (5), the nearest available base is selected. Violations of BE-ADJACENCY are, in other words, assessed gradiently, according to a basic unit of measurement such as the segment or syllable. An epenthetic segment that copies an output segment not immediately adjacent or in an adjacent syllable, such as an epenthetic *h* that copies another output *h* at some remove in the intonation group, would incur multiple violations of BE-ADJACENCY. GEN, however, would always provide another candidate that performs better than the long-distance copy candidate on the constraint hierarchy (a candidate with a default epenthetic consonant or with a copy of a more nearby base). Consequently, long-distance copying may simply be a phonological/linguistic impossibility.

It seems unlikely, then, that h-epenthesis can be attributed to a relation of correspondence between the epenthetic segment and an output base. H-epenthesis appears to be a different phenomenon from the examples of non-default copy epenthesis provided by Kitto and de Lacy. One explanation may be that all of the examples of epenthesis Kitto and de Lacy consider are first language phenomena, determined purely by constraints on phonotactics, such as ONSET for consonant epenthesis and *CODA for vowel epenthesis. H-epenthesis, if Janda and Auger (1992) are right, is a form of hypercorrection, which is determined largely by sociolinguistic factors and occurs in a

language contact situation, whether between an L1 and an L2 or between two varieties of L1.

Nonetheless, another account of h-epenthesis employing output-output correspondence may be possible where the base that is copied lies elsewhere than in the surrounding output. Bradley (to appear) analyses a process remarkably similar to h-epenthesis, namely s-epenthesis in the formal speech (or so-called *hablar fisno*) of Dominican Spanish speakers. His analysis proposes that s-epenthesis is determined by an output-output correspondence constraint, but that the output forming the base is not in the speaker's own output; rather, the base appears in the output of speakers of the more refined variety that Dominican Spaniards strive to duplicate in formal contexts.

The situation involving *s* in Dominican Spanish closely parallels that involving *h* in h-dropping varieties of English: historically, *s* has been lost in codas, ceasing entirely to surface in output forms. In *hablar fisno*, speakers attempt to emulate a more conservative and respected style of s-preserving Spanish, but they overshoot the mark, producing hypercorrect coda-s. *S* is either inserted into a word with no coda-s in it at all, as in /a.bo.ga.do/ → [a<u>s</u>.bo.ga.do] "lawyer" (with the periods indicating syllable boundaries), or displaced within the word from the appropriate to an inappropriate coda position, as in /dis.pu.ta/ → [di.pu<u>s</u>.ta] "dispute". With some restrictions, epenthetic *s* inserts freely into coda position anywhere within a word. That is, /a.bo.ga.do/ can surface as either [a<u>s</u>.bo.ga.do], [a.bo<u>s</u>.ga.do], [a.bo.ga<u>s</u>.do], or [a.bo.ga.do<u>s</u>]. Interestingly, epenthesis is apparently limited to one inserted *s* per word, so hyper-hypercorrect [as.bos.gas.dos], for instance, does not occur.

Analogous to the situation regarding h-dropping varieties of English, Dominican Spanish speakers are sensitive to the fact that other hispanophones look down on the absence of coda-s in Dominican speech. In circumstances where Dominicans wish to elevate their speech, consequently, they attempt to preserve *s* in codas, except that they are apparently unsure of where *s* should go, with the result that they slot it in more or less blindly.

Bradley (to appear) accounts for the emergence of hypercorrect coda-s with a high-ranking output-output faithfulness constraint, MAX-OO-[s] ("An output coda [s] in conservative Spanish has an output correspondent in Dominican-Spanish *hablar fisno* output"). The constraint is ranked highly in the *hablar fisno* grammar through speakers' efforts to re-establish *s* in coda position; whereas in the grammar of ordinary "lost-s" Dominican speech, the constraint is ranked so low that it never has any effect on output. Ordinary Dominican speech, which lacks both epenthetic and underlying coda-s, exhibits the effects of highly ranked *s]σ ("*S* does not appear in codas," a segment-specific version of *CODA). Given a hypothetical input /CVs/ (i.e., any consonant-vowel sequence with coda-s), the ranking of *s]σ above MAX-IO and MAX-OO-[s] in (6) accounts for the failure of the coda-s to surface as in candidate (a) [CVs]; the high ranking of DEP-IO, moreover, rules out candidate (c) [CVsV], where the epenthetic vowel resyllabifies the illicit coda as an onset. Conversely, in the event of an input /CV/, epenthetic coda-s would of course also be blocked by *s]σ.

(6) Coda-s Deletion in Dominican Spanish

/CVs/	*s]σ	DEP-IO	MAX-IO	MAX-OO-[s]
(a) [CVs]	*!			
☞ (b) [CV]				
(c) [CVsV]		*!		

In the *hablar fisno* grammar, however, MAX-OO-[s] emerges as a decisive, high-ranking constraint such that coda-s may be not only preserved but epenthesized as well. How this process occurs precisely requires a more detailed explanation.

Bradley's (to appear) analysis rests on the crucial assumption that historical deletion of coda-s has been so pervasive in Dominican Spanish that, over the generations, coda-s in input forms has disappeared. Underlying forms being cued primarily by output forms (and only to a much lesser degree by orthography), if an input form such as coda-s is universally suppressed in output, it will eventually disappear also from input. If Dominican Spanish input forms truly are impoverished in this way, speakers cannot rely on their input to indicate where to produce a coda-s. When attempting to adopt a more refined spoken style, speakers realize then that rather than referring to their own input they must model their speech on the output of speakers of conservative Spanish. The Dominican-Spanish speakers are, however, stymied in their efforts by an inadequate knowledge of conservative Spanish, due largely to limited language contact. As a result of this unfamiliarity with the target prestigious variety, the output forms to which *hablar fisno* correspond are not accurate representations; instead, they are an incomplete generalization of true conservative output forms. The generalization can be expressed something like this: "Output forms can contain coda-s."

The imprecision of the generalization is crucial to understanding why an input /CV/ (which is also in fact /CV/ in conservative Spanish input and output) can generate output [CVs] in *hablar fisno*, as shown in the tableau in (7).

(7) S-Epenthesis in *Hablar Fisno*

/CV/	MAX-OO-[s]	*s]σ	DEP-IO	MAX-IO
(a) [CV]	*!			
☞ (b) [CVs]				

Were MAX-OO-[s] referring to an accurate base for correspondence rather than the approximation, coda-s would not surface here. It would surface only in a word such as *disputa*, which has the input form /di.pu.ta/ in Dominican Spanish but the output form [dis.pu.ta] in conservative Spanish, and it would surface only as [dis.pu.ta], never inaccurately as [di.pus.ta]. By extension, coda-s would never appear in the surface form of *abogado*, since coda-s does not appear in conservative output forms of this word.

Epenthesis of *s* in coda position is highly unusual given the cross-linguistic preference for syllables without codas. The process whereby input form /CV/ surfaces as unfaithful output form [CVs] cannot, therefore, be accounted for by a markedness constraint, since [CVs] is more marked than [CV]. The only plausible solution is to explain the process via another kind of faithfulness constraint, such as MAX-OO-[s], which determines faithfulness in terms of correspondence not to an input but to another output form. Whether a similar constraint should be posited to explain the process of h-epenthesis by francophone ESL learners will be discussed in chapter 5.

3.3 Variation within OT

Before the advent of OT, variation in linguistic processes was accounted for either via the concept of variable rules (e.g., Dickerson, 1975), according to which the applicability of a rule is subject to contextual factors, or via the Dynamic Paradigm (e.g., Gatbonton, 1978), according to which variation is the consequence of an ongoing shift from a state where one rule applies, to a state where another one does. In the OT framework, constraint interaction rather than a rule-based system is used to account for output. Constraint-based grammars are, however, inherently categorical, in that the constraint hierarchy always selects a single optimal candidate for output. Consequently, one of the criticisms levelled at OT has been that it is incapable of handling variation. A number of solutions have been proposed, however, to the problem of encoding variation within an OT grammar: Kiparsky (1993) proposed a *multiple grammars* explanation; Reynolds (1993) and Anttila (1997) both account for variation via the crucial non-ranking of constraints; and Boersma and Hayes (2001) proposed a stochastic version of OT involving a continuous ranking scale rather than a constraint hierarchy of strict domination.

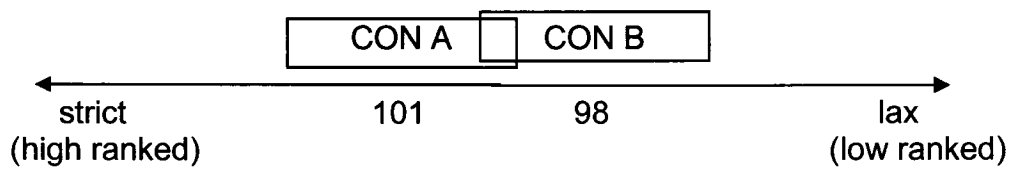
According to Kiparsky (1993), constraints are crucially ranked within the hierarchy in a relation of strict domination, as originally proposed by OT. Variation results from competing multiple grammars with different constraint rankings. In other words, speakers have at their disposal not a single but any number of grammars that select different optimal output candidates. At candidate selection, any one of the grammars may prevail, so more than one output candidate may surface at different times. The problem with this approach is first that it requires a proliferation of grammars, as

many grammars in fact as there are variants. Second, the probability of the different variants being selected is not at all predicted by a multiple grammars approach – the variants are simply viewed as being in a relation of free variation.

In a different approach to variation, both Reynolds (1993) and Anttila (1997) proposed that two or more constraints within a grammar may be crucially unranked and either float with respect to each other within the hierarchy or be in a relation of non-dominance (i.e., not crucially ranked with respect to one another). In the case of two floating constraints A and B, for example, the grammar alternates between a ranking of A >> B and B >> A, such that the output candidate that satisfies either A or B is variably selected as optimal. One problem with the approach is that, in the case of more than two floating constraints, the grammar is excessively permissive in terms of the possible constraint rankings. Given three floating constraints A, B, and C, for instance, six different hierarchies can be generated (A >> B >> C; B >> A >> C; C >> A >> B, etc.). Another problem concerns how the approach calculates probability: if a candidate is selected by *n* hierarchies and *t* is the total number of hierarchies, then the probability of the candidate being selected is *n/t*. In other words, if only two constraints are floating, generating two distinct hierarchies and two variants, each variant is predicted to surface exactly 50 % of the time. Variant probability is, however, rarely so neat. Janda and Auger (1992), for instance, found that h-epenthesis occurred less than 2 % of the time in their data; in order to account for such a frequency using a floating constraints approach, there would need to be approximately 50 different rankings, with h-epenthesis selected by only one of the hierarchies and no epenthesis by all 49 others. Surely, there has to be a better way.

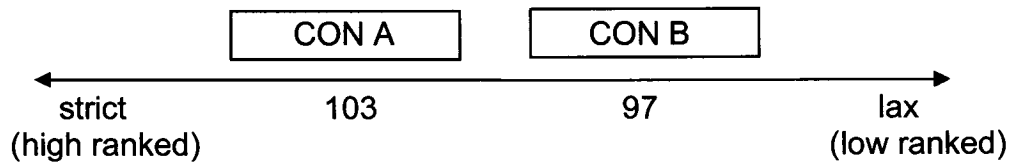
A more promising approach for handling variation proposed is the stochastic version of OT (SOT) developed by Boersma and Hayes (2001). In SOT, constraints are assigned a ranking value on a continuous scale, so constraints may be varying distances apart. Furthermore, a small noise component is added to each ranking value (typically a standard deviation of 2.0) such that the constraint occupies a range on the scale rather than a single point. At candidate evaluation time (i.e., while a person is speaking), the grammar selects for each constraint a point anywhere within its range, so if constraints are close enough together that their ranges overlap, at times one constraint dominates and at times the other does. For example, in Figure 6, constraint A has a ranking value of 101, and constraint B of 98, but at evaluation time, the grammar selects a point anywhere within the range covering two standard deviations from the ranking value, so on occasion constraint B will in fact outrank A. In other words, the grammar is variable.

Figure 6: Stochastic OT Variable Ranking



In Figure 7, on the other hand, the locations of the two constraints are sufficiently distanced that their ranges do not overlap, a situation which yields a categorical ranking.

Figure 7: Stochastic OT Categorical Ranking



While squares are used in Figures 6 and 7 to represent the constraint ranges, selection points in fact have a normal distribution across the range (a point near the middle of the range is selected more frequently than one at either extremity), so the ranges more properly should be curved, with a central peak typical of a normal distribution. As a result of this distribution, in the majority of cases, A does in fact dominate B with a variable ranking as in Figure 6. Importantly, however, A does not always dominate B, and the frequency of B outranking A is a function of the distance between the ranking values for the two constraints. Unlike the multiple grammars or floating constraints approach, therefore, SOT can easily encode any degree of frequency into the grammar.

If, as we have already considered, h-epenthesis is due to a high-ranking of the ONSET constraint or is a form of copy epenthesis, SOT could provide a valuable means of accounting for the variability of h-epenthesis and for the frequency of application of the process. If, on the other hand, h-epenthesis arises in response to a MAX-OO constraint, an SOT account is not strictly required to account for all the variation: the MAX-OO constraint inherently eschews categorical epenthesis since a non-underlying segment is inserted into output only at those times that the output generalization posits the segment in the output base. An output generalization such as "Syllables may have [h] in onset

position" would not require the speaker to epenthesize an *h* at the beginning of every onsetless syllable. In order for MAX-OO to generate variable epenthesis, therefore, it is not absolutely necessary for it to overlap with a conflicting constraint such as DEP-IO ("no epenthesis"). In other words, even when MAX-OO crucially outranks DEP-IO, h-epenthesis will not occur categorically in all vowel-initial syllables.

On the other hand, different frequencies of h-epenthesis across different proficiency levels could be expressed in terms of differing degrees of overlap between MAX-OO-[h] and DEP-IO, and the two constraints could perhaps be crucially ranked with respect to one another only at the proficiency level recording the highest frequency of epenthesis. Since different style levels are generally assumed to represent different grammars, the same analysis of differing degrees of overlap between the two constraints could also be applied to the frequency of h-epenthesis at different levels of formality.

3.4 OT and language acquisition

In terms of L1 acquisition, OT posits that constraints are innate and that children are initially hard-wired with a hierarchy in which all markedness constraints crucially outrank all faithfulness constraints – whence the very limited forms that emerge in children's output in the early stages of acquisition. Over time, exposure to adult output leads to a re-ranking of constraints which aims to resolve the discrepancies between the child's own and the adult's output. In terms of input, children's underlying forms are generally assumed to be accurate: although children's production is constrained by markedness, phonological perception (as discussed in section 1.1) is not subject to the

same constraints; consequently, children can generally develop accurate underlying representations for any vocabulary they acquire.

In L2 acquisition, on the other hand, learners start off with the L1 ranking of constraints in their IL. With exposure to the L2, and in conjunction with L2 output opportunities, the IL hierarchy of constraints becomes reordered, passing from the initial stage in which the L1 ranking prevails, to a potential final stage with a ranking identical to that of a native speaker, via medial stages where the ranking represents neither entirely the L1 nor entirely the L2 but various developmental rankings. During the medial stages, a phenomenon dubbed the "Emergence of the Unmarked" may be observed; that is, unmarked forms, which can be accounted for neither by the L1 nor the L2 grammar, appear in the IL, sanctioned by constraints that surface in the process of re-ranking.

Broselow, Chen and Wang (1998), for example, observed the emergence of unmarked forms in the treatment of English codas by native speakers of Mandarin. Specifically, the learners showed: 1) a tendency to devoice obstruent codas, and 2) a preference for bisyllabic forms in the output. With regard to 1), Mandarin does not permit obstruents in coda position whatsoever, whether voiced or voiceless, so the L1 cannot be responsible for the process of devoicing; instead, the learners' behaviour must be accounted for by a universal markedness constraint that designates voiceless obstruents as less marked than their voiced counterparts in coda position. This constraint leads to a devoicing of obstruent codas in many natural languages (in German, Russian and Polish, for example), but is so lowly ranked in English to be inoperative. In other words, the devoicing process is characteristic of neither the L1 nor the L2; instead, it is a feature specific to the IL. With regard to 2), the learners showed a greater frequency of vowel

epenthesis after the coda at the end of a monosyllabic rather than of a bi- or polysyllabic word. This behaviour points to the influence of a universal preference for minimally bisyllabic forms in the output, a tendency that is observed in neither Mandarin nor English. Cardoso (2005) observed the effect of this same markedness constraint in the IL of Brazilian ESL learners, who showed a greater frequency of i-epenthesis after a coda in a monosyllabic than in a bi- or polysyllabic English word.

To return to a central theme of the previous chapters, an important distinction between L1 and L2 acquisition is that, in L2 acquisition, input forms cannot be presumed to be accurate, since L2 underlying representations may be constructed using L1 phoneme categories; more rarely, certain phonemes may actually be absent from representations or perhaps be only murkily specified. Consequently, non-targetlike output can be the result of a difference in either the constraint hierarchies or in the input forms of native speakers and L2 learners. When inaccurate input forms are to blame, learners may attempt to access L1 output as a correspondent on which to base their own output.

3.5 Summary

Since h-epenthesis occurs in onset position, it is possible that the process is conditioned by markedness, at least in terms of the site of epenthesis. It is unlikely, on the other hand, that *h* is the least marked default segment in francophone IL, so an explanation for *h* being selected as the epenthetic segment needs to be found. As discussed in section 3.2, sometimes an epenthetic segment is a copy of a nearby segment. If, as is widely believed, h-epenthesis is influenced by the presence of other instances of *h* in proximity, the possibility arises then that the epenthetic *h* is a copy. There are,

however, two problems with this interpretation: first, the presence of another *h* in proximity in the output is not an absolute precondition for h-epenthesis; second, the distance separating the base from its presumed copy would generally have to be much greater than the distance covered in other examples of copy epenthesis.

It seems more likely then that, like s-epenthesis in *hablar fisno*, h-epenthesis arises due to an output-output correspondence constraint of the type where the output base lies in NS output. The base used, however, is inaccurate: it is in fact an approximation of native English speaker output. Hypercorrect h-epenthesis would thus come about as a result initially of an awareness on the part of learners of a discrepancy between their own output and that of native speakers, along with a realization that this gap is the result of unreliable underlying representations. The assumption is that, except at higher levels of phonological proficiency, learners' input forms either lack or are only murkily specified for *h*, as a result not only of the phoneme being absent from the L1 inventory, but of the Pharyngeal node required to specify *h* being unavailable. Learners attempt then to model their speech on the output of native speakers rather than relying on their own input. Their efforts are hampered, however, by an incomplete familiarity with native speech patterns. Consequently, the output on which learners base their own output forms is an inaccurate generalization. In the case of h-epenthesis, this generalization would be something like: "Syllables may have [h] in onset position."

If h-epenthesis is due to a high ranking of the ONSET constraint or is a form of copy epenthesis, some explanation of the variable application of the process will be needed. For instance, the constraint ranking ONSET, MAX-IO >> DEP-IO, which was used by Kager (1999) to account for t-epenthesis in Axininca, leads to categorical epenthesis in all

onsetless syllables. H-epenthesis, on the other hand, is not categorical – in Janda and Auger's (1992) study, it was in fact found to be quite rare. Of the various attempts o account for variation within an OT framework, the SOT approach (Boersma & Hayes, 2001) is the most promising, particularly in that it can readily encode any degree of frequency effect into a single grammar. SOT postulates that constraints occupy ranges on a continuous ranking scale and hence may overlap. At different candidate selection times, overlapping constraints may be ranked differently. As a result, a single constraint ranking can yield variable output. If, on the other hand, h-epenthesis is due to a MAX-OO constraint, along the lines of the constraint proposed by Bradley (to appear) for coda-s epenthesis in Dominican Spanish, no such explanation of variation is required. Variation is inherent to the MAX-OO constraint itself in the form of the non-categorical output generalization which specifies that the output forming a base for correspondence merely *can* or *may* have [h].

The process of h-epenthesis emerges during the course of ESL acquisition, which involves a re-ranking of constraints from an initial IL stage in which the L1 ranking prevails to a potential final IL stage with the same ranking as a native speaker of English. At some point in the re-ranking process, a ranking is established that variably selects output with an epenthetic *h* as most harmonious with the grammar, whether because of the emergence of a markedness constraint such as ONSET or of a faithfulness constraint such as MAX-OO. In the next section, we turn to the details of the study which forms the basis for investigating the various hypotheses concerning francophone h-epenthesis that have been formulated thus far. The results of the study will help determine which of the various OT accounts for consonant epenthesis best apply to h-epenthesis.

Chapter 4. Methodology

In the preceding chapters, chapter 1 addressed the issue of francophone ESL learners' perception and acquisition of the non-native phoneme *h*; next, chapter 2 presented the results of the only previous study of h-epenthesis (Janda & Auger, 1992), along with the interpretation of this process as a form of qualitative hypercorrection of a prestige variable; finally, chapter 3 discussed three different OT accounts of consonant epenthesis which could elucidate the process of variable h-epenthesis. Over the course of these chapters, six hypotheses concerning h-epenthesis were formulated. These are now grouped together and presented again below in section 4.1. Next, the methodology of the present study is detailed, including a description of the participants (section 4.2), the data collection (section 4.3), and finally the data analysis (section 4.4).

4.1 Research question and hypotheses

The primary aim of the research study was to identify the linguistic and extralinguistic factors that influence the variability of h-epenthesis. The hypotheses presented below were generated from the discussions of the preceding chapters. Hypotheses 1 and 2 were formulated based largely on the prediction that IL h-epenthesis would to some degree reflect the distribution of *h* in L1 English. Hypothesis 3 stems from the intuition that h-epenthesis arises not so much from a lack of control, but from a real concern and effort on the part of the learner, which should be more intense in more formal speech. Hypothesis 4 reflects the popular belief that an *h* in proximity plays a role in h-epenthesis. Hypothesis 5 is based on the observation that many forms of consonant epenthesis arise to satisfy the ONSET constraint: because the constraint is already satisfied

in the event of a preceding consonant (variably) resyllabifying into the ensuing vowel-initial word, such an environment should disfavour epenthesis. Finally, hypothesis 6 reflects the predictions of the Ontogeny-Phylogeny Model (Major, 2001), which was discussed in the introduction.

1. H-epenthesis should be more frequent in content than in function words.
2. H-epenthesis is expected to be subject to an alignment constraint, aligning with the left edge of either the prosodic word, the foot (including both trochaic and superfeet) or the stressed syllable.
3. H-epenthesis should be more frequent in more formal styles of speech.
4. H-epenthesis should be more frequent given the presence of other *h*'s in proximity preceding the vowel-initial syllable (with proximity defined as within the same intonation group, a domain bounded by pauses).
5. H-epenthesis should be more frequent in vowel-initial words preceded by a vowel or a pause than by a consonant.
6. The frequency of h-epenthesis should rise and then fall as a function of increased proficiency.

4.2 Participants

Fifteen Quebec francophone adult ESL learners aged 27 to 52 (with an average age of 41)[31] participated in the study between February and June, 2005. Participants were recruited via a call for participants (see Appendix A) distributed among my network of friends and acquaintances. All of the participants were living in the Montreal area or relatively nearby (three approximately one hour from Montreal). The participants were not actively taking an ESL course at the time of data collection, but all had formally studied

[31] The precise age of three of the participants was not determined (although they appeared to be within the 27 to 52 age range). The average is based on the remaining 12 participants' ages.

English to varying degrees in the past, including in elementary and secondary school and, in some cases, in cégep.

The only previous study of h-epenthesis (Janda & Auger, 1992) found low rates of epenthesis (less than 2 %) among relatively advanced learners. Consequently, for the current study, participants at the beginner to high-intermediate levels of proficiency were sought out and explicitly targeted in the call for participants. The assumption, based on the Ontogeny-Phylogeny Model (Major, 2001), was that h-epenthesis would be more frequent at the intermediate level. Proficiency levels were determined after data collection using a measure of specifically phonological proficiency that was deemed appropriate to the issue of h-epenthesis: rate of h-deletion in obligatory contexts (that is, h-production in function words, which is not obligatory in English, was not calculated). As it turns out, insofar as this measure is accurate, the participants' proficiency levels can be said to range from beginner to advanced (discussed further in the forthcoming section 5.2).

4.3 Data collection

For the purpose of data collection, participants wore a lavaliere microphone (Audio-Technica AT831b, a miniature microphone clipped to clothing) and were recorded using a Marantz CD recorder (CDR300). The data collection procedure is in four parts (see Appendix B), representing three levels of formality[32] (very formal, formal and informal):

[32] A possible criticism of the study is that more formal speech is elicited using reading-aloud tasks and that such data may not be representative of spontaneous speech in formal contexts (e.g., presentations, job interviews, and so on). However, the use of reading-aloud tasks to elicit formal speech is an established convention in sociolinguistics, based on the observation that reading aloud and spontaneous formal speech are similar in the degree of attention brought to speaking. Also, reading aloud is not an unnatural task: it is used in real life in reading aloud stories, passages from newspaper articles, instructions, and signs, for example.

1) Participants were recorded reading aloud lists of words (very formal speech) and short phrases and sentences (formal speech) that were designed to target specific contexts for h-epenthesis.[33] Both the words and phrases were printed individually on pieces of paper the size of playing cards that the participants turned over one by one and read aloud; the sentences were presented on two sheets of paper as they appear in Appendix B.

2) Participants were interviewed informally, answering general questions about themselves, their habitual activities, their likes and dislikes, and so on, in order to elicit a casual speech sample. Sample questions that were used in the informal interview appear in Appendix B.

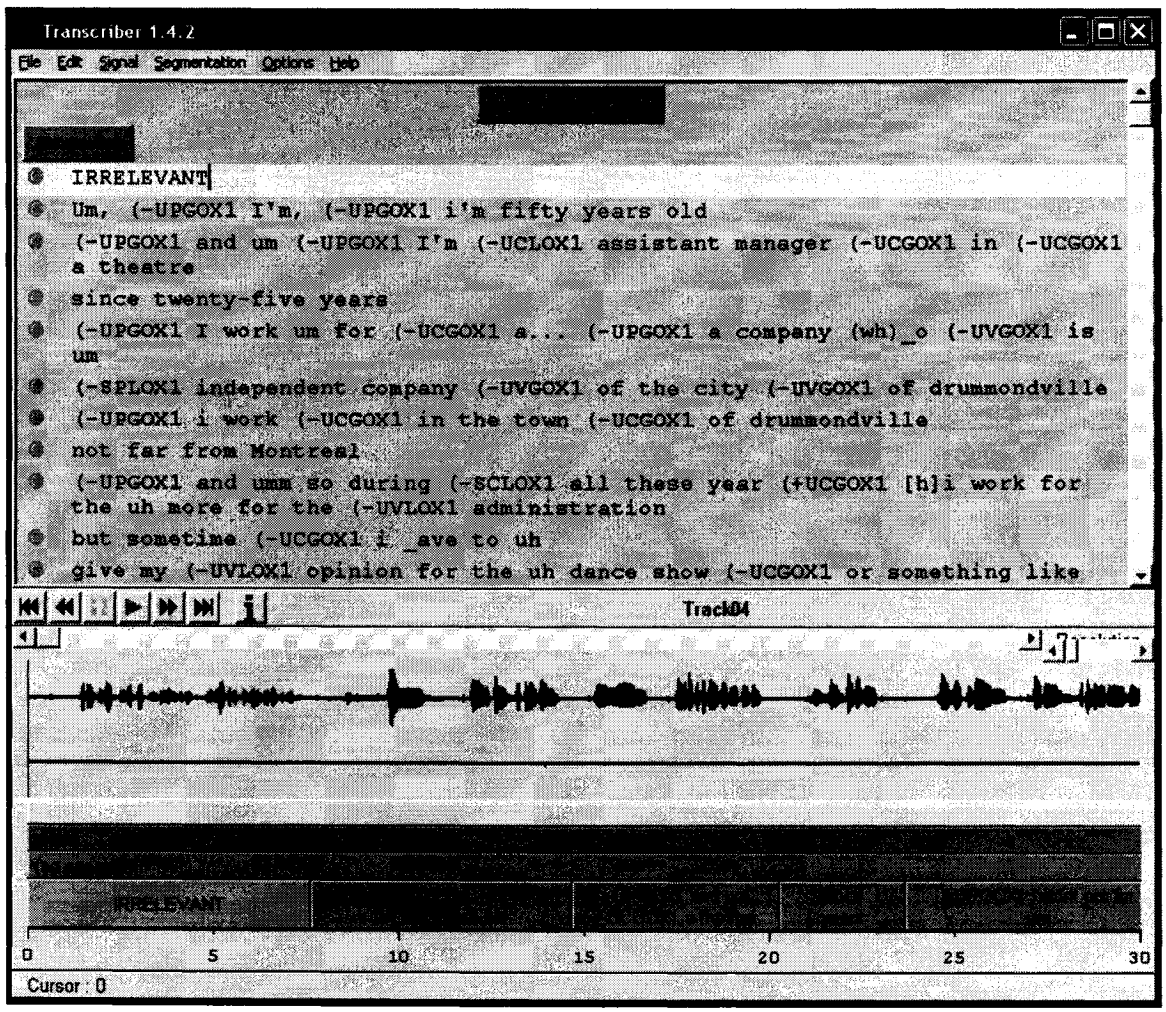
Data collection was carried out either in an office at Concordia, in my own office at home, or in the participants' own homes, and took about 45 minutes for each participant. It was explained to participants that they were participating in a study of the acquisition of the English sound system by francophones, but it was not revealed that the focus of the study was on h-epenthesis. For the reading-aloud tasks, participants were asked to try to pronounce all the words correctly and to indicate afterwards if there were any words they were unfamiliar with or were unsure of how to pronounce. All the participants were familiar with the vast majority of the words, and the rare time a word was unfamiliar did not appear to have any effect on h-epenthesis.

The data were transcribed using the program Transcriber version 1.4, and then each individual vowel-initial syllable was coded for dependent and independent variables in preparation for analysis. Transcriber is a tool for segmenting and transcribing speech recordings. In essence, the program allows one to divide a lengthy sound recording such as an informal interview into manageable sections of any desired length and to include a

[33] The tasks were designed to target all the contextual factors identified in Table 1 (presented in the forthcoming section 4.4). An analysis of the number of instances each factor is encountered in the tasks, as well as an analysis of the types of initial vowels used, is provided in Appendix C.

transcription with each section. This segmentation of the recording facilitates identification and retrieval of any small part within the longer recording. Figure 8 below shows how a sound recording is shown on the computer screen using Transcriber. The top two thirds of the screen contain the transcription (each section in the recording is preceded by a large dot), as well as the coding (in capital letters) for each vowel-initial word. In the bottom part of the screen appears the wave form for the recording, with the text corresponding to the wave form reproduced directly underneath.

Figure 8 – Screen Shot of Transcriber File



4.4 Data analysis

For data analysis, the statistical program GoldVarb (Robinson et al., 2001) was used: GoldVarb is an updated version of VARBRUL (Pintzuk, 1988), a sociolinguistic tool for analyzing variability. In a nutshell, the program assigns to a variable a probabilistic weight that indicates the variable's degree of influence on the application of a process. For example, h-epenthesis may be expressed in terms of the process: [h] *is inserted into the onset of vowel-initial syllables*. In the IL of francophone learners, this process applies variably rather than categorically to onsetless syllables. GoldVarb determines the degree to which certain contextual factors influence the frequency that the process applies. Initially, GoldVarb determines the overall *input probability* or general likelihood a process applies regardless of context. This value is then used as a base measure of the influence of the contextual factors. The factors that were analyzed using GoldVarb are presented below in Table 1.

Table 1: Factors for GoldVarb Analysis of H-Epenthesis

Factor Gps	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Dependent variables	Epenthesis	No epenthesis			
Position in word	Word initially	Word internally			
Position in foot	Head of foot	Non-head of foot			
Stress status	Stressed Syl.	Unstressed Syl.			
Preceding environment	Pause	Vowel	Consonant		
Word category	Content word	Function word			
***h* in proximity**	Preceding *h* in intonation gp[34]	No preceding *h* in intonation gp			
Level of formality	Informal (interview)	Formal (phrases, sentences)	Very formal (word list)		
Participants	1	2	3	4	5, 6, etc.

Each vowel-initial syllable in the transcriptions of the recordings was coded for all of the factors specified in Table 1. For example, in the reading-aloud of phrases for participant 1, the word "old" in the phrase "my old age" was coded as +FWSVLOY1 (i.e., + indicates *with an epenthetic h*; F, *foot-initial*; W, *word-initial*; S, *in a stressed syllable*; V, *with a preceding vowel*, and so on). The coded data is then fed into GoldVarb, which determines whether and to what degree the independent variables contribute significantly to the presence or absence of h-epenthesis (the dependent variable). This information provides a degree of statistical confidence for accepting or rejecting the hypotheses that are being investigated. Finally, information about the variables that contribute probabilistically

[34] In all cases where a vowel-initial syllable appeared after an underlying *h* in the same intonation group, whether this *h* was pronounced or not, the syllable was coded as having an *h* in proximity. The actual content of the participants' mental representations could not, of course, be directly accessed to determine whether an underlying *h* was actually present, so the presence of underlying *h* was determined based on my own representations as a native speaker.

to h-epenthesis also provides a basis on which to argue for a specific OT analysis that can account for the observed distribution of h-epenthesis in the data.

Chapter 5. Results and Discussion

Two separate runs of GoldVarb analysis were carried out. First, before all the data collection and coding were complete, a pilot study was carried out involving the analysis of only the first 10 participants' formal and very formal data, the results of which were presented at the *XIX Journées de linguistique* at Laval University (John, 2006) and the *5th International Symposium on Bilingualism* at Universitat Autònoma de Barcelona (John & Cardoso, to appear). Next, for the purposes of this thesis, a final analysis was carried out once the data from all 15 participants had been collected and fully coded. Since the initial analysis in the pilot study affected how the rest of the data were coded, the results of both analyses are presented below (sections 5.1 and 5.2). In the discussion of the results that follows (section 5.3), an OT account of the distribution of h-epenthesis is presented.

5.1 Initial GoldVarb analysis (pilot study)

An initial GoldVarb analysis of only the first 10 participants' formal and very formal data was carried out in March, 2005, before the informal data had been fully transcribed and coded. Although restricted in scope, this initial analysis already yielded some interesting results which led to a number of observations concerning the distribution of h-epenthesis in the IL of the participants, specifically concerning the factor groups: *position in word, position in foot*, and *level of formality*.

With regard to the factor group *position in word*, no instances of word-internal h-epenthesis were observed. In other words, barring evidence to the contrary in the rest of the data, the domain of h-epenthesis was determined to be word-initial position. The only tokens of h-epenthesis that could potentially be deemed word-internal were *head*[h]*ache*

and *tooth*[h]*ache*; however, since the two words in question are compound words, the onset slot receiving the inserted consonant should in fact be considered phonologically as word-initial. This preliminary finding suggests that h-epenthesis always aligns with the left edge of words. It was decided then that, unless tokens of word-internal h-epenthesis were observed subsequently in the data, the data would no longer be coded for this factor, since GoldVarb cannot analyze categorical phenomena. Henceforth only those vowel-initial syllables that were at the beginning of words were the object of analysis.

As far as *position in foot* is concerned, a correlation was indeed found between h-epenthesis and foot-initial position. Specifically, the GoldVarb analysis assigned a factor weight of 0.697 to foot-initial position versus 0.375 for foot-internal position (with a weight above 0.5 indicating that a factor exerts a positive influence on the probability of the process occurring). In other words, the fact that a vowel-initial syllable is positioned at the beginning of either a regular trochaic foot or a superfoot appears to increase the frequency of h-epenthesis. However, because the majority of the foot-initial syllables in the formal and very formal data are at the head of trochaic feet rather than superfeet (110 versus 27 – see Appendix C), in most cases the foot-initial syllables are stressed, and the results for the factor *stressed syllable* show that stress plays an even greater role in the process of h-epenthesis than does the factor *foot-initial*: the factor weight for stressed syllables is 0.766 versus 0.259 for unstressed syllables. Given the considerable overlap between foot-initial and stressed syllables and the fact that greater weight was attributed to the stress status in influencing the frequency of h-epenthesis, it was deemed that stress status and not position in foot is the significant factor. In other words, francophone IL appears to show sensitivity to the stress status of syllables but not to syllables' position in

terms of the foot; specifically, no evidence to confirm the somewhat abstract notion of the superfoot was found in the data. As a consequence of this result, the factor group *position in foot* was removed from the analysis, and subsequently the data were no longer coded for position in foot, only for stress status.

The influence of *level of formality* on the frequency of h-epenthesis was found to be insignificant in the data. For statistical purposes, the factor weights of 0.522 for the very formal data and 0.493 for the formal data are even, so formality does not have a significant effect here. However, it was subsequently hypothesized that the distinction between formal and very formal speech in the data was perhaps misguided; the reading aloud of a list of words may not differ sufficiently (or at all) in level of formality from the reading aloud of phrases and sentences. Consequently, all the reading-aloud data were regrouped under the single heading of *formal task*. It was anticipated, therefore, that in further analyses incorporating the data from the informal interviews, a difference between informal speech and formal reading aloud might be observed.

5.2 Final GoldVarb analysis

In the final GoldVarb run, therefore, the factor groups *position in word* and *position in foot* were eliminated from the analysis. The results for the remaining factor groups are presented below in Table 2, with the factor weights that indicate a significant influence on the frequency of h-epenthesis circled. A total of 11,526 tokens of vowel-initial words were coded for the analysis.[35] The overall input probability is 0.006.

[35] The results are based on the data for 14 of the 15 participants. One participant had no instances of h-epenthesis in the data; since this participant's behaviour was categorical and GoldVarb analyzes variability, her data were neither coded nor analyzed.

Table 2 – Final Results of GoldVarb Analysis

Factors	Factor weights
Stressed	0.744
Unstressed	0.409
Content word	0.488
Function word	0.506
Pause	0.584
Vowel	0.653
Consonant	0.383
H in proximity	0.738
No h in proximity	0.469
Formal	0.737
Informal	0.394

Briefly, the final results of the GoldVarb analysis indicate that the frequency of h-epenthesis is influenced by the stress status of the vowel-initial syllable, by the environment preceding the syllable, by the presence of an *h* in proximity, and by the level of formality; the category of the word containing the vowel-initial syllable has no effect on the frequency of h-epenthesis, with neither content nor function words favouring epenthesis – their factor weights, at 0.488 and 0.506 respectively, are statistically indistinguishable, and GoldVarb eliminated this factor group in the step-up/step-down regression analysis. In sum, the probability of h-epenthesis is greater in stressed syllables, with a preceding pause or vowel, with other *h*'s in proximity, and in more formal speech.

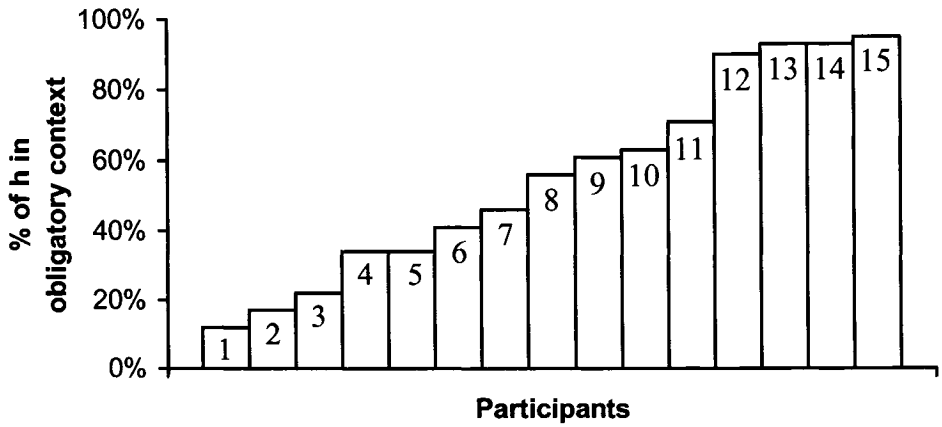
Level of proficiency was not coded for in the GoldVarb analysis, partly due to the contradictory pattern of correlation that was anticipated, with increased level of proficiency expected first to correlate with a rise and then eventually with a fall in rate of h-epenthesis.

Each individual participant was, however, assigned a factor weight, allowing an after-the-fact analysis of the pattern of correlation between rate of h-epenthesis and proficiency level. Initially, however, it was necessary to come up with an appropriate, reliable and valid (as well as manageable) measure of specifically phonological proficiency pertinent to the issue of h-epenthesis. Because the process of h-epenthesis is clearly linked to the acquisition of *h* itself, and because a high rate of h-deletion (and even categorical h-deletion) is incontrovertibly associated with the initial stages of francophone ESL acquisition, it was decided to use percentage of h-retention to determine proficiency.[36] Only percentage of h-retention in obligatory context was calculated, however, since it is perfectly normal for native speakers to delete *h* in function words in English.[37] In order to ensure that all participants had equal and identical opportunity for deletion, only h-retention rates in the formal reading-aloud tasks were considered. H-retention rates for all 15 participants are presented below in Figure 9, where each bar corresponds to a participant.

[36] At the end of the informal interview, the participants were also asked to evaluate their own proficiency in spoken English, rating themselves on a scale from 0 to 5, with 0 meaning that they can barely speak English at all, and 5 that they speak English virtually as well as a native speaker. The results of this self-rating were not particularly promising, however, when compared with the more objective measure of percentage of h-retention. The participant with the lowest rate of h-retention (12%), for example, gave himself the highest self-rating of all the participants (3.5), whereas the two participants with 93% retention rates (including the lone participant with zero h-epenthesis) rated themselves at 2 and 2.5.

[37] Paradoxically, higher rates of h-deletion in function words may in fact be associated with both lower as well as higher proficiency levels: at the lower levels because h-production rates are low across the board, and at the higher levels, because h-production is more native-like. Conversely, the highest rates of h-retention in function words probably occur at an intermediate or perhaps penultimate stage of development and may even surpass the rates of native speakers, representing a form of quantitative hypercorrection.

Figure 9 – Proficiency of Participants



A wide range of proficiency in terms of percentage of h-retention was found across the continuum of 15 participants, stretching from a low of 12 % to a high of 95 %. If the absolute beginner is assumed to have zero h-production, then the participants can be said to range from high beginner (with some h-production) to very advanced (with near native-like h-retention). The steady slope between the two endpoints on Figure 9 also indicates that the intervening stages of proficiency are well represented in the data. Maintaining the same order of participants (that is, with least proficient on the left rising to most proficient on the right), the factor weights assigned by GoldVarb are presented in Figure 10 below; in Table 3, the factor weights are presented as probabilities, with those that indicate a positive correlation with h-epenthesis highlighted in bold.[38]

[38] In terms of percentages, for the sake of comparison, whereas h-retention rates ranged from 12 % to 95 % in the formal tasks, the range for h-epenthesis was 0.4 % to 16.6 %, with none of the participants having a higher rate of h-epenthesis than h-retention.

Figure 10 – H-Epenthesis in Terms of Proficiency Level

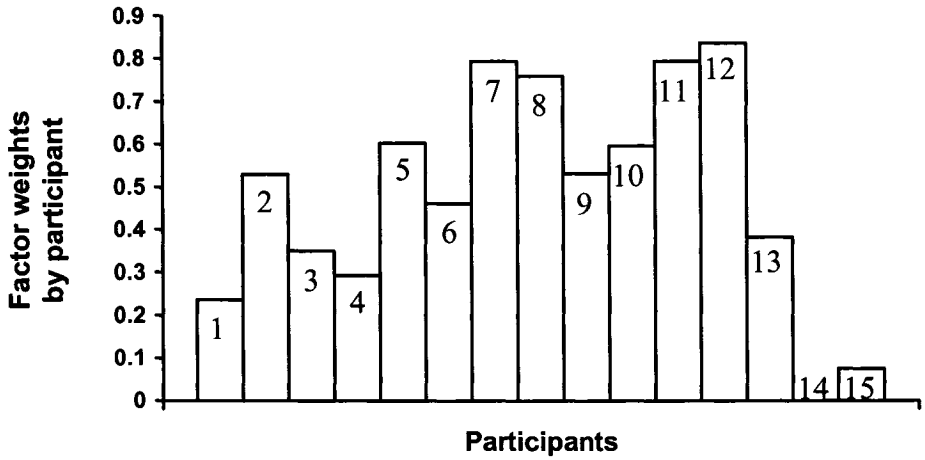


Table 3 – H-Epenthesis in Terms of Proficiency Level [39]

Participants	Factor weights	Proficiency
15	.075	Most proficient
14	.000	↑
13	.382	↑
12	**.836**	↑
11	**.793**	↑
10	**.596**	↑
9	**.531**	↑
8	**.759**	↑
7	**.793**	↑
6	.461	↑
5	**.602**	↑
4	.293	↑
3	.350	↑
2	**.529**	↓
1	.237	Least proficient

[39] Participant 14 in Table 3 is the participant who showed zero epenthesis and whose data consequently were not analyzed; she has been accorded a factor weight of zero.

In Figure 10, while the curve is not perfect, there is a definite sense that factor weights (and hence greater frequency of h-epenthesis) rise and then fall across the middle range of proficiency; high factor weights are certainly not associated with either extreme in the proficiency continuum. Likewise, in Table 3, we can see that the factor weights that indicate a positive association with h-epenthesis cluster in the mid to high-mid range of proficiency. Of the first 4 participants at the lower end of the continuum, the factor weights for 3 participants are considerably below 0.5, which indicates that their frequency of h-epenthesis is lower than usual in the data; the same applies to the 3 participants at the high end of the continuum.

In sum, the results indicate that h-epenthesis is a domain-specific process, limited to the left edge of the prosodic word, with no instances of word-internal epenthesis being found in the data. Also, h-epenthesis is sensitive to the stress status of the vowel-initial syllable, but apparently not to the syllable's position in the foot. Furthermore, the preceding environment has a significant influence on the application of the process, with greater frequency of h-epenthesis in the case of a preceding vowel or pause than a preceding consonant. Somewhat surprisingly, h-epenthesis is not sensitive to word category; the process applies equally to content and to function words in the data. The presence of other *h*'s preceding the vowel-initial syllable within the same intonation group, on the other hand, does increase the probability of h-epenthesis. Likewise, style level plays a role in the application of the process: the rate of h-epenthesis is greater in more formal, reading-aloud tasks than in casual speech. The findings of the only previous study of h-epenthesis (Janda & Auger, 1992) were inconclusive and even contradictory regarding the formality factor, so this new finding is important. Finally, a role for the level of proficiency

of the participant was observed: h-epenthesis is not associated so much with either the lower or the higher levels of proficiency; the probability of the process applying is greatest at the intermediate stages of phonological development.

5.3 Discussion and Optimality-Theoretic analysis

On the whole, the results of the two studies confirmed the hypotheses formulated earlier; these are presented again below, with a checkmark next to those that were confirmed and an X beside the lone refuted hypothesis.

× 1. H-epenthesis should be more frequent in content than in function words.

√ 2. H-epenthesis is expected to be subject to an alignment constraint, aligning with the left edge of either the prosodic word, the foot (including both trochaic and superfeet) or the stressed syllable.

√ 3. H-epenthesis should be more frequent in more formal styles of speech.

√ 4. H-epenthesis should be more frequent given the presence of other *h*'s in proximity preceding the vowel-initial syllable (with proximity defined as within the same intonation group, a domain bounded by pauses).

√ 5. H-epenthesis should be more frequent in vowel-initial words preceded by a vowel or a pause than by a consonant.

√ 6. The frequency of h-epenthesis should rise and then fall as a function of increased proficiency.

Confirmation of the final hypothesis, concerning the relation between frequency of h-epenthesis and proficiency, provides support for the Ontogeny Phylogeny Model (Major, 2001), which posits that over the course of L2 acquisition L1 features gradually decline, L2 features gradually rise, and developmental features steadily rise, peak and then fall

again. The model can also be restated in terms of OT: L2 acquisition involves progression from an *initial stage* dominated by the L1 ranking of constraints to a *final stage* in which the L2 ranking prevails via *medial stages* where the ranking is neither that of the L1 nor the L2; output that occurs in neither the L1 nor the L2 (such as epenthetic *h*) may surface during these medial stages.

Leaving the other hypotheses to one side for the moment, we will examine first the consequences of the positive result for hypothesis 2: h-epenthesis was found to align always with word-initial position,[40] as well as more frequently with stressed syllables, but not apparently with foot-initial position. The finding of categorical alignment with word-initial position means that the domain of h-epenthesis is the left edge of the word; consequently, the process should not be described as variable insertion of *h* into vowel-initial syllables but more properly vowel-initial words. The restriction of h-epenthesis to word-initial position is not surprising perhaps, given that word-internal *h* is fairly rare in English and that, where *h* is present underlyingly in the middle of words, it does not always surface.

The greater probability of h-epenthesis occurring in stressed syllables suggests: i) that the learners do have a representation of English lexical stress patterns; and ii) that they have to some degree registered an association between surface *h* and stress patterns. Concerning i), this is no mean feat, given that the learners' L1 does not have lexical stress, only tonic accents (which fall invariably word- and phrase-finally in French).[41] Concerning

[40] Interestingly, the participants' h-production is not strictly limited to word-initial position, however: for example, in the reading-aloud tasks, 3 participants pronounced the *h* in the one word (*Ohio*) with word-internal *h*.

[41] An exception is the rather marginal case of the *accent d'insistance*, which is used for special emphasis or contrast and which falls on the first syllable of a word (Gendron, 1984).

ii), if we rule out the notion of the superfoot and consider only trochaic feet (which start with a stressed syllable), whether we state that h-epenthesis aligns probabilistically with the left edge of the foot or of the stressed syllable amounts to the same thing. It is impossible in other words to determine whether learners in fact associate *h* with foot-initial position or with stressed syllables. However, because stress is more tangible than the rather abstract foot, it makes more sense to maintain that learners associate *h* with stress patterns rather than with a foot representation. This is not to say that the evidence in the data renders the superfoot representation invalid, but merely that the IL data neither support nor refute the concept; as discussed in section 1.4, the distribution of *h* and aspiration in English, along with the distribution of expletive infixation, still support the notion of the superfoot, as does the Strict Layer Hypothesis.

The confirmation of both hypotheses 3 and 5 is particularly interesting, since a positive finding for 5 invites an interpretation that would normally preclude a positive finding for 3. That is, the positive finding for hypothesis 5 (h-epenthesis is more frequent with a preceding vowel or pause than a consonant) suggests a role for the ONSET constraint in the process of epenthesis. Cross-linguistically, ONSET (which states that syllables have onsets) is behind many phonological processes. For instance, under the influence of ONSET, when a vowel-initial word is preceded by a consonant in both English and French and many other languages, this consonant detaches itself (variably) from underlying coda position and resyllabifies into the ensuing available onset (Labov, 1997; Tranel, 1996); the same variable process is doubtless active in francophone ESL learners' IL. When the preceding phonological environment consists of a vowel or a pause, however, the only means of satisfying ONSET (barring deletion of the word-initial vowel) is to epenthesize a

consonant, thus explaining the greater frequency of h-epenthesis and apparently establishing its source as the ONSET constraint. Furthermore, when the preceding consonant fails to resyllabify, an epenthetic consonant may still surface; for this reason, h-epenthesis is not absolutely blocked in the event of a preceding consonant, but its frequency is significantly curtailed. If the previous scenario is accurate and ONSET is in fact responsible for h-epenthesis, an OT account of the process would be along the lines of Kager's (1999) analysis of t-epenthesis in Axininca Campa (as discussed in section 3.1) which employs the following constraint hierarchy: ONSET, MAX-IO >> DEP-IO. In addition, a constraint such as WORD-CONTIGUITY ("The input for a word is a single contiguous string in output" – hence no word-internal epenthesis) (e.g., McCarthy & Prince, 1995) could account for the absence of h-epenthesis within words.

There are, however, two important objections to the ONSET-based account of h-epenthesis. First, as discussed in section 3.1, while ONSET may explain the site of epenthesis, the identity of the epenthetic segment still needs to be accounted for. If the segment does not derive its identity from an adjacent segment via the process of copy epenthesis (Kitto & de Lacy, 1999), it should be a default, least-marked segment. Although glottal is apparently the least-marked place of articulation and as such is responsible for the pervasive cross-linguistic insertion of the glottal stop [ʔ], the glottal fricative [h] as epenthetic onset is not attested in the literature (Lombardi, 2002). Thus, if glottal stop (which is used in English, along with epenthetic partial-copy glides [w, j], to satisfy ONSET) is not employed in a given language, coronal [t] (which is sometimes used in

French)[42] is a common least-marked alternative, but [h] is not. In sum, ONSET can provide at best a partial explanation for h-epenthesis.

The second objection, which deals a fatal blow to the ONSET account, arises from the confirmation of hypothesis 3: h-epenthesis is more frequent in more formal speech. Why this result undermines the ONSET account is related to how OT envisions speech production. According to OT, output forms are generated from input, a process conditioned by considerations of both faithfulness and markedness: output forms can be either fully faithful to input or in some way unfaithful in order to satisfy one or more markedness constraints. Furthermore, based on an analysis of the variable L1 patterns of French liaison, Dutch vowel reduction, and Turkish vowel epenthesis, van Oostendorp (1997) proposed the cross-linguistic principle that the more formal the speech, the higher ranked the faithfulness constraints. In other words, output is universally more faithful to input in more formal styles. Labov (1973), likewise, found greater retention of post-vocalic *r* (and hence greater faithfulness) as a function of formality. A markedness constraint such as ONSET, therefore, should exert less influence in more formal speech, and unfaithful forms that are attributed to ONSET (including epenthetic *h*) should be less frequent. In francophone IL, however, the opposite was found: the probability of h-epenthesis actually rises as a function of formality.

Two interpretations of this finding can be envisioned: 1) ONSET may nonetheless be responsible for h-epenthesis, in which case the IL data have to be taken either as refuting van Oostendorp's (1997) principle or as establishing an important distinction between L1 and IL systems; 2) conversely, another constraint than ONSET, one belonging to the

[42] An epenthetic [t] appears, for example, when *elle a* "she has" is inverted in question formation: *a-t-elle* "has she." Despite the epenthetic [t] being recorded in written forms, it is purely phonetic, with no phonemic or morphemic value.

faithfulness category, may be behind the process of h-epenthesis, in which case van Oostendorp's principle is reinforced by the IL data. It is this second interpretation that is adopted here, and the faithfulness constraint in question is an output-output correspondence constraint along the lines of the one proposed by Bradley (to appear) (as discussed in section 3.2) to account for s-epenthesis in Dominican Spanish: MAX-OO-[h] ("An output [h] in native speaker English has an output correspondent in francophone IL output"). H-epenthesis, in other words, is not an instance of the Emergence of the Unmarked, but of the emergence of output-output faithfulness.

The emergence of MAX-OO-[h] in the IL grammar is the consequence of two realizations on the part of francophone learners: first, that there is a discrepancy between their own and native speaker (NS) output – [h] is absent from learner speech but present in NS speech; second, that this discrepancy is due to the unreliability of learner input forms. To explain, when a discrepancy between learner and NS output exists, there are two possibilities: 1) the discrepancy is due to IL and NS constraint rankings being different and to their grammars' selecting as a consequence different output candidates as optimal; or 2) the discrepancy is due to IL input not being the same as NS input. More simply, the discrepancy arises either because the IL grammar $\neq$ the NS grammar, or because the IL input $\neq$ the NS input. The second explanation is adopted here to account for h-deletion: h-deletion results from deficient IL input forms, which either lack *h* entirely or are otherwise inadequate (for instance, in being only murkily specified for *h* or being based on an orthographic representation, as discussed in section 1.2). IL input forms are deficient because, at least initially, learners do not even notice *h* in the L2 output or, if they do detect *h*, they treat it as a phonologically irrelevant feature of the speech signal, for which a

phonemic representation is unavailable. Eventually, however, perhaps because teachers or peers draw their attention to the situation, learners come to realize first that something is missing from their output, and second, that a deficiency in their input is to blame. In other words, learners make the realization that input unreliability is responsible for the discrepancy between their own and NS output.

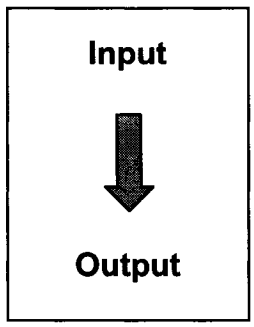
It is this second realization that leads learners to try to base their output on NS output forms, at least until they are able to develop a proper phonemic representation for *h* and to fully introduce *h* into the underlying forms of words. Faithfulness to NS output is expressed in the grammar in terms of the constraint MAX-OO-[h]. Emergence of this constraint results in h-epenthesis because learners cannot access NS output forms directly and with complete accuracy; instead, they access an *output generalization*. This generalization concerning *h* can be expressed as: "[h] may appear in word-initial position, particularly in stressed syllables, when no other consonant already occupies the onset."

The content of the output generalization explains why h-epenthesis always aligns with word-initial position and generally prefers stressed syllables. The content is also partly accurate in terms of English h-distribution: *h* is far more common in word-initial position and is never deleted from stressed syllables; as well, *h* occurs virtually exclusively as a singleton, rather than in combination with any other consonant in the onset. The output generalization is, however, overly permissive, not limiting the occurrence of *h* at the surface to words that contain *h* underlyingly. This permissiveness is what gives rise to h-epenthesis. Furthermore, *h* is selected for epenthesis over a less marked consonant because *h* specifically is the object of output-output correspondence. Neither the identity nor the site of epenthesis is determined by markedness. Finally, the fact that h-epenthesis is the

work of an output-output faithfulness constraint explains the greater frequency of the process in more formal contexts: while the epenthetic *h* is not faithful to either learner or NS input forms, paradoxically the *h* is faithful to the output generalization. In other words, an epenthetic *h* is truly epenthetic only in terms of the input, not in terms of the approximation of NS output that speakers access as a base for output.

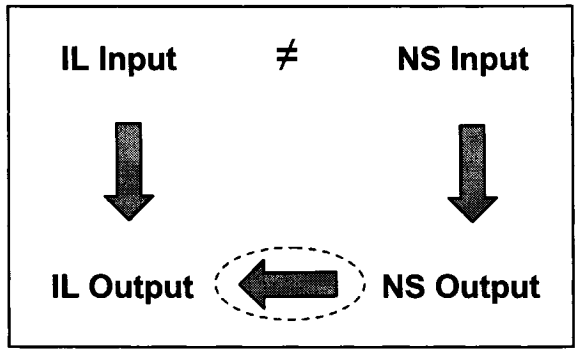
Under most circumstances, therefore, speakers rely on input as a base for output, as illustrated in Figure 11, and any alterations to the input in the output form are the result of high-ranking markedness constraints.

Figure 11 – Generation of Output from Input



In SLA, however, if it comes to learners' attention that their output differs from that of NSs (i.e., IL output ≠ NS output), they may posit that this is due to a difference in input forms (IL input ≠ NS input), in which case they may attempt to generate their output from NS output forms, as shown in Figure 12.

Figure 12 – Generation of IL Output from NS Output



Given a high enough ranking of MAX-OO-[h], the only reason for learner output not to correspond perfectly with NS output in terms of *h* is that the output generalization is imprecise. Conversely, only if a conflicting markedness constraint is ranked higher than the output-output constraint in the IL grammar may the lack of perfect correspondence be due to markedness rather than to the imprecision of the output generalization.

Essentially, ONSET (or any other markedness constraint) is not responsible for h-epenthesis because h-epenthesis is a form of hypercorrection. The process derives from learners' attempts to reproduce in their own output a prestige variable from NS output. Fuelling these attempts is the sense that the absence of *h* in their output is stigmatized. Hypercorrection can either lead to greater markedness (e.g., s-epenthesis in *hablar fisno* violates the markedness constraint *CODA) or, conversely, output may be less marked as a result of hypercorrection (e.g., epenthetic *h* satisfies ONSET), but the lesser markedness of output is only an incidental by-product of the process of hypercorrection rather than its root cause.

Four of the six hypotheses have thus been accounted for and discussed. All that remain are hypothesis 1, concerning word categories, and hypothesis 4, concerning *h* in

proximity. The finding that word category does not affect the frequency of h-epenthesis was unexpected. It was expected that rates of epenthesis would be higher in content than in function words. First, *h* is more likely to surface in content than in function words in English. On the other hand, francophones may in fact not realize that NSs of English variably delete *h* in function words; they may attribute absence of *h* in the output to their own difficulty in perceiving *h*. Next, function words tend not to be stressed, and since h-epenthesis is more common in stressed syllables, there should be lower rates of h-epenthesis in function words. On the other hand, it may be that some of the function words receiving an epenthetic *h* were in fact stressed by the participants. After all, function words do occasionally receive emphatic or contrastive stress in English. The actual stress status of a given syllable in continuous speech can, however, be hard to identify. This is particularly the case in the speech of francophone ESL learners, who generally transfer the L1 tendency of only weakly stressing a syllable. For simplicity, all function words in the data were coded as unstressed, but this may not have been strictly true.

The final finding to be discussed is the confirmation of hypothesis 4: the presence of another *h* in proximity significantly influences the frequency of h-epenthesis. A vowel-initial word was coded as having another *h* in proximity if there was another *h* preceding the word within the same intonation group. All instances of *h* that should be present underlyingly in English were included, whether the *h* was obligatory or not and whether it was pronounced or not. Only those *h*'s within the same intonation group, a domain bounded by pauses, were considered, since a proximity effect was deemed unlikely to extend beyond this domain. Only preceding *h* was considered – a vowel-initial word with a subsequent *h* in the same intonation group was not coded as having an *h* in proximity,

under the assumption that *h* in proximity would not have a regressive effect. Of course, this assumption may not always hold true: where an initial *h* follows very closely a vowel-initial word, it may in fact influence the likelihood of h-epenthesis (e.g., consider [h]*I have*, *the* [h]*old house,* and [h]*a hard experience*, which are taken from the data). Such forms of *h* in proximity were not coded in the data, however, so we cannot be sure that *h* in proximity has a regressive effect, only that a preceding *h* in proximity certainly influences the frequency of h-epenthesis.

To explain the influence of *h* in proximity, we need to reconsider the output generalization on which output-output correspondence is based: "[h] may appear in word-initial position, particularly in stressed syllables, when no other consonant already occupies the onset." The key word here is *may*. The output generalization is not categorical, so a grammar with high-ranking MAX-OO-[h] *may* or *may not* posit an *h* at the beginning of a vowel-initial word. The effect of another *h* in proximity appears to be to influence speakers in their assessment of ensuing vowel-initial words, making it more likely that they will judge these words to belong to the category of words that do rather than do not require an *h*. An *h* in proximity seems to serve as a reminder that what for francophone learners are vowel-initial words in input may in fact have an *h* in NS output, thus increasing the likelihood that learners will posit an *h* where none is needed and resulting in a higher rate of h-epenthesis.

The initial stage of francophone IL grammar is not observed in the data, arguably because there were no true beginners among the participants. Hypothetically, however, this stage generates categorical h-deletion and no h-epenthesis: h-deletion because *h* is absent from underlying representations, and no h-epenthesis because MAX-OO-[h] is too lowly

ranked to affect candidate selection. More precisely, the h-deletion and no h-epenthesis grammar would consist of the following constraint ranking (which largely reflects the L1 ranking):[43] MAX-IO, DEP-IO >> ONSET, MAX-OO-[h]. The output that such a grammar selects as optimal for the input word *happen* is shown in the tableau in (8). Note that because learners cannot at first represent the phoneme *h* in input nor assimilate it to a native phoneme category, what for a NS is input /hæpən/, for a francophone ESL learner is /æpən/, as it appears in the tableau.

(8) Categorical H-Deletion and No Epenthesis Grammar

Input: /æpən/	**MAX-IO**	**DEP-IO**	**ONSET**	**MAX-OO-[h]**
☞(a) [æpən]				
(b) [hæpən]		*!		
(c) [pən]	*!			

In the tableau, a violation of MAX-OO-[h] is attributed to candidates (a) [æpən] and (c) [pən], although in reality, at the very beginning stages of ESL acquisition when this grammar is presumed to be in place, learners probably are not particularly aware of and therefore do not posit *h* in NS output. Consequently, it is probably more accurate to omit the violation, but it is included in order to show that even if a violation does in fact occur, it has no effect on candidate selection. Candidate (a) [æpən], which is faithful to input but violates the markedness constraint ONSET, is selected over the unfaithful candidates (b)

[43] The initial-stage IL grammar may be identical to the L1 grammar, although perhaps not entirely. Learners could be loath to reproduce in the L2 certain characteristically L1 transformations of input in output. These transformations may be judged to be almost uniquely typical of the L1 and thus unlikely to be found in the L2. Such judgments are particularly likely if the L1 and L2 are not closely related. As a consequence of these judgments, hypothetically, initial-stage IL grammars may tend to rank faithfulness constraints higher than do the L1 grammars of learners.

[hæpən] and (c) [pən] (both of which satisfy ONSET) because the faithfulness constraints MAX-IO and DEP-IO crucially outrank ONSET.

Interestingly, for the word *apple*, which lacks underlying *h* in both the IL and NS input, again the faithful candidate [æpəl] would be selected as optimal over candidates [hæpəl] or [pəl], as shown in the tableau in (9). At a later stage of acquisition, however, as is shown further on in the tableau in (12), the candidate [hæpəl] with an epenthetic *h* could at times be most harmonious with the grammar. Paradoxically, then, the output at the lower level of acquisition is (in this respect at least) more native-like.

(9) Categorical H-Deletion and No Epenthesis Grammar

Input: / æpəl /	**MAX-IO**	**DEP-IO**	**ONSET**	**MAX-OO-[h]**
☞ (a) [æpəl]				
(b) [hæpəl]		*!		
(c) [pəl]	*!			

When learners realize that there is at times a discrepancy between their own and NS output concerning the phoneme *h* and that the omission of *h* in input is the cause, MAX-OO-[h] is promoted in the constraint hierarchy, resulting in the following constraint rankings: MAX-OO-[h] >> MAX-IO, DEP-IO >> ONSET. Now, given the same input /æpən/ as in the tableau in (8), the grammar can variably select either output [hæpən] or output [æpən], depending on whether the speaker accurately posits *h* in NS output or not, as demonstrated in the tableaux in (10) and (11) respectively.

(10) Variable H-Deletion and H-Epenthesis Grammar (*h* posited in NS output)

Input: /æpən/	MAX-OO-[h]	MAX-IO	DEP-IO	ONSET
(a) [æpən]	*!			
☞ (b) [hæpən]				
(c) [pən]	*!			

(11) Variable H-Deletion and H-Epenthesis Grammar (no *h* posited in NS output)

Input: /æpən/	MAX-OO-[h]	MAX-IO	DEP-IO	ONSET
☞ (a) [æpən]				
(b) [hæpən]			*!	
(c) [pən]		*!		

Thus, in (10), because *h* is posited to be present in NS output, candidates (a) [æpən] and (c) [pən] are rejected in that both violate MAX-OO-[h]; candidate (b) [hæpən], on the other hand, satisfies MAX-OO-[h] and so is selected as optimal for output. In (11), however, where no *h* is posited in NS output, none of the candidates violates MAX-OO-[h], and hence MAX-OO-[h] plays no role in candidate selection; instead, candidates (b) [hæpən] and (c) [pən] are rejected for violating the faithfulness constraints DEP-IO and MAX-IO, which are ranked crucially higher than ONSET, the only constraint violated by optimal candidate (a) [æpən].

The examples in the tableaux in (10) and (11) show variable deletion of *h* in output, depending on whether *h* is *accurately* posited as present in NS output for learner input /æpən/. For learner input /æpəl/, *h* may be *inaccurately* posited as present in NS output, in

which case the candidate with an epenthetic *h* is selected as optimal by the grammar, as shown in the tableau in (12).

(12) Variable H-Deletion and H-Epenthesis Grammar (*h* posited in NS output)

Input: /æpəl/	MAX-OO-[h]	MAX-IO	DEP-IO	ONSET
(a) [æpəl]	*!			
☞ (b) [hæpəl]				
(c) [pəl]	*!			

Because *h* is posited in NS output for the input /æpəl/, but does not surface in the representations in (a) and (c), candidates (a) [æpəl] and (c) [pəl] violate MAX-OO-[h] and are rejected by the grammar; candidate (b) [hæpəl], on the other hand, which has an epenthetic *h* in the surface representation, does not violate MAX-OO-[h] and is therefore selected.

Of course, the output generalization sometimes does not cause *h* to be posited inaccurately in NS output for learner input /æpəl/. In this case, as shown in the tableau in (13), candidate (b) [hæpəl] with an epenthetic *h* is rejected by the grammar, as is unfaithful candidate (c) [pəl]; instead, fully faithful candidate (a) [æpəl] is selected by the grammar.

(13) Variable H-Deletion and H-Epenthesis Grammar (no *h* posited in NS output)

Input: /æpəl/	MAX-OO-[h]	MAX-IO	DEP-IO	ONSET
☞ (a) [æpəl]				
(b) [hæpəl]			*!	
(c) [pəl]		*!		

Thus, a grammar with the constraint hierarchy MAX-OO-[h] >> MAX-IO, DEP-IO >> ONSET is able to account for both variable h-deletion and variable h-epenthesis. Variable deletion occurs because the output generalization does not always posit an *h* in NS output when there should be one; variable epenthesis occurs because the output generalization sometimes posits an *h* in NS output where there should not be one. H-epenthesis only occurs word-initially because the output generalization only posits NS output [h] in this position. Likewise, h-epenthesis is more frequent in stressed syllables because of the codicil "particularly in stressed syllables" contained in the output generalization. H-epenthesis is less frequent when a consonant is present preceding the vowel-initial word, because this consonant variably resyllabifies into the ensuing available onset slot; when it does so, *h* cannot be posited in the onset because the output generalization specifies that it may only appear as a singleton (i.e., "when no other consonant already occupies the onset"). The likelihood of an *h* being posited in NS output is higher with another *h* in proximity, as well as in more formal styles of speech, where learners are more concerned to accurately emulate the NS target form. The generalization does not, however, distinguish between content and function words, so the rate of h-epenthesis is equal in either word category.

The issue of the variability of h-deletion and h-epenthesis needs to be addressed in more depth. One of the criticisms of OT has been that, given that OT constraints are categorical (e.g., ONSET – "Syllables have onsets"), variation cannot be accounted for within the OT framework. As discussed in section 3.3, a number of solutions to this problem have been proposed. For example, Kiparsky (1993) proposed a *multiple grammars* solution, the notion being that individuals are in possession of more than one grammar, and at the time of candidate selection, one or another grammar is drawn on to evaluate output candidates. Reynolds (1994) proposed a *floating constraints* account in which some constraints do not have a fixed ranking in the hierarchy, continually shifting position instead with respect to other constraints and thus giving rise to variation in the optimal output. Similarly, Anttila (1997) suggested that certain conflicting constraints within a hierarchy may be in a relation of non-dominance (i.e., not crucially ranked with respect to one another), in which case more than one output candidate may be harmonious with the grammar. Finally, variability has been accounted for via a stochastic version of OT (Boersma & Hayes, 2001). SOT proposes a continuous ranking scale, with constraints being assigned ranking values that represent not individual points on the scale but a range of points, such that the ranges of two constraints may overlap. At candidate selection time, any point within a constraint's range may be selected as its value, with the result that, when two constraints overlap, at times one and at times the other will dominate; as a consequence, the single grammar may select different candidates as optimal at different times. Of the different explanations, SOT has the advantage of being able to account for any degree of frequency effect in variation – the degree to which two constraints overlap determines how frequently one or the other is dominant.

Such an explanation, however, is not strictly required to account for the variability of h-deletion and h-epenthesis, since variation is inherent to the output generalization on which output-output correspondence depends: "[h] *may* appear in word-initial position." Learners do not posit that all vowel-initial words in fact require an *h*. They are aware that words may or may not start with *h* and hence epenthesize *h* only variably, doing so generally with greater frequency in stressed syllables, with a preceding vowel or pause, and with other *h*'s in proximity.

On the other hand, the fact that learners epenthesize more frequently in more formal speech, as well as to differing degrees at different levels of proficiency, could in the future be analyzed using a stochastic version of OT. For example, h-epenthesis is found in both the formal and the informal data, which suggests that MAX-OO-[h] is ranking sufficiently highly in both grammars to have an effect, but rates of epenthesis are nonetheless higher in the formal data. Consequently, MAX-OO-[h] may overlap with DEP-IO in the informal grammar (or at least overlap to a greater degree than in the formal grammar). The SOT analysis is being assigned, however, to the commodious category of future research.

A final question that needs to be addressed is: Why are the h-retention rates higher than the h-epenthesis rates? If *h* is absent from input and h-production is entirely due to output-output correspondence, hypothetically the rates should be equal, yet all of the participants had a considerably higher percentage of h-retention than h-epenthesis in the formal tasks (and presumably the same divergence holds for the informal data, although the rates were not calculated). Clearly, something is at work that allows francophone ESL learners to produce *h* more often in appropriate than in inappropriate

contexts. The output generalization stating that [h] may appear word-initially cannot on its own generate a higher rate of accurate than inaccurate h-production. Nonetheless, learners do not simply slot *h* into word-initial position blindly; more often than not they do so accurately, so something must be cuing their production. The only plausible explanation for this situation is the one discussed in section 1.2: while input forms may lack a proper phonemic representation of *h*, some kind of murkily specified (or even possibly orthographic) representation may be present. Such a representation would be inadequate to ensure consistently native-like h-production. Nonetheless, it could provide some guidance for when *h* should or should not be posited in the NS output form which output-output correspondence attempts to access as a base for learner output. Murky specification can explain, therefore, why there is a greater number of accurate hits than epenthetic misses in francophone h-production.

The fact that *h* in proximity was found to influence the rate of h-epenthesis provides a further argument in favour of some form of IL representation for *h*. An *h* was coded to be in proximity of a vowel-initial word every time an underlying *h* would normally be present in NS representations for the words preceding the vowel-initial word. If learners' representations lack *h* entirely, there is no reason for *h* in proximity to affect the frequency of h-epenthesis. On the other hand, if learners' representations are murkily specified for *h*, *h* in proximity could conceivably increase the probability of an *h* being posited at the beginning of a vowel-initial word and thus affect the rate of h-epenthesis.

The notion that certain non-native phonemes may be murkily specified in IL input is a novel concept that needs to be explored further in the future. Usually, phonologists assume that phonemic representations are fully present or fully absent from input, but

over the course of the acquisition of L2 phonemes not occurring in the L1 inventory, it seems plausible to posit an intermediate stage for IL phonemic representation. Essentially, the idea is that, at the initial stage, francophone learners simply ignore *h*, filtering it out as linguistically irrelevant and impossible to phonologize, whereas at the final stage, learners will have acquired native-like phonemic representations for *h*. In between these stages, learners may go through a (possibly protracted) period where they say: "I don't know what it is, and I can't always manage to reproduce it, but I know there's *something* there." The sense of some elusive thing, something that is hard to define, being nonetheless there could result in the murky specification of a segment such as *h*.

Chapter 6. Conclusion: Implications and Applications

All that remains to be considered now are some of the classroom implications and applications of the results of the study detailed in the previous two chapters. First, the findings have implications both for teachers' judgments of learner progress and for their attitudes towards learners' epenthetic "errors." Because of the finding that rates of h-epenthesis rise and then fall as a function of increased proficiency, teachers need to recognize the paradox that, up to a certain stage, an increase in epenthetic errors is actually an indication of progress on the part of a learner. Furthermore, h-epenthesis is systematic: it is based on a generalization that learners' construct concerning the distribution of *h* in NS output. Until learners are able to construct a phonemic representation of *h*, such a generalization is necessary, and h-epenthesis is a predictable and inevitable stage in phonological acquisition. Importantly, also, h-epenthesis is not the result of carelessness or lack of effort. Quite the contrary is true: h-epenthesis stems from concern for pronunciation accuracy and from a concerted effort on the part of francophone ESL learners to reproduce a difficult and elusive feature of NS speech. If evaluation is based on effort rather than accuracy of performance, learners who produce high rates of h-epenthesis should perhaps not be rewarded, but they should certainly not be penalized.

In terms of ESL applications, classroom activities for *h* can generally be divided into those that target either the perception or the production of *h*. Perception activities are needed to develop learners' ability to detect *h* in the speech signal and eventually to construct a phonemic category for this non-native segment. More specifically, perception activities should heighten awareness of the contrast between words that begin with *h* and

those that begin with a vowel (e.g., minimal pairs such as *heat/eat* and *hair/air*). Perception activities should also develop a feeling for the distribution of *h* in English: for when *h* is obligatorily pronounced or suppressed, and for when *h* is optional. In terms of production, learners need to develop a clear sense of how to articulate *h* and particularly to identify the place of articulation of *h* (in the throat or *glottis*). Finally, learners need practice in both spontaneous and more controlled formal speech, especially in activities that target the problematic contexts that trigger greater frequency of h-epenthesis: stressed syllables, with a preceding vowel or pause, and with other *h*'s in proximity. The following two sections give examples of the kind of perception- and production-based classroom activities that could be developed.

6.1 Perception activities

6.1.1 Bingo game

A bingo game using vowel- and h-initial words (particularly minimal pairs) is an excellent means of developing learners' sound awareness. Students are given a list of words that they then have to write into the blank squares of a bingo card as shown below in Figure 13.

Figure 13 – Bingo Card with Vowel- and H-Initial Words

B	I	N	G	O
egg	howl	hat	owl	ear
at	hair	ace	hip	hate
I	eat		ate	hi
heel	up	air	heat	harm
hear	hold	arm	old	eel

In order to correctly tick off the items on their bingo cards as the teacher reads them out, learners need to discriminate between words with or without an initial *h*. Furthermore, this activity could later be reused as a production activity, with learners working in small groups with their own bingo game – so as to provide equal opportunity for production practice, learners could take turns reading out the word selected from the bingo tumbler.

6.1.2 ReadPlease listening discrimination

Listening discrimination activities for learners to do at home can easily be devised using the text-to-speech program ReadPlease (a free, downloadable software tool). Word lists or longer passages of text can be fed into ReadPlease, which then renders the text as speech. For instance, learners can enter the series of words *house, hour, inhibit* and *inhibition* into the program and try to determine whether the orthographic *h* is pronounced or not. The speech produced by ReadPlease is synthetic and somewhat stilted, lacking in native-like prosodic features, but the program is nonetheless useful for

listening activities that target individual segments such as *h*. Moreover, such activities can be performed outside the classroom when a teacher or native speaker is not readily available to demonstrate how to pronounce a word.

6.1.3 Listening comprehension

Next, learners can listen to stories and answer comprehension questions that require them to correctly discriminate whether there is an *h* at the beginning of a word or not. For example, the teacher could read the following story:

> *Peter works all day and usually arrives home at 7:00. Today, his roommate prepared eel for dinner. Peter hates eel, so he heats some canned soup around 8 o'clock. He eats the soup while watching tv.*

Next, learners are asked to answer the following questions:

1. *Peter hates the eel, but he eats it.* True ___ False ___
2. *Peter eats the soup around 8 o'clock.* True ___ False ___
3. *Peter eats the soup while watching tv.* True ___ False ___

In the example given, learners who do not perceive the *h* in the words *hates* and *heats* may of course be able to comprehend the text by logical inference. Still, perception of the *h* disambiguates the passage entirely, so this kind of exercise should help sensitize learners to the potential importance of *h* for both perceiving and conveying meaning clearly.

6.2 Production activities

6.2.1 Articulation practice

Francophones are capable of producing *h*, but they are not accustomed to treating the sound as phonemically significant. For example, francophones sometimes produce *h* phatically when laughing; also, as mentioned before in section 1.2, *h* is produced in some regions of Quebec as a phonetic variant of /ʃ/ and /ʒ/, notably in the town of Joliette (which locals refer to as [hɔliɛt]). Production problems are related, therefore, to francophones' inability to phonologize *h* and particularly to assign it a place of articulation in a mental representation. Consequently, teachers should refer explicitly to the articulation of *h*, pointing out that it is similar to other voiceless fricatives such as /f/ and /ʃ/ that francophones readily produce in onset position, except that *h* has a glottal rather than an oral place of articulation (i.e., it is produced in the throat rather than the mouth). Moreover, when *h* is produced, the oral articulators (in the mouth) are already in place to pronounce the ensuing vowel sound, a process referred to as vowel co-articulation. A laughing activity in which learners alternate between *hee, hee, hee* and *ha, ha, ha* can help them situate the place of articulation of *h* and observe its co-articulation with the following vowel.

Another activity (the *flying tissue* exercise) can help learners distinguish between when they are producing a word-initial *h* or a word-initial vowel. Learners hold a tissue in front of their mouths and produce minimal pairs such as *harm/arm* or *hold/old*. If the pair is pronounced correctly, the tissue visibly flutters for the production of *h* but not the vowel. The flying tissue can, therefore, provide concrete evidence for when an *h* is deleted or epenthesized.

6.2.2 Formal reading-aloud activities

Controlled reading-aloud practice is easily incorporated into a board game such as the following *Hit the highway!* game. In *Hit the highway!*, in order to advance the number of spaces rolled on a die, a player is required to read aloud a tongue twister with alternating vowel- and h-initial words, including for example:

- Are his ears ugly?
- How ugly are her ears?
- Heather had an old oak table in her office.
- He ate ham and eggs for breakfast.

Depending on whether the player does or does not manage to avoid deleting or epenthesizing an *h*, the other players tell him or her either to *Hit the highway!* or to *Hold your horses!* As with those provided above, the tongue twisters can be designed to target the factors that have been shown to elicit higher rates of h-epenthesis, that is, stressed syllables, with a preceding vowel or pause, and with other *h*'s in proximity. The degree of difficulty of the tongue twisters can thus be controlled by manipulating these factors and adjusted to the level of the learners.

In another activity (mentioned in Celce-Murcia, Brinton & Goodwin, 1996), learners could compose a story incorporating minimal pairs of vowel- and h-initial words. Learners could either read their story aloud or retell it more spontaneously, with other learners listening and providing feedback on their pronunciation.

6.2.3 Spontaneous speech activities

Info-gap activities can readily be developed to target the production of vowel-initial prepositions as well as items that begin either with an *h* or a vowel. For example, two learners are each given one of the illustrations shown below in Figure 14 and have to find out what objects appear in the other learner's illustration and where the objects are situated.

Figure 14 – Info-Gap Cards

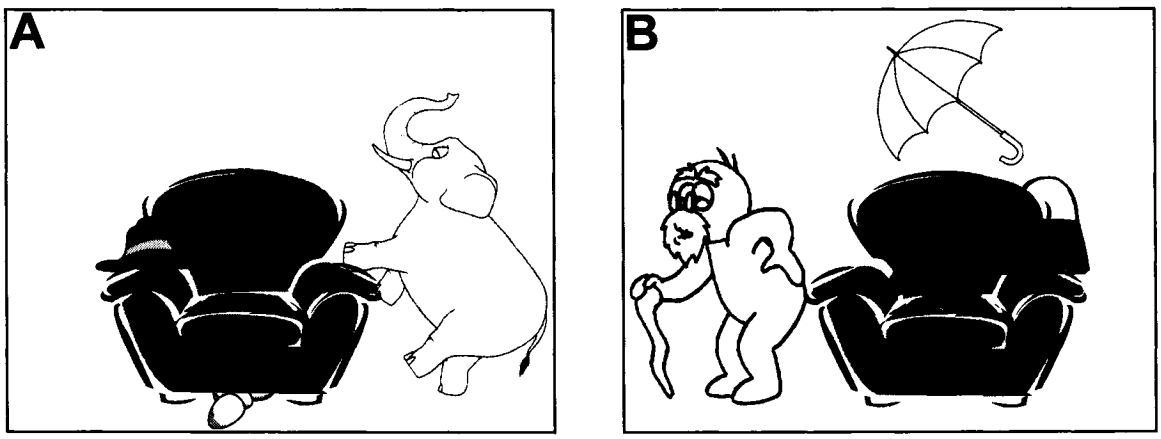


Illustration A contains *an armchair*, *a hat*, *some eggs* and *an elephant*; illustration B contains *an old man*, *an armchair*, *an apple*, *an umbrella*, and *a handbag*. In order to explain where each of these items is located, the learners would have to use a number of vowel-initial prepositions. For example, the learner with illustration A would state that the hat is *on the armchair* and the eggs are *under the armchair*. The many vowel-initial words required to complete the activity (particularly those which start with a stressed syllable and are preceded by a vowel or pause), along with the alternation of vowel-initial with h-initial

words, makes this kind of activity a potential minefield of h-epenthesis for francophone learners.

6.3 Concluding remarks

In conclusion, I would like examine a portion of a transcript from one of the informal interviews, where the participant refers explicitly to her own difficulties with h-epenthesis, without knowing of course that this process was the subject of the research study itself:

> Participant: .... *so I was at that point frustrated that I went to McGill to have an English course at university. [h]I went there for a year.*
>
> Interviewer: *When you were studying English, did you enjoy studying it?*
>
> Participant: *Yeah, yeah, I liked to learn, yes, but sometimes English people are really rush to make you understand that, hey French people, you're putting an h before all words. There is no h, or you don't when there is one, and even the singers are doing the same mistake, you know, so that, I'm taking care of....*
>
> Interviewer: *So for you it's important to try and speak correctly?*
>
> Participant: *Yes, I don't want to hurt people when I'm speaking, you know.... I don't want to "incommode" people like, you know, some, some kind of accents sometimes. Can you make a little effort? You know, what it is to put an h before words or, you know? .... I guess, for me, if you learn, learn properly. You know, make that little effort. So that _elp me a lot, let me tell you, when someone is saying, what are you saying? It's not the way to talk.... You know, maybe I'm a "vanish" person, and uh,*

for me, one time I heard that and I tried to correct that right away, you know. But I know that I'm still doing the same mistakes sometimes, but I'm trying at least....

As indicated in the transcript, the participant variably pronounces, deletes and epenthesizes *h*, and she does so without apparent consciousness, which is consistent with the theory that *h* is hard for francophones to perceive and represent phonemically. Consequently, *h* is probably absent or only murkily specified in her underlying representations of words. The participant expresses considerable concern about her h-production, stressing the importance of making an effort to produce *h* accurately. The concern she expresses about her h-production indicates that *h* is a prestige variable, the deletion (or epenthesis) of which is stigmatized in francophone IL output. In making an effort to "take care of" the deficiency in her underlying forms, according to the account adopted in this thesis, the participant tries to access NS output forms as a base for her own output (a form of imitative behaviour, in fact). In this participant's IL, in other words, the correspondence constraint MAX-OO-[h] ("An output [h] in NS English has an output correspondent in francophone IL output") is high ranking. Due to her difficulty in perceiving and processing *h* phonologically, however, her notion of where *h* appears in NS output is relatively limited. This limited familiarity hampers her efforts to reproduce NS output *h* accurately. Instead of accessing NS output forms directly, then, she draws on an *output generalization*, expressed as: "[h] may appear in word-initial position, particularly in stressed syllables, when no other consonant already occupies the onset." Because the generalization is overly permissive, it generates hypercorrect forms in the participant's

output, and she cannot avoid making "the same mistakes sometimes" such as "put[ting] an *h* before words."[44]

The fact that the faithfulness constraint MAX-OO-[h] is responsible for h-epenthesis rather than a markedness constraint such as ONSET explains why, in the data of the study that forms the base for this thesis, the process applies more frequently in more formal speech. Cross-linguistically, faithfulness constraints are more highly ranked in more formal contexts. The content of the output generalization explains why the domain of h-epenthesis is word-initial position (i.e., why no instances of word-internal h-epenthesis were observed in the data): because the generalization posits *h* to occur only word-initially in NS output. The output generalization also explains why greater h-epenthesis is triggered in stressed syllables, as well as in words with a preceding vowel or pause than a consonant. *H* in proximity, which also triggers a higher rate of h-epenthesis, influences the learner's judgment, increasing the likelihood that the learner will posit an *h* in NS output for ensuing vowel-initial words. These *h*'s in proximity are underlying in NS representations but are not necessarily present in the participants' speech; the fact that these *h*'s nonetheless have an effect on h-epenthesis suggests that learners may have some form of murkily specified underlying representation for words containing *h*. The fact that the rates of h-retention were higher than those for h-epenthesis in the data also supports the murky specification hypothesis.

On a final note, I would like to address the issue of whether h-deletion and h-epenthesis should be targeted in the classroom. On the one hand, the fact that learners can communicate perfectly well in English without *h* might suggest that *h* should be a low

[44] Note that the participant refers only to inserting *h* unnecessarily *before* words and not *within* words. This reflects the content of the output generalization and confirms that it has been correctly formulated here.

priority in the classroom. On the other, the same can be said of all sorts of aspects of English that receive considerable attention in ESL classes, including verb tenses, articles and prepositions. For example, a NS listener's response to the learner sentence "Tomorrow I take train Ottawa" is likely to be "Oh, you're taking the train to Ottawa tomorrow," thus showing that the meaning is never in doubt, just the well-formedness. I would argue then that h-deletion and epenthesis should also be given some attention in the classroom for reasons of well-formedness. H-deletion and epenthesis (and other aspects of learner speech) should perhaps not be stigmatized, but they are at least to a degree, so it makes sense that teachers should help learners progress with their h-production. H-epenthesis results from learners' attempts to counter the tendency to delete *h*, so learners who epenthesize *h* are clearly already concerned about their h-production. It makes sense then that teachers should help learners to succeed in their endeavour. The findings of the study reported on in this thesis, along with the analysis of these results, can give teachers some guidance on how to proceed.

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Appendix A – Call for Participants

Projet de recherche sur l'anglais langue seconde tel qu'il est parlé par les francophones

Bonjour/Hello! Aimeriez-vous participer à une étude à l'Université Concordia sur l'acquisition des sons anglais par des francophones? Nous cherchons des francophones adultes (20 ans et plus), particulièrement du niveau débutant à intermédiaire, qui accepteraient d'être enregistrés lors d'une brève entrevue informelle en anglais et de la lecture à haute voix d'une liste de mots et d'une série de phrases. Le processus au complet durera au maximum une heure.

Si vous êtes intéressé à participer ou si vous désirez d'abord plus de renseignements, veuillez communiquez avec Paul John (tél. : (514) 289-9563; courriel : p_gjohn@yahoo.com).

Merci beaucoup! Thank you!

Research project on English as a second language as spoken by francophones

Bonjour/Hello! Would you like to participate in a study at Concordia University on the acquisition of the sounds of English by francophones? We are looking for francophone adults (age 20 up), particularly in the beginner to intermediate range, who are willing to be recorded during a brief informal interview and while reading a list of words and a series of sentences. The entire process should take at most one hour.

If you are interested in participating or if you would first like more information, please contact Paul John (tel.: (514) 289-9563; email: p_gjohn@yahoo.com).

Merci beaucoup! Thank you!

Appendix B – Data Collection Procedures

Informal Interview (Sample Questions)

Personal information

- Tell me a little bit about yourself.

- What is your name?

- Where were you born? When were you born? (How old are you?)

- When did you move to Montreal? Why did you move here?
- Have you lived anywhere else for a long period of time? Why did you go there?
- Where do you prefer to live? Why?
- What do you like/dislike about Montreal?

- Do you work? Are you looking for work? (What kind of work do you do? OR What are you studying?)
- Do you enjoy your work? Why did you choose your profession? OR Why did you choose to study what you are studying?
- What do you do exactly in your job? (Can you describe a typical working day for me?)

- Do you have any brothers or sisters? Tell me little bit about them. (How old are they? Where do they live? Do they work/study?)

- Can you tell me a little bit about your parents? (Where are they from? Do/did they work? Are they similar to you or different? In what ways?)

Leisure activities – Likes/dislikes

- What do you like to do in your free time? Do you have any special interests or hobbies?

- Do you enjoy listening to music or watching films or playing sports or reading or surfing the internet or clothes shopping? What is your favourite film/tv program/book/cd?

- What do you enjoy doing with your friends or with your husband/wife/children?

- What do you usually do on the weekend? What did you do last weekend? What are you going to do next weekend? Do you have any plans?

- What is your favourite food? (Do you like sweet things? Spicy food? Chinese food? Indian food? Italian? Seafood/meat?)

- What do you think your life will be like in ten years time?
- Will you be married with children? (How many children do you want to have?)
- Will you be working/retired? (What will your job be?)
- Will you be living in another place, another city or country?

- Is there another country you would like to live in or visit? (Why do you want to go there?)

- Of all the places you have visited, which place do you like the most?

- Is there a person you really admire? (It can be a famous person or not. Is there someone you would really like to meet?)

- Is there anything else you would like to tell me about yourself? Something I haven't asked about?

- Do you have any questions for me? Is there anything you would like to know about myself?

English instruction/exposure and attitude

- Where did you learn English?
- How many years did you study English? (How many hours a week?)

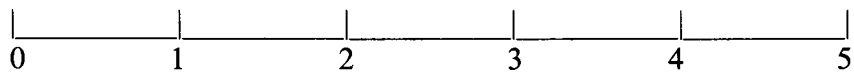
- Did you enjoy learning English?
- Did you want to learn it?
- Was it important for you to speak English well, to sound like a native speaker?
- Is it important for you to have a good accent when you speak English? Is it important at work or with friends?

- Do you ever speak English now, with friends or at work?
- How often or how much do you speak English?
- Have you used your English in the past, with friends or at work or while travelling?

- Do you ever listen to English TV or radio?
- Do you watch films in English?
- Have you listened to English TV, radio or films in the past?

Evaluation of proficiency

Can you tell me how well you think you can speak English? How good is your spoken English? I would like you to rate your ability on a scale of 0 to 5. 0 means that you can barely speak English at all, and 5 means that you speak English almost as well as a native speaker. Place an X to indicate your evaluation of your ability. You can place the X either on a number or halfway between two numbers to indicate 1.5, 2.5, 3.5, etc.



Word List

Down	January	My elbow
Closed	In April	A finger
To be	October	Your ankle
Open	Deviate	The ear
Under	Drinking	Reaction
Have	Eating	Their exam
Out	Accurate	An idiot
In	Coincidence	The air
Up	Understand	Oil
Over	Important	Unhappy
We	Happier	Our diagram
Us	Enormous	Noisiest
Our	Success	The eightball
Is	Anything	Halloween
Are	Miami	At Easter
Ate	New Haven	Authority
Iceberg	Old Orchard	To examine
Cheap	Ohio	Cooperate
Expensive	Embarrassing	Her attitude
Easy	Kitchen	His argument
Difficult	Accent	Other
Help	Easiest	Information
Ignore	An oyster	Eventually

Phrases

Virtual reality	Now or never	An important decision
A cup of tea	Embarrassing event	A heated apartment
Ham and eggs	Free as a bird	The old house
Once again	Under the table	The ace of spades
Who else?	Huge eyes	An Indian elephant
A violent riot	My left arm	Have an oyster
Fall over	His Adam's apple	Hot apple pie
Eighty years old	Change the oil	A large lion
Go to Africa	Her orange juice	Think about it
Stay in Asia	True or false	Law and order
My old age	Each other	A bad headache
Throw out	An angry citizen	Including tax
Create a problem	Life insurance	Heaven and earth
Carnival in Rio	An ugly actor	A chaotic situation
The author of the book	Try to understand	Neon lights
Ask a question	A heavy armchair	Important news
On the diagram	A chain reaction	A happy ending
Ask for help	Until nine thirty	An innocent man
An expensive meal	Her glass of iced tea	Out for lunch
Hotel accommodation	Almost eleven o'clock	Hate our jobs
Go outside	The month of August	Over dinner
A bad idea		A hard experience

Sentences

1. David couldn't remember the phone number.
2. It was an emergency.
3. I don't agree with you.
4. Arthur broke his arm.
5. I hurt my ankle.
6. She has a toothache.
7. It was impossible to include everyone.
8. Are his ears ugly?
9. He understands her accent.
10. Why is the lion angry?
11. I have no energy.
12. It was an unfortunate coincidence.
13. They expect a lot.
14. Often, he had eggs and bacon for breakfast.
15. We opened the letter.
16. The film has a happy ending.
17. It was an unfortunate coincidence.
18. They earned only eighteen dollars yesterday.
19. I am the luckiest man/woman alive.
20. The main idea of the book is difficult to identify.
21. The author was applauded after her speech.
22. We understand how to react to it.

23. Eventually, a doctor examined our sick daughter.

24. If I am not there when you arrive, wait for me in the front office.

25. Actually, I am not a complete idiot.

26. How is it possible that you forgot to wake up Brian?

27. If we are innocent, they will free us.

28. If we are guilty, they will hold us in prison forever.

29. Heather had an old oak table in her office.

30. She encouraged him to cooperate with the police.

31. In Times Square, there are a lot of neon lights.

32. The artist was happier about his new creations.

33. After our car accident, we avoided driving on the highway.

Appendix C

Table of Vowel-Initial Syllable Contexts

Factor Groups		One- and Two-Word List	Phrases	Sentences
Position in foot	Trochaic Head	36	46	28
	Superfoot Head	10	10	7
	Non-head	5	35	31
Position in word	Word-initial	41	83	57
	Word-internal	10	9	9
Stress status	Stressed syllable	36	46	27
	Unstressed syllable	15	45	39
Preceding environment	Vowel	15	26	30
	Consonant	5	39	27
	Pause	31	26	9
Word category	Content word	43	55	37
	Function word	8	36	29
Proximity	Preceding /h/ in same intonation group	Not applicable	9	21
	No preceding /h/ in intonation group	Not applicable	82	45

Table of Quality of Initial Vowels in Onsetless Syllables

	One- and Two-Word List	Phrases	Sentences
Front	24	35	27
Central	15	36	24
Back	8	16	8
High	12	12	15
Mid	24	55	29
Low	11	20	15
Diphthongs	2	4	7