Francophone ESL Learners' Difficulties with English /h/

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1. Introduction

English /h/ is highly problematic for francophone ESL learners, with two processes being observed in their interlanguage (IL): h-deletion (e.g., *I 'urt my ankle*) and h-epenthesis (e.g., *I hurt my* [h]*ankle*). H-deletion is quite frequent in francophone speech, especially in the early stages of acquisition (where it may even be categorical). Since h-deletion also occurs in English loanwords to French (Paradis & LaCharité, 2001), such as *'old-up, 'ot-dog* and *'igh-end*, it is best characterized as a process transferred from the L1. Eventually, francophones generally start to produce [h], but even at higher proficiency levels, h-production remains variable. Interestingly, once learners develop the ability to produce the elusive phoneme, they also start to produce instances of h-epenthesis, involving the insertion of [h] at the beginning of vowel-initial words. The processes of h-deletion and h-epenthesis do not represent discrete stages in L2 phonological development, since they can sometimes be observed side-by-side in learner speech (e.g., *I 'urt my* [h]*ankle*). Nonetheless, h-epenthesis in some sense follows h-deletion in the course of L2 acquisition and is best characterized as a developmental process. This process of epenthesis of a non-underlying phoneme in the IL of francophone ESL learners is the object of the research study presented here.

The process of h-epenthesis is variable. Under the assumption that linguistic variation is systematic, the primary aim of our study is to identify the linguistic and extralinguistic factors that trigger a higher frequency of h-epenthesis, in other words, that condition the process probabilistically. The second aim is to provide a principled account of the process within the framework of Optimality Theory (Prince & Smolensky, 1993).

One assumption underpinning the study is that IL is not simply a deficient, error-riddled or random version of the target language, 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 are termed developmental. To represent this systematic dynamism, Major (2001) has proposed the Ontogeny Phylogeny Model (OPM) of language acquisition and change. 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 (see Figure 1). In francophone IL, according to the OPM, h-epenthesis rates should initially rise to a summit of frequency and subsequently decline as a function of increased proficiency.

Developmental features such as h-epenthesis often involve unmarked features reflecting language universals. In Optimality Theory (OT), the occurrence of developmental features in IL can be considered a case of 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 markedness constraints that surface in the process of acquisition (see, for example, Broselow, Chen, & Wang, 1998; Cardoso, 2007, to appear). With this view in mind, our 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 visible in either the L1 or the L2, emerge in the process of constraint re-ranking? The ONSET constraint ("Syllables have onsets") would seem to be an obvious and promising candidate. ONSET is responsible for the universal preference for syllables to start with a consonant, as well as for numerous cross-linguistic phonological processes that insert a consonant at the beginning of a vowel-initial syllable.
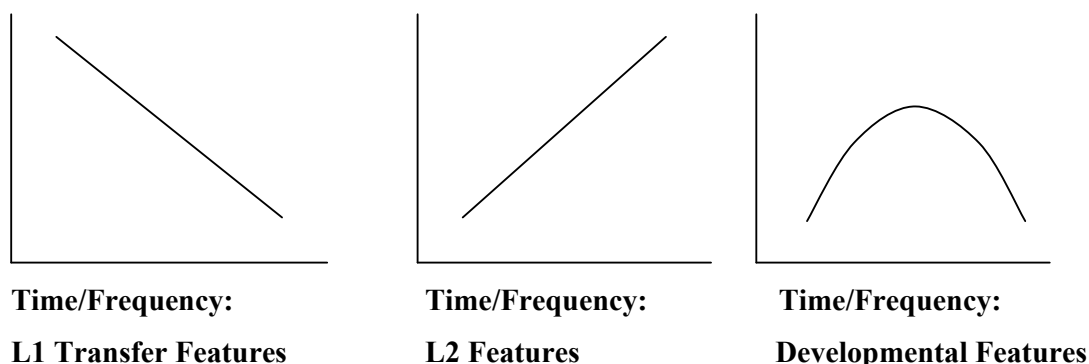

Time/Frequency:	Time/Frequency:	Time/Frequency:
L1 Transfer Features	**L2 Features**	**Developmental Features**

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

In the end, however, the results of our study do not support the hypothesis that h-epenthesis in francophone IL is due to a high-ranking markedness constraint, whether ONSET or any other constraint. Crucially, we found greater frequency of h-epenthesis in the more formal speech of our participants. Since cross-linguistically, the higher the level of formality, the greater the faithfulness of output (surface forms) to input (underlying forms) (van Oostendorp, 1997), we conclude that h-epenthesis should paradoxically result from a high-ranking faithfulness constraint. The situation is paradoxical given that by definition an epenthetic segment is one which is absent from the underlying representation; hence, by epenthesizing a segment, one is automatically unfaithful to the phonological input. We resolve this contradiction by proposing the presence in francophone IL of an output-output faithfulness constraint: MAX-OO-[h] ("An output [h] in native-speaker (NS) English has an output correspondent in IL output"). This output-output constraint emerges in francophones' IL grammar when they realize that their output, with its many instances of h-deletion, diverges from that of native speakers. H-deletion, a particularly salient feature of francophone speech, is generally stigmatized, and as a result, francophones devote considerable effort to overcoming the problem.

Despite these efforts, h-deletion proves to be an enduring problem for francophones. We propose that h-deletion is so resistant to correction because francophones have difficulty developing a phonemic representation for /h/. Until they acquire the phoneme category, they cannot include a representation for /h/ in the lexical entries of h-ful words. H-deletion would, in other words, be due to an absence of /h/ in francophones' underlying representations of English words. Francophones' input, therefore, cannot be relied upon to generate [h] in output. In order to introduce [h] into their speech, francophones make an effort to emulate NS English (i.e., they re-rank MAX-OO-[h] in the grammar). The attempt to imitate sometimes misfires due to the learners' having an imprecise representation of NS output. The result is occasional epenthesis of [h] at the beginning of vowel-initial words. H-epenthesis is more frequent in formal speech since the output-output correspondence constraint (as with other faithfulness constraints) is ranked more highly here than in informal speech.

A few observations on francophones' perception of English /h/ are in order to support our claim that learners fail to encode this non-native phoneme in underlying representations. In SLA, when learners encounter a non-native phoneme such as /h/, there is an overwhelming

tendency for the L2 phoneme to be assimilated to a native category. 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 strategy for L2 learners to apply to a novel phoneme. Paradis and LaCharité (2001) attribute h-deletion in loanwords 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). Moreover, Brown (1997, 1998) argues that 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 its distinguishing features are also operative in the L1. Without access to the Pharyngeal node in their L1, francophones would have great difficulty developing a phoneme category for /h/. At the beginning stages of ESL acquisition, therefore, francophone learners are probably impervious to [h] in the auditory signal, filtering it out as linguistically irrelevant noise, and simply leaving it out of the lexicon such that *hear* and *ear* are both stored as /ir/. 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 representations of words.

The rest of the article is organized as follows. Section 1 presents the findings of the only previous study of h-epenthesis (Janda & Auger, 1992), which interprets the phenomenon as a form of qualitative hypercorrection. Section 2 presents the hypotheses of our own study, along with the methodology used to test these hypotheses, followed by our results. In Section 3, in light of these results, we discuss in greater detail why h-epenthesis should be attributed to the presence in francophone IL grammar of an output-output correspondence constraint (MAX-OO-[h]), rather than to a markedness constraint such as ONSET.

2. H-epenthesis and hypercorrection (Janda & Auger, 1992)

In the only previous study of h-epenthesis by francophone ESL learners, Janda and Auger (1992) argue for a distinction between two forms of hypercorrection, namely *quantitative* and *qualitative*, with h-epenthesis constituting a form of qualitative hypercorrection. They also provide the results of their empirical research examining certain stylistic and linguistic variables that may condition the process of h-epenthesis.

2.1 Quantitative vs. qualitative hypercorrection

Hypercorrection involves the overproduction in one speech variety of an element that is adopted from another variety because it is highly valued according to some criterion. A well-known example concerns the rates of production of postvocalic-r in the speech of New Yorkers of different social classes (Labov, 1972). Postvocalic-r is variably deleted in the speech of all New Yorkers, but generally less so in upper-class speech. As a consequence, postvocalic-r has developed into a prestige marker associated with the distinguished speech of the educated and the upper classes. In more formal styles of speech, however, Labov found greater frequency of postvocalic-r by lower-middle-class speakers than by upper-class speakers. Such overproduction of the prestige marker in the speech of those who do not normally speak the prestige variety is a form of 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. For example, an alternation in the prestige variety between a phoneme and Ø may be lost in the non-prestige variety (such that for instance *spar/spa* are both pronounced [spa]). That is, a contrast occurring in the prestige variety is neutralized in

the non-prestige variety. Hypercorrection results when speakers attempt to emulate the prestige forms by introducing the contrast into their speech. Typically, such efforts are associated with more with formal contexts, where the standard variety is deemed more appropriate, and where speakers consequently are more inclined to imitate it and 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 (*quantitative hypercorrection*), or they produce the element in contexts where it should not appear (*qualitative hypercorrection*). A higher rate of postvocalic-r production represents the former pattern; h-epenthesis fits the second pattern, an element surfacing in inappropriate contexts.

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. 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/), but this explanation is surely inaccurate. For one thing, the degree to which h-deletion results in incomprehension or ambiguity is open to dispute, since contextual clues are generally sufficient to disambiguate h-less utterances. Moreover, if h-deletion created such confusion, 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. A more likely reason for the value accorded the phoneme /h/ by francophones is first that it is more prestigious to speak English like a native speaker, and second that it is stigmatized to delete /h/, since h-deletion is one of the most salient and least favourable features of francophones' speech.

2.2 The results of the study (Janda & Auger, 1992)

Aside from establishing the distinction between quantitative and qualitative hypercorrection, Janda and Auger's (1992) aims were: i) to determine h-epenthesis and h-deletion rates; and ii) to uncover the stylistic and linguistic variables which condition these processes. The variables examined included level of formality, 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). Six francophone participants, described as relatively advanced learners of English, performed five tasks involving different levels of formality: a casual conversation and four reading tasks of increasing formality (a connected text, individual sentences, a word list, and minimal pairs).

The deletion patterns were 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 is not surprising, given that /h/ variably deletes in function words – *he, him, his, her* and auxiliary *have* – in NS English). Overall, h-epenthesis rates were low, with h-epenthesis 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. Among the remaining five speakers, the authors identify two distinct patterns: i) Two participants showed *decreased* rates of hypercorrection as a function of increased formality; ii) three participants showed *increased* rates.[1]

Rather surprisingly, Janda and Auger expected to find a decline in h-epenthesis just as they found a decline in h-deletion with increased formality, based on the assumption that more formal speech should be more target-like. If, however, qualitative hypercorrection

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[1] Since the results are in percentages, we cannot be certain of their statistical significance. Also, the rates for the participant Albert, described as showing decreased rates of epenthesis with increased formality, do not show a clear pattern across the five tasks (from least to most formal): 0.53%, 2.77 %, 3.0 %, 0 %, 0 %.

behaves like quantitative hypercorrection (such as postvocalic-r in New York), higher rates of epenthesis should be predicted for more formal styles. Furthermore, a higher frequency of correct forms (due to a lower deletion rate) should be accompanied by a higher frequency of hypercorrect forms, since the source of the two forms is surely the same: the desire to sound like a native speaker. The effort to achieve this desired result is probably more readily furnished in formal styles, which are more conducive to self-monitoring. Hence, we would expect a higher rate of h-epenthesis in more formal speech.

Another issue that Janda and Auger examine is the extent to which h-epenthesis in a vowel-initial word results from proximity with other words containing an /h/. The view that proximity with other instances of /h/ plays a role in h-epenthesis is widely held by those familiar with francophone ESL learners, but the link has never been fully established. The pivotal issue is whether epenthesis can be attributed to an interference effect triggered by the presence of other /h/s nearby. Since some instances of h-epenthesis in Janda and Auger's data occurred without any /h/ in proximity, however, the presence of another /h/ in proximity is not a necessary precondition for h-epenthesis. Nonetheless, of course, /h/ in proximity might still influence the process probabilistically in triggering a higher rate of h-epenthesis.

It is also possible that qualitative hypercorrection arises due to lexical confusion (Knowles, 1978). Lexical confusion refers to speakers' uncertainty regarding the phonological composition of a word. For example, 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. The notion of lexical confusion, in other words, attributes hypercorrection to the inaccuracy of speakers' underlying representations. Janda and Auger argue that the fact that all their participants were 100 % target-like on the word-pairs task indicates that the participants' underlying representations must be accurate. Consequently, they argue, h-epenthesis should not be attributed to lexical confusion.

However, the conclusion drawn from the word-pairs task is not necessarily correct. The participants' performance is not irrefutable evidence of accurate underlying representations. It could equally 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 all that distinguished the words – as a consequence, orthographic indicators may have been sufficient to cue flawless performances. Lexical confusion, therefore, should not be dismissed as a potential explanation for hypercorrection. Moreover, if we accept the conclusion that /h/ is in fact present in the participants' underlying representations, h-epenthesis would then be occurring despite accurate representations for /h/. But, like h-deletion, h-epenthesis is stigmatized in the speech of francophone ESL learners, so 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/.

3. Method

3.1 Hypotheses

A central aim of our study was to identify the linguistic and extralinguistic factors that influence the probability of h-epenthesis. First, we hypothesized that rates of h-epenthesis would increase as a function of increased formality. Next, we predicted the presence of another /h/ in proximity would lead to higher rates of epenthesis. In addition, h-epenthesis was expected to be more frequent in stressed syllables and content words. This hypothesis was based on the distribution of [h] in NS speech: NSs delete word-internal /h/ in unstressed syllables (see

prohibit vs. *pro(h)ibition*, and *historic* vs. *pre(h)istoric*) and variably delete /h/ at the beginning of function words (*he, him, his, her*, and auxiliary *have*). Finally, if h-epenthesis arises as a result of the ONSET constraint, the process should be more frequent at the beginning of vowel-initial words preceded by a vowel or a pause as opposed to a consonant, since the consonant variably resyllabifies across the word boundary into the onset of the ensuing word, thus obviating the epenthetic [h]. The factors expected to trigger a higher rate of epenthesis are indicated in Table 1 by a checkmark √.

Table 1. Hypotheses regarding factors for h-epenthesis

Factor Groups	Factor 1	Factor 2	Factor 3
Stress status	√ Stressed syl.	Unstressed syl.	
Word category	√ Content word	Function word	
Environment (pre)	√ Pause	√ Vowel	Consonant
/h/ in proximity	√ /h/ in proximity	No /h/ in proximity	
Level of formality	√√ Very formal	√ Formal	Informal

√ = Predicted to correlate with higher rates of h-epenthesis

A further hypothesis, based on the OPM, is that the frequency of h-epenthesis should rise and then fall as a function of increased proficiency.

3.2 Data collection

Fifteen Quebec francophone adult ESL learners aged 27 to 52 participated in the study. The participants were not actively studying ESL at the time of data collection, but all had formally studied English to varying degrees in the past, including in primary and high school and, in some cases, in college. For the purpose of data collection, the 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 was in four parts, representing three levels of formality (very formal, formal and informal):

1) Participants were recorded reading aloud lists of words (very formal speech) and short phrases and sentences (formal speech).

2) Participants were interviewed informally, answering general questions about themselves, their leisure activities, their likes and dislikes, and so on (informal speech).

3.3 Data analysis

After transcription, all vowel-initial words in the data were coded for the dependent variable *h-epenthesis/no h-epenthesis,* along with all the factors given previously in Table 1.[2] Each participant was also coded in order to permit us to check for a correlation between individual participants, their proficiency level, and their rate of h-epenthesis. For data analysis, we used the statistical program GoldVarb (Robinson, Lawrence, & Tagliamonte, 2001): 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 variable process.

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[2] Only vowel-initial syllables at the beginning of words were coded, since we observed no instances of h-epenthesis in word-internal syllables. Hence forms such as *ri*[h]*ot, ru*[h]*in* or *re*[h]*act* are unattested.

3.4 Results

The results of the GoldVarb analysis for the various independent factors are presented below in Table 2, with the factor weights that indicate a significant influence on the frequency of h-epenthesis circled.[3] A total of 11,526 tokens of vowel-initial words were coded for the analysis.[4] Briefly, the 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[5]; the category of the word containing the vowel-initial syllable has no effect on the frequency of h-epenthesis – the factor weights for content and function words, 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 /h/ in proximity, and in more formal speech.

Table 2. Final Results of GoldVarb Analysis

Factors	Factor weights
Stressed syl.	0.744
Unstressed syl.	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

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, in accordance with the OPM. Each individual participant was, however, assigned a factor weight, permitting a subsequent analysis of the pattern of correlation between rate of h-epenthesis and proficiency level. First, it was necessary to identify an appropriate measure of 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 levels. Only h-retention in obligatory context (and in the reading-aloud tasks) was calculated, since it is

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[3] Factor weights range from 0 to 1. A factor weight in excess of 0.5 is generally considered to indicate that a factor favours application of the variable process. See Paolillo (2002) and Tagliamonte (2006) for more on GoldVarb.
[4] The results are based on the data for 14 of the 15 participants. One participant had no instances of h-epenthesis; since this participant's behaviour was categorical and GoldVarb analyzes variability, her data were not coded.
[5] The difference between the formal and very formal data was not significant, so these were conflated.

perfectly normal for native speakers to delete /h/ in function words in English. The rates are presented below in Figure 2, with each column corresponding to a participant.
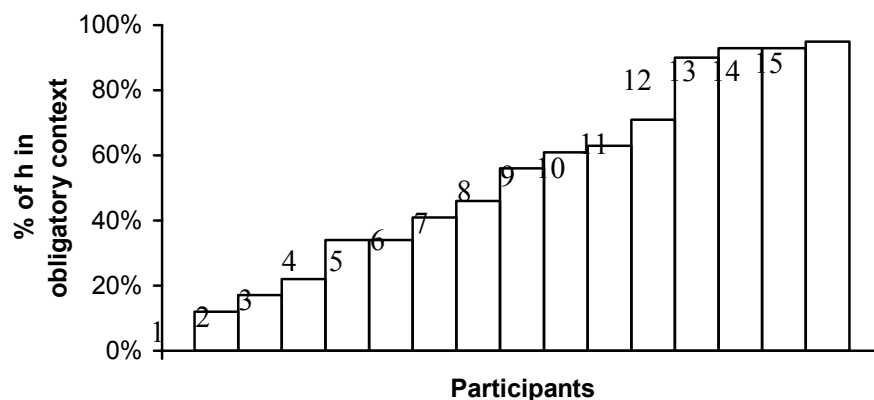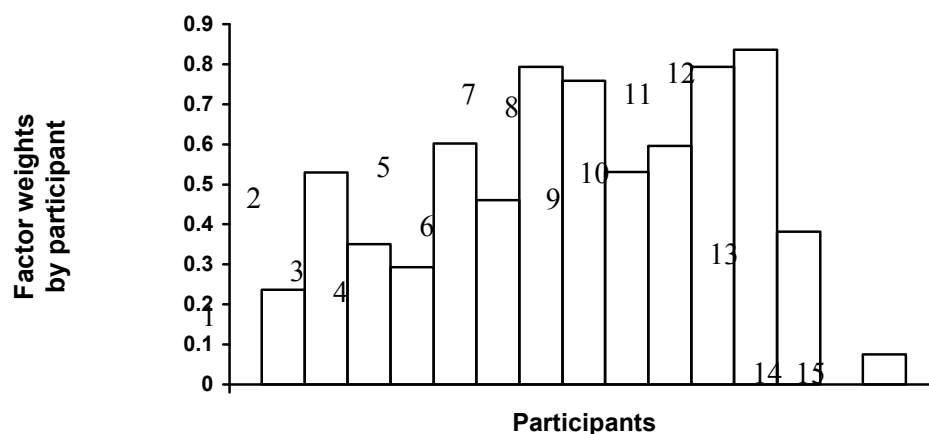

Figure 2. Proficiency of Participants

Figure 3. H-Epenthesis in Terms of Proficiency Level[6]

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 around 12 % to a high of 95 %. The participants can be said to range from high beginner (with some h-production) to very advanced (with near native-like h-retention). 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 3 above.[7] While the curve in Figure 3 is by no means perfect, there is a definite tendency for the factor weights (i.e., frequency of h-epenthesis) to rise and

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[6] Participant 14 in Figure 3 is the one who showed zero epenthesis and whose data consequently were not analyzed; she has been accorded a factor weight of zero.
[7] In terms of percentages, whereas h-retention rates ranged from 12 % to 95 %, 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.

then fall across the range of proficiency. We consider then that these data confirm that the OPM provides an essentially accurate portrait of L2 phonological development.

4. Discussion and Optimality-Theoretic analysis

Overall, the results confirmed our hypotheses; these are presented again below, with a checkmark √ next to those that were confirmed and an X beside the refuted hypothesis.

√   1. H-epenthesis is expected to be more frequent in stressed syllables.

×   2. H-epenthesis should be more frequent in content than in function words.

√   3. H-epenthesis should be more frequent in words preceded by a vowel or a pause.

√   4. H-epenthesis should be more frequent in the presence of another /h/ in proximity (i.e., within the same intonation group) preceding the vowel-initial syllable.

√   5. H-epenthesis should be more frequent in more formal styles of speech.

√   6. H-epenthesis rates 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 OPM, which posits that over the course of L2 acquisition, the rates of developmental features steadily rise, peak and then fall again.

In terms of hypothesis 1, 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).[8] The failure of hypothesis 2 to be confirmed, on the other hand, suggests that the learners do not distinguish phonologically between content and function words in their IL; this behaviour contrasts with that of NSs, who exhibit variable h-deletion in function words.

The confirmation of hypothesis 3 as well as 5 is particularly interesting, since a positive finding for 3 invites an interpretation that would normally preclude a positive finding for 5. That is, the positive finding for hypothesis 3 (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 diverse 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. This would explain the greater frequency of h-epenthesis and apparently establish its source as the ONSET constraint.

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

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, which employs the following constraint hierarchy: ONSET, MAX-IO >> DEP-IO. Hypothetically, the same ranking could account for h-epenthesis in francophone IL.[9] For example, in Tableau 1, given the input form /æpəl/ "apple", the output form with an epenthetic [h] in (a) is selected over both the form with a deleted vowel in (b) and the fully faithful form in (c). The form in (c) is rejected because it violates ONSET, which is highly ranked. The form in (b), which satisfies ONSET, is nonetheless also rejected since it violates the faithfulness constraint MAX-IO ("Every segment of the input has a correspondent in the output" – i.e., no deletion), which is ranked higher than DEP-IO ("Every segment of the output has a correspondent in the input" – i.e., no epenthesis).

Tableau 1. H-Epenthesis in Francophone IL

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

There are, however, two important objections to the ONSET-based account of h-epenthesis. First, while ONSET may explain the site of epenthesis, the identity of the epenthetic segment still needs to be accounted for. One possibility is for an epenthetic segment to derive its identity from an adjacent segment via spreading. This explanation cannot account for epenthetic [h], however, since the content of the inserted phonological material is not conditioned by the environment. Conversely, if the phonological context does not determine the phonological form, an epenthetic segment should be a default, least-marked phoneme. Glottal is arguably the least-marked place of articulation, but epenthesis of the glottal fricative [h] in onset position (as opposed to a glottal stop) is not attested in the literature (Lombardi, 2002). In sum, while ONSET might be able to account for the site of epenthesis, it cannot explain the quality of the segment selected.

The second objection, particularly problematic for 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 follows from how OT envisions speech production. In OT, output (surface) forms are generated from input (underlying representations), a process conditioned by considerations of both faithfulness and markedness: output forms are unfaithful to input only in order to satisfy a markedness constraint. Importantly, based on an analysis 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. 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.

It would appear, therefore, that a constraint other than ONSET, one belonging to the faithfulness category, is behind the process of h-epenthesis. Along the lines of the constraint proposed by Bradley (2006) to account for s-epenthesis in Dominican Spanish, we propose that the faithfulness constraint in question is an output-output correspondence constraint: MAX-OO-[h] ("An output [h] in NS English has an output correspondent in francophone IL output"). H-

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[9] 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.

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, they realize that there is a discrepancy between their own and NS output – [h] is absent from learner speech but present in NS speech; second, they realize that this discrepancy is due to the unreliability of their input forms. 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 thus to the two grammars' selecting 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 ≠ the NS grammar, or because the IL input ≠ the NS input. The second explanation is adopted here to account for h-deletion: h-deletion results from deficient IL input forms. 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, which cannot be assimilated to an L1 category. Eventually, however, learners come to realize first that something is missing from their own 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.

Consequently, learners try to base their output on NS output forms, at least until they are able to develop a proper phonemic representation for /h/. 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 accurately; instead, they access an *output generalization*. This generalization concerning /h/ can be expressed as: "[h] may occur in word-initial position, particularly in stressed syllables, when no other consonant 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 partially accurate in terms of English h-distribution. 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 it is /h/ that is the target 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 only epenthetic 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, speakers rely on their own input as a base for output, and any alterations to the input in the output form are due to high-ranking markedness constraints. 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 deduce that this results from 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 4 by the encircled arrow).
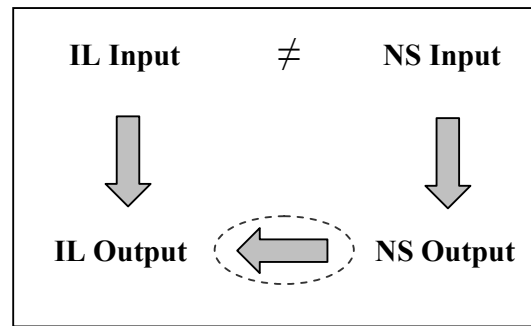
Figure 4. Generation of IL Output from NS Output

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. Hypercorrection can lead to output that is either less or more marked than the input. For example, h-epenthesis leads to output forms that are less marked in that they satisfy ONSET. Nonetheless, the lesser markedness of output is only an incidental by-product of the process of hypercorrection. Indeed, hypercorrection can just as well lead to output that is more marked than the input. For example, in the variety of Spanish spoken in the Dominican Republic, /s/ is not pronounced in coda position (Bradley, 2006). In more formal speech, however, speakers try to emulate a more conservative style of Spanish which preserves coda-s, but they sometimes overshoot the mark, producing hypercorrect coda-s. In other words, the formal grammar has a high-ranking output-output correspondence constraint (in this case MAX-OO-[s]), which generates output forms with epenthetic [s]. These forms are actually more marked than the input forms in that the output but not the input violates the markedness constraint NOCODA ("Syllables do not have codas").

All of the hypotheses have thus been accounted for, except hypothesis 4: the presence of another /h/ in proximity significantly 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 occur in word-initial position, particularly in stressed syllables, when no other consonant 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 /h/ at the beginning of a vowel-initial word at a given candidate selection time. 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 require /h/.

Hypothetically, the initial stage of francophone IL grammar 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. 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 input /æpən/ for "happen", the grammar can variably select either output [hæpən] or output [æpən], depending on whether the speaker accurately posits [h] in NS output or not. This is the scenario for variable h-deletion patterns. For learner input /æpəl/, on the other hand, [h] may be *inaccurately* posited in NS output, in which case the candidate with an epenthetic [h] is selected as optimal by the grammar, as shown in Tableau (2). 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] with an epenthetic [h], on the other hand, does not violate MAX-OO-[h] and is therefore selected.

Tableau 2. 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]	*!	*		

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 Tableau (3), candidate (b) [hæpəl] with an epenthetic [h] is rejected by the grammar, as is unfaithful candidate (c) [pəl]; instead, the selected candidate is (a) [æpəl], identical to the input form.

Tableau 3. 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 [h] in NS output when there should be one; variable epenthesis occurs because the output generalization sometimes posits [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 occupies the onset"). The likelihood of [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.

5. Concluding remarks

Epenthetic segments are by definition absent from (and hence unfaithful to) underlying forms. Consequently, within the framework of Optimality Theory, we hypothesized that h-epenthesis results from the high ranking in francophones' interlanguage of the markedness constraint ONSET, which is associated cross-linguistically with various forms of consonant epenthesis. The finding of greater frequency of h-epenthesis as a function of greater formality, however, contradicts the ONSET hypothesis given that, cross-linguistically, the more formal the speech, the higher ranked the faithfulness constraints (Oostendorp, 1997). Our proposed solution is that, in interlanguages, output is sometimes generated not from the speaker's own input, but rather from the prestige-variety native-speaker (NS) output that the learner strives to duplicate faithfully, especially in more formal contexts. When MAX-OO-[h] is promoted in the francophone IL grammar, hypercorrect h-epenthesis results because, rather than accessing NS

output forms directly, speakers formulate an inaccurate and overly permissive *output generalization*.

Francophones elevate MAX-OO-[h] in their IL grammar due to two realizations: first, that their output diverges considerably from the NS norm (h-deletion); and second, that h-deletion results from deficient input forms. Francophones, we argue, fail to produce [h] consistently in their output because of impoverished underlying representations, which lack /h/ because francophones have difficulty acquiring this phoneme category and cannot assimilate it to an L1 category. In a nutshell, then, h-epenthesis is due to a form of lexical confusion, francophones' uncertainty as to which words are supposed to contain /h/, combined with their desire to produce this prestige marker in their speech.

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