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Hiatus Resolution in Non-Rhotic English: An Optimality Theoretic Account

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ABSTRACT

Hiatus takes place when two vowels occur in adjacent syllables. Within the Optimality Theory (OT), hiatus-breaking has been a contentious and controversial topic which has been largely examined in phonology. This paper reviews, from a theoretical standpoint, hiatus resolution strategies under the lens of Optimality Theory and focuses on hiatus-breaking in non-rhotic English varieties. The theoretical evaluation of /r/, glides and glottal stops as potential epenthetic consonants reveals that the optimal candidate to resolve hiatus in non-rhotic English is /r/, such as /r/ intrusion or linking /r/ due to phonetic properties and sonority. Hence, the pronunciation of *law is* as [lɔːrɪz] is not to be considered as a 'mistake', as the insertion of /r/ can be phonologically explained.

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KEYWORDS: phonology; hiatus resolution; non-rhotic English; language variation; Optimality Theory.

1. Introduction

Students who acquire English as a foreign language learn to read differently from children in English-dominant societies (Hou & Wang, 2017). Indeed, English language reading is challenging for EFL students, as the English writing alphabetic system does not represent the phonological structure of the language, hence phonological decoding skills are required. However, in some EFL contexts, learners are not often exposed to oral English (Gunderson, 2014), owing to an emphasis on language instruction which remains firmly on grammar (Milton, 2009). Linking graphemes – the smallest functional unit of a writing system (e.g. <t> in *what*) – to phones – the actual pronunciation of a specific sound (e.g. /t/ realised as a glottal stop in *what*) - is found to be effective on early literary skills among young students in western societies (Hou & Wang, 2017). Shen (2003) suggests that phonemic awareness, along with alphabetic principles, should be explicitly taught by teachers in schools. The present paper draws the attention on some phonological features which are not etymologically present, but occur at a phonological level, and thus might generate confusion amongst EFL learners. Before describing the phonological processes involved in hiatus-breaking, I shall firstly provide a brief overview of hiatus.

2. Description of hiatus

Hiatus-breaking has been extensively studied by a wide number of phonologists and has been a debatable and controversial issue within the Optimality Theory (OT). Hiatus takes place when two vowels occur in adjacent syllables (McCarthy, 1993), and one of the most common strategies to resolve hiatus is the insertion of an epenthetic consonant. In the standard accent of British English (i.e. Received Pronunciation - RP) hiatus can be prevented with the use of linking /ɹ/, e.g. *far away* à /fɑɹ əˈweɪ/, intrusive /ɹ/, e.g. *law and order* à [lɔɹənd] (Uffman, 2007), the insertion of a palatal glide, e.g. *seeing* à [sijiŋ] (McCarthy, 1993), and with the indefinite article *an*, e.g. *an oak* vs. *a tree*. It is argued that linking /ɹ/ and intrusive /ɹ/ are the favoured hiatus resolution strategies (Wells, 1982; McCarthy, 1993), however, besides these phenomena, I will also review the role of glides and glottal stops as potential hiatus fillers. This paper (a) provides some remarks

on the terminology of rhoticity distinguishing between rhotic vs. non-rhotic accents, linking /r/ vs. intrusive /r/; (b) provides an overview of Optimality Theory; (c) takes into account the sonority scale in order to evaluate the most plausible hiatus breaker (Orgun, 2001), and (d) discusses whether glides and glottal stops could be also classified as possible epenthetic consonants.

3. Rhoticity, linking /r/, and intrusive /r/

This section discusses what is meant by rhoticity, linking /r/, intrusive /r/ and briefly focuses on both phonetic and phonotactic qualities of the approximant /r/. The phonetic quality and the phonotactic distribution of (r) are both variable. The alveolar approximant [ɹ] is the most common realisation (Cruttenden, 1980), whereas [ɾ] is typically found in conservative RP, especially in intervocalic position (Foulkes & Docherty, 2007) as well as in northern dialects (e.g. Shorrocks). Traditional NE dialects have uvular /ʁ/, giving back quality to vowels and diphthongs which historically precede /r/ (e.g. *work* à /wɜːk/ à /wɔːk/).[1] In phonotactic terms, the variability concerns the realisation or absence of (r), distinguishing between rhotic vs. non-rhotic varieties. Rhoticity (i.e. the realisation of /r/) is preserved in all linguistic environments and carries social prestige in American English dialects, Scotland, Ireland (Foulkes & Docherty, 2007). Conversely, dialects spoken in England (except for rhotic dialects spoken in South West England), Wales, Australasia, and South Africa are non-rhotic. In non-rhotic accents, /r/ is retained in speaker's lexical representation, yet it is phonetically absent in non-prevocalic environments (e.g. *hard* à /hɑːd/, *car park* à /kɑː pɑːk/) (Cox, et al. 2014). The decline of rhoticity in many British English accents occurred between the sixteenth and the eighteenth centuries, generating two phonological processes: linking /r/ and intrusive /r/. While R Dropping was operating on underlying forms containing /r/, a new generation of speakers started to insert /r/ (i.e. [ɹ]) in environments where /r/ was not underlyingly present (Wells, 1982). Linking /r/ is defined as the realisation of /r/ in coda position when followed by a vowel, as in *fa[r] away*,

[1] See Foulkes & Docherty (2007) for a more exhaustive account of the phonetic quality of (r).

fou[r] apples. This natural phonological process exhibits little social variation, except for Newcastle where results revealed that linking /r/ is significantly not present in the speech of working-class speakers and among the young generation (Foulkes, 1997). Intrusive /r/ (i.e. the insertion of /r/ even when there is no etymological /r/) is widespread in RP and in many other accents of England, even though it is often stigmatised. This phenomenon seems to occur only in non-rhotic dialects and applies across a morpheme or word boundary, as well as after acronyms, and operates as follows:

Ø à r / [-high V] _ # V (Wells, 1982).

In other words, in hiatus environments, non-high vowels (i.e. mid and open vowels) acquire an epenthetic /r/ which is etymologically not required, as in *saw [r] it*.[2]

4. A brief overview of Optimality Theory

Optimality Theory, proposed by Prince & Smolensky in the early 1990s, is an output-based model where the input is retrieved in the output. OT assumes that language is governed by a set of violable constraints on possible forms, with the assumption that for each input there are possible outputs, but only the most logical ones will be considered (e.g. [dɒ̲g] as an input of /kæt/ would be illogical). However, each output can potentially have an infinitive number of inputs. The pioneers of the theory assumed that the constraints are universal, and that the more highly ranked a constraint, the more serious a violation is. Table 1 displays a typical layout of an OT representation, in which Cand 1 is not the optimal candidate as it incurs the serious violation of constraint (CON1); Cand 2 violates one constraint (CON2) which is ranked higher than CON3, thus Cand 2 loses, and the optimal candidate remains Cand3.

[2] R-insertion has also been found word-internally, as in *gnawing* [ˈnɔːrɪŋ] (Cruttenden, 1962).

/input/	CON1	CON2	CON3
CAND1	*		*
CAND2		*	
☞CAND3			**

Table 1. OT representation

The three principal components of OT are: a universal generator (GEN), constraints (CON) and an evaluator (EVAL). GEN generates potential candidates of a given input; CON provides specific criteria which aim at selecting the winner candidate, as each constraint is likely to be violated; and EVAL identifies the optimal candidate resulting in the final output.

OT constraints can be classified in two broad categories: *Faithfulness* (phonemic contrast) constraints and *Markedness* (structural) constraints. *Faithfulness* prohibits any distinction between input and output, and the input is not altered in the surface form. McCarthy (2008) proposed two principal faithfulness restrictions, namely MAXIMALITY[14] (MAX) and DEPENDENCY (DEP), which restricts against epenthesis and deletion, respectively.

(1) MAX strictly entails any item in the input to have an equivalent in the output.
(2) DEP guards that an item present in the output must have a correspondent in the input.

IDENTITY constraint is to be considered as an alternative segmental restriction, linked to faithfulness, and elements in the input are preserved in the output.

Markedness was originally explored by Trubetzkoy (1939), and then reviewed by Jakobson (1941) who provided a divergent interpretation of this concept as well as the first perception of naturalness of human language. He claims that a less marked sound appears earlier in language acquisition by children, and its frequency is likely to unfold in the world's languages. This notion has also been considered by Stampe (1969/1972) in the theory of *Natural Phonology*, suggesting that the natural process, also known as *unmarked*, is due to an ease of articulation. The adult grammar, during the acquisition phase, may take different

paths, which have been re-echoed in OT. One of the principal differences between Natural Phonology and OT is that Natural Phonology views both child and adult phonology as the result of applied substitution rules, whereas OT accounts for the downgrade of markedness restriction ranking, originally higher, to the advantage of faithfulness constraints. In OT, a superiority of the markedness over faithfulness constraints means that all languages are associated with an analogous inventory. Even when obfuscated by faithfulness, the markedness restriction tends to emerge in diachronic changes in the so-called *emergence of the unmarked* (McCarthy & Prince, 1994).

5. /r/ as an Epenthetic Consonant

This section explores /r/ as a possible hiatus resolution under the lens of OT, according to which constraints are in principle violable at the surface structure (Prince & Smolensky, 1993). The examination of the non-rhotic Eastern Massachusetts dialect, carried out by McCarthy (1993), suggests that (3) /r/ is not allowed in coda-condition and (4) sequences of adjacent heterosyllabic vowels are forbidden.

(3) *V*r*X]σ CODA-COND
(4) *V]σ [σ V NO-HIATUS.

The first restriction (3) demonstrates that /r/ is dropped in coda environments, whilst the second restriction (4) shows the plausibility for the insertion of /r/ in order to resolve hiatus. Since restriction (4) is violated in the Eastern Massachusetts dialect, McCarthy (1993) proposed an alternative constraint: FINAL-C. This requires a consonant or a glide in final position, and /r/ intrusion is considered as a resolution strategy rather than an obstacle on hiatus. Similarly, Antilla and Cho (1998) adopted the same technique, but they replaced FINAL-C with the ONSET constraint. Linking /r/ and intrusive /r/ were found to occur in word + clitic collocation (*Timor is…, Cuba is*…) as well as after reduced function words, but, in Eastern Massachusetts, /r/ insertion is not found after the following reduced function words: *wanna, gonna, coulda, shoulda, etc.* (McCarthy, 1993). /r/ intrusion may occur after a lexical word (analogous to

prosodic words), on condition that the last item of a prosodic word is a consonant or a glide.

Kahn (1976) proposed that consonants in coda position are ambysillabic when followed by an adjacent vowel. Indeed, in the examples *Wanda [r] arrived* or *saw [r] eels*, intrusive /r/ satisfies both FINAL-C and ONSET (Kahn, 1976). It is argued that smooth /r/ has phonetic properties of *linking* and *intrusive /r/,* which seems to confirm the necessity of the FINAL-C constraint, as the NO-HIATUS restriction forces the insertion on the onset, but it might not determine the proper breaker segment. Kahn (1976) and McCarthy (1993) argue that epenthesis of a default vowel can satisfy CODA-COND, but not FINAL-C. Indeed, *Homer [ə] left* seems not to be a plausible solution, and the output is characterised by *Home <r> left.* On the other hand, *Wand <a> left* could be a further potential candidate, but it violates PARSE-V. The latter prohibits the presence of a stray vowel and it is the equivalent of MAX in the Correspondence Theory (McCarthy & Prince, 1995).

Uffman (2007) rejects the presence of underlying /r/ as, viewed through the lens of the Principle of Richness of the Base (Prince & Smolensky, 1993), potential output forms are characterised by output constraints only, regardless the input constraints. Uffman (2007) challenges the fact that underlying /r/ is a form that precedes non-high vowels, arguing that it should be considered as a violation of the previously mentioned OT principle, since /r/ does not occur in the input. Sebregts (2001) noticed that intrusive [r] was also found in loanwords, such as *pasta, UEFA*, which do not contain /r/ in the input form. Even though the position of /r/ as an epenthetic consonant has been treated as being phonologically arbitrary and an unnatural process (McCarthy, 1993), Uffman (2007) contends that intrusive /r/[3] is not synchronically arbitrary, yet it is a natural process.

Harries (1994) suggested that floating /r/ is used in onset environments when no segment can fill hiatus, however, this claim appears not to be in line with McCarthy's argument, as /r/ cannot form an onset. Halle & Idsardi (1997) proposed two rules: 1) /r/ is dropped in the rhyme of the syllable; 2) epenthetic /r/ is acquired by non-high word final vowels, followed by a vowel initial syllable. They argue that intrusive /r/ can be considered as a form of hypercorrection, whilst linking /r/ is due to the failure of rule 1. Hay & Sudbury (2005) argue

against the rule inversion as their historical New Zealand English (NZE) suggest both partial rhoticity and /r/ insertion.

6. Sonority hierarchy

From the viewpoint of sonority, Orgun (2001) suggests that coda consonants are more sonorous than the adjacent onset, therefore the proposed sonority hierarchy, which is based on markedness scale for peaks, is as follows:

(4) *Coda-t >> *Coda-n >> *Coda-r >> *Coda-w.

Uffman (2007) argues that /r/ is an optimal epenthetic consonant as it satisfies the faithfulness constraint according to which the less is inserted, the more faithful the output is to the input. Moreover, a maximally sonorous segment is usually inserted in intervocalic environment. When glide formation is blocked, /r/ is inserted as it is the most sonorous segment. In edge environments, minimally sonorous elements are considered unmarked and they can function as epenthesis (e.g. glottal stop), whereas in different contexts (e.g. intervocalically) maximally sonorous segments can function as optimal epenthesis. In other words, the sonority scale, markedness and faithfulness prompt /r/ insertion in environments where glides are blocked. The non-arbitrariness of intrusive /r/ in hiatus environments is not an isolated phenomenon, in both English and German, but it is triggered by prosodic factors.

7. Glides and Glottal Stops as Epenthetic Consonants

McCarthy (1993) pointed out that /r/ is not the only strategy to resolve hiatus in the English language. The glide [w] can be followed by high back vowels, whereas [j] occurs after high front vowels. Glide insertion is treated as a plausible hiatus resolution as they are minimally contrastive and are minimally marked epenthetic consonants. Moreover, glides make the inserted element as similar to the preceding vowel as possible (Uffmann, 2002). Indeed, if the roundness and backness of vowels is taken into account, [w] is found after [u, ʊ], whilst [j], in hiatus contexts, is followed by [i, ɪ] (Sagey, 1986; Clements, 1991), as shown in the following sentences:

(5) The key is [ki:**j**ɪz]
(6) The zoo is [zu:**w**ɪz]
(7) The law is [lɔ:**r**ɪz]

In both (5) and (6), glides can successfully avoid hiatus. However, in (7) a potential epenthetic glide is blocked by the preceding vowel whose features are [+ round] and [+back]. The Geometry Feature suggests that the non-high back rounded vowel [ɔ], as in (7), may spread, but the result is not permitted in English as the non-high glide formation may be expressed by the vowel [ɤ] - a segment which cannot occur in the English language. Both ONSET and DEP, as illustrated in the following table, determine whether epenthesis can occur in hiatus contexts.

/lɔ:ɪz/	ONSET	*G[-h]	DEP(hi)	DEP	*V_V/lar	*V_V/r	*V_V/V
[lɔ:ɪz]	*!						
[lɔ:wɪz]			*!	*			*
[lɔ:ɤɪz]				*			*
[lɔrɪz]				*		*	
[lɔ:ʔɪz]				*	*!		

Table 2. OT representation of the input [lɔ:ɪz](Uffman, 2007).

The first candidate of the above table, [lɔ:ɪz], has to be excluded as it violates ONSET; the second candidate, [lɔ:wɪz], violates DEP(hi) as only the place feature spreads; the third candidate, [lɔ:ɤɪz], cannot be accepted as it violates the non-high glides restriction discussed above, thus glides are ruled out[3]. The glottal stop is inserted to maximise the contrast to the following vowel (Uffman, 2007)

[3] Several linguists have suggested that /r/ should be classified as a glide, due to the [low] and [pharingeal] features (Gnanadesikan, 1997). Broadbent (1996), attempted to explain that /r/ corresponds to low vowels, yet it is not clear that other languages adopt the same strategy when confronted, in hiatus environment, with a low vowel. Gick (2002) argues that, within the Government Phonology framework, /r/ is a natural correspondent of schwa.

and can be a frequent epenthetic consonant as it only violates the *PHARYNGEAL constraint (Lombardi, 1990). However, the above table suggests that [ʔ] in [lɔːʔɪz] is excluded from potential epenthesis due to the violations incurred, leaving the insertion of /r/ - the nearest element to glides on the markedness scale - as the only resolution strategy to resolve hiatus, as in [lɔrɪz]. In many languages, the glottal stop occurs in a strong position, it functions as a hiatus breaker before a stressed context in German and Dutch and occurs as an obligatory onset in Arabic. In English, however, the glottal stop is an allophone of /t/ which is commonly found in weak positions[4]. Whereas, in strong positions /t/ is more likely to be aspirated. Davidson & Erker (2014) show that, in rhotic American English, hiatus can be tolerated word-medially, whereas at word-boundaries it is preferred to resolve hiatus with glottal stop insertion, when it occurs before unstressed syllables. In Australian English, linking /r/ is frequently found in hiatus environments where the first vowel is non-high and the second vowel is weak (Cox et al., 2014). Penney et al. (2024) suggest that glottalisation occurs most frequently with strong right-edge vowels, and gliding/linking-r are more likely with weak right-edge vowels.

8. Conclusion

This paper has evaluated the different hiatus-breaking strategies in non-rhotic English and has theoretically reviewed the role of /r/, glides and glottal stop as potential epenthetic consonants. Among the different argumentations provided by phonologists throughout the years, McCarthy pointed out that epenthesis, in hiatus environment, is satisfied by the FINAL-C constraint. Along this line, Antilla & Co (1998) developed a similar argument where FINAL-C was replaced with the ONSET constraint. Kahn (1976) suggested that consonants in coda position are ambysillabic when followed by adjacent vowels, and the necessity of /r/ intrusion or linking /r/ is due to phonetic properties. The most plausible explanation seems to be provided by Uffman (2007) who explained that /r/ is

[4] The stress pattern found in East Anglian English, for word-medial /t/, suggests that unstressed syllables containing /t/ favour glottal(ised) variants, whereas syllables with primary stress disfavour glottals (Ciancia, 2020).

the optimal epenthetic consonant due to sonority, whereas glottal stops and glides are both excluded as potential epenthetic consonants. Empirical findings form rhotic American English, however, do not rule out glottal stop insertion to resolve hiatus (Davidson & Erker, 2014).

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