

i-Shortening and *CiV* Lengthening*

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0. Introduction

English displays the following vowel length alternation, which is considered to be triggered by suffixation:

- (1) a. ign[áy]te/ign[i]tion div[áy]de/div[i]sion.
b. mámm[ə]l/mamm[éy]lian Bábyl[ə]n/Babyl[ów]nia.

(1a) shows vowel shortening triggered by the suffix *-ion*, while (1b) shows vowel lengthening triggered by the suffixes *-ian* and *-ia*. The former is called *i*-Shortening since the alternating vowel is always *i*, which alternates [ay] to [i] (cf. Rubach 1984; Halle and Mohanan 1985; Yip 1987). The latter is called *CiV* Lengthening since the alternating vowel is always followed by a consonant (C) + /i/ + a vowel (V) (cf. Chomsky and Halle 1968; Rubach 1984; Halle and Mohanan 1985; Myers 1985; Yip 1987).

In this paper, I will attempt to provide these phenomena with an appropriate explanation by reorganizing the data from the viewpoint of the quality of the relevant vowels, arguing that the vowel alternations depend on the quality of the alternating vowels themselves rather than the type of suffix which has been considered to be the trigger of the alternations. Section 1 introduces the relevant data of *i*-Shortening and *CiV* Lengthening. Section 2 suggests a new angle on these phenomena, reviewing previous treatments of them. Based on a claim made in section 2, I argue in section 3 that the phenomena can be captured by a set of purely segmental conditions on vowels and a couple of simple rules which are invoked when the condition is not observed (3.1.). I also present other possible ways to account for the facts (3.2.).

1. The Basic Data

In this section I present the relevant data, which illustrate *i*-Shortening and *CiV* Lengthening.

1.1. *i*-Shortening

When the suffix *-ion* is added to a stem, the stem-final long *i* [ay] shortens to [i]. This vowel alternation is called *i*-Shortening. Some examples are given below:

(2)	ign[ay]te/ign[i]tion	erudite/erudition
	deride/derision	decide/decision
	precise/precision	circumcise/circumcision
	elide/elision	collide/collision
	revise/revision	supervise/supervision
	divide/division	provide/provision
	expedite/expedition	extradite/extradition
	contribute/contribution	recognize/recognition.

(from Myers 1985: (5); Yip 1987: (14))

The suffix *-ion*, however, cannot condition such an alternation by itself. As seen in (3), stem-final long vowels other than [ay] do not shorten when *-ion* is suffixed to the stem.

(3) a.	rel[ey]te/rel[ey]tion	accentuate/accenuation
	celebrate/celebration	illustrate/illustration.
b.	compl[iy]te/compl[iy]tion	excrete/excretion
	cohesive/cohesion.	
c.	prom[ow]te/prom[ow]tion	explode/explosion
	corrode/corrosion.	
d.	conf[juw]se/conf[juw]sion	pollute/pollution
	constitute/constitution	
	excl[uw]de/excl[uw]sion.	

(from Rubach 1984: (43); Yip 1987: (14))

The examples in (3) are separated in terms of the quality of the stem-final vowel; that is, (3a), (3b), (3c), and (3d) are examples of [ey], [iy], [ow], and [juw], respectively. Each of the above stem-final vowels, irrespective of vowel-quality, is not affected by shortening and hence remains long.

As is clear from the above observation, reference to the quality of the relevant vowel is essential to the description of the phenomenon in question. Because of this restriction on vowel quality, *i*-Shortening has generally been stated as a special rule (Rubach 1984: 98, Yip 1987: 472).

1.2. *CiV Lengthening*

The pairs listed in (4) show alternations between short and long vowels, called *CiV* Lengthening, which take place immediately before the sequence *CiV*. The suffixes relevant to *CiV* Lengthening are those such as *-ian*, *-ious*, *-ia*, *-ium*, and *-ial*, etc. (4a), (4b), (4c), and (4d) illustrate the lengthening of *a*, *e*, *o*, and *u*, respectively.

- | | | |
|--------|--------------------------------------|---------------------------------------|
| (4) a. | Ir[æ]n/Ir[ey]nian | gymn <u>a</u> stic/gymn <u>a</u> sium |
| | aud <u>a</u> city/aud <u>a</u> cious | mamm[ə]l/mamm[ey]lian |
| | Can <u>a</u> da/Can <u>a</u> dian | Cauc <u>a</u> sus/Cauc <u>a</u> sian |
| | fant <u>a</u> sy/fant <u>a</u> sia | libr <u>a</u> ry/libr <u>a</u> rian. |
| b. | rem[ə]dy/rem[iy]dial | Mend[ɸ]l/Mend[iy]lian. |
| c. | zirc[ɑ]n/zirc[ow]nium | Mong[ə]l/Mong[ow]lian |
| | Babyl <u>o</u> n/Babyl <u>o</u> nia | Oreg <u>o</u> n/Oreg <u>o</u> nia |
| | Oreg <u>o</u> n/Oreg <u>o</u> nian | col <u>o</u> ny/col <u>o</u> nial |
| | Et[ɸ]n/Et[ow]nian. | |
| d. | Lillip[ʌ]t/Lillip[juw]tian | stud <u>y</u> /stud <u>i</u> ous |
| | Malth[ə]s/Malth[(j)uw]sian | |
| | Arth[ə]r/Arth[(j)u(ə)]rian. | |

(from Halle and Mohanan 1985: (58); Myers 1985: (25), (28); Yip 1987: (17); Kazumi 1990: (3))

What should be noted here is that *CiV* Lengthening is very similar in nature to *i*-Shortening in that it is conditioned not only by suffixation but also by the quality of the stem-final vowel. In particular, short *i* [i] does not undergo *CiV* Lengthening, as the examples in (5) amply show.

- | | | |
|-----|----------------------|------------------------|
| (5) | Darw[i]n/Darw[i]nian | Paris/Parisian |
| | avarice/avaricious | ignominy/ignominious |
| | malice/malicious | artifice/artificial |
| | office/official | prejudice/prejudicial. |
- (from Rubach 1984: (2); Yip 1987: (18))

As is clear from (5), [i], in the stem-final syllable, never lengthens, even if one of the conditioning suffixes is added to the stem. Thus, a simple specification of suffix type is not a sufficient condition for *CiV* Lengthening, as was the case with *i*-Shortening. We must again refer to the vowel quality in order to account for the facts.

2. A New View

This section proposes a new view of *i*-Shortening and *CiV* Lengthening which makes it possible to capture the behavioral regularity of vowels observed in these phenomena. In 2.1, I argue that the distinction between suffixes made in previous analyses is not necessary to account for the alternations. In 2.2, I reorganize the relevant data from this new point of view, making clear the observed regularity of the vowel *i* and other vowels.

2.1. The Elimination of the Distinction Between *CiV* and *CyV*

Recent analyses of *i*-Shortening and *CiV* Lengthening have focused attention on the nature of the suffix as a trigger for the phenomena (cf. Rubach 1984; Halle and Mohanan 1985; Yip 1987). Specifically, they assume *-ion* to

be /y/-initial and distinguish it from the other relevant suffixes such as *-ian* which are considered /i/-initial. Based on this assumption, *i*-Shortening has been formulated so that its environment is restricted only to $_CyV$, which makes the rule triggered exclusively by *-ion*. CiV Lengthening on the other hand is considered to be lengthening which takes place either in the environment $_CiV$ or $_CyV$, permitting any of the relevant suffixes as a trigger. These assumptions cannot be maintained, however, for the following three reasons.

First, there is no apparent crucial evidence to decide that the initial segment of *-ion* differs from that of other suffixes, like *-ian*, underlyingly. Consider, for example, the facts involving palatalization. Palatalization, the target of which must be followed by /y/, is obligatory before *-ion* (*ignite* [t] > *ignition* [š]), while it is optional before *-ian* (*Caucasus* [s] > *Caucasian* [z/ž, š]). This difference, however, is not sufficient enough to argue that *-ion* and *-ian* begin with /y/ and /i/, respectively. As mentioned just above, suffixes like *-ian* actually trigger the process, although optionally. In fact, these suffixes trigger the process obligatorily in cases like *presidential* [š], where there is little evidence that the suffix-initial *i* is underlyingly /y/. Thus, *-ion* and suffixes like *-ian* can be said to share the same property of triggering palatalization.

Second, there are other non-trivial similarities between 'shortening-triggering' suffix *-ion* and 'lengthening-triggering' suffixes such as *-ian*. In addition to their orthographical similarity, namely *iV*-initial, all of the suffixes mentioned above exhibit similar stress patterns. Specifically, these suffixes always place primary stress on the immediately preceding syllable (*supervise* > *supervision*; *Caucasus* > *Caucasian*; *ignominy* > *ignominious*; *fantasy* > *fantasia*; etc.). These similarities suggest that

the suffixes in question belong to the same class, hence it is not unreasonable that they also constitute a class with respect to the vowel alternations discussed in this paper.

Finally, even if we admit a difference in the initial segment such as stated above, we do not have to classify *-ion* separately from other suffixes. In the recent development of phonological theory, the notion of underspecification has become increasingly important. In particular, Radical Underspecification Theory predicts that there are unspecified or default segments in a language's phoneme inventory. In English /i/ is considered to be a completely unspecified vowel. /y/, the [-vocalic] counterpart of /i/, can thus be recognized as an unspecified glide (Yip 1987: 472 fn.). These segments are not distinguished in the underlying representation. The unspecified segment is realized as either /i/ or /y/, depending on syllable position (cf. Borowsky 1986; Yip 1987). If this hypothesis is correct, we are able to argue that /i/ and /y/ are the same except for their syllable position, and hence cannot be differentiated before syllabification.

In sum, there is no compelling evidence to draw a distinction between *-ion* and suffixes beginning with *i* such as *-ian*. Rather, there are two positive similarities, i.e. orthographical and stress-behavioral similarities, between them. These two similarities lead us to conclude that they all qualify as the same kind of suffix. If this is the case, the same environment CXV (where X = /i/ or /y/, a segment unspecified except for [-consonantal]) will be formed in all relevant instances of suffixation. It follows from this that both *i*-Shortening and *CiV* Lengthening must be considered vowel alternations observed in the environment CXV. Note that it is not crucial here whether X is a vowel or a glide. In the remaining parts of this paper I will use 'i' to represent 'X' in 'CXV' for convenience.

2.2. The Significance of the Quality of Target Vowels

I have proposed that *i*-Shortening and *CiV* Lengthening be treated as two types of vowel alternations which take place in the same environment, as opposed to previous analyses (cf. Rubach 1984; Halle and Mohanan 1985; Yip 1987), where *i*-Shortening and *CiV* Lengthening are triggered respectively by two different classes of suffixes. In fact, I have shown reasons for incorporating *-ion* and the suffixes alleged to trigger lengthening into a single class.

Given this fundamental idea, we are able to attribute the vowel-length alternation facts purely to the quality and tendency of the target vowel (i.e. the stem-final vowel) itself. To illustrate this point, consider the following table:

(6)

	<i>i</i> -Shortening	<i>CiV</i> Lengthening
<i>i</i>	shortening [ay] > [i]	no change (short) [i]
other vowels	no change (long) ex. a [ey]	lengthening ex. a [æ] > [ey]

(6) illustrates the behavior of the vowel *i* and other vowels in the environment of the two vowel alternations, the data of which are presented in section 1. Here it is obvious that *i* contrasts with other vowels in that it tends to be short in the relevant environment: long *i* shortens (cf. (2)), while short *i* remains short (cf. (5)). In contrast, other vowels tend to be long in the same environment: short vowels lengthen (cf. (4)), while the long counterparts remain long (cf. (3)). Thus, our claim that the relevant suffixes all serve to form the same environment provides a clearer picture of the behavioral tendency of the two classes of vowels than previous treatments of the two phenomena.

If on the other hand we exclude *-ion* from the class of suffixes that begin with *iV*, we seem to be missing a generalization about the consistent behavior of each vowel. In other words, the fact that the suffix *-ion* triggers the shortening of *i* but has no effect on other vowels, and that such suffixes as *-ian* trigger the lengthening of other vowels, allowing *i* to remain short, would appear to be merely accidental.

Next, I present a piece of evidence that further supports the claim which attributes the vowel-length facts to the quality of the target vowel, given the assumption that the suffixes all serve to create the same environment. Observe the following data:

- | | | |
|-----|-----------------------------|-------------------|
| (7) | crocod[ay]le/crocod[i]llian | reptile/reptilian |
| | Palestine/Palestinian | hide/hideous |
| | vice/vicious | bile/bilious |
| | line/linear, lineal. | |

(from Myers 1985: (25); Kazumi 1990: (14))

(7) is a case in which such suffixes as *-ian* trigger *shortening* but not *CiV* Lengthening. Each example clearly shows that long *i* [ay] shortens when the environment *_CiV* is met, independent of the nature of the suffix. It follows, then, that shortening can be triggered not only by *-ion* but also by so-called 'lengthening' suffixes like *-ian*. Thus, these data provide counter-examples to such analyses which relate *i*-Shortening exclusively to the suffix *-ion*. Although I have not found data in which lengthening is triggered by the 'shortening' suffix *-ion*, the alternation in (7) suffices to show that vowel alternations depend on the quality of the vowel, not on the type of suffix which follows the stem. With respect to the target vowel *i*, (7) is further evidence of its tendency to be short, since *i* shortens immediately before *CiV*.

There is at least one more fact which should be noted with respect to *i*. Consider the pairs listed in (8):

(8)	inhib[<u>i</u>]t/inhib[<u>i</u>]tion	prohibit/prohibition
	exhibit/exhibition	edit/edition
	admit/admission	submit/submission
	emit/emission	remit/remission
	permit/permission	omit/omission.

In (8) the target vowel is a short *i*. In this case the vowel quantity is not changed; it is already short. This result is predicted by the general tendency of *i*, as was the case of (5) in which a short *i* remains short when followed by suffixes like *-ian*.

3. Analysis

In the preceding section, I have shown that there is a fairly strong generalization to be made about the tendency of *i* and other vowels, which would have been overlooked if we treated *-ion* as a special suffix. In 3.1, I argue that this generalization is best characterized by means of conditions and a couple of simple rules. In 3.2, I present alternatives to the analysis proposed here and argue that the former are less convincing than the latter.

3.1. Two Conditions on Vowels in *_CiV*

First, I describe the generalization in terms of both environment and vowel quality in order to ease the exposition of the following argument. The relevant environment is *_CiV*; where *C*, *i*, and *V* correspond respectively to the stem-final consonant, the suffix-initial segment, and the following vowel. With respect to vowel quality, the following descriptive generalization is made:

- (9) The vowel *i* has a tendency to surface in short form before *CiV*, while other vowels tend to surface in long form in the same environment.

Now, I will turn immediately to the question of how to formulate the above generalization in more formal terms. I assume that the so-called rules of '*i*-Shortening' and '*CiV* Lengthening' are the visible residue of the general behavior or tendency of vowels in the environment *_CiV*. In other words, I assume that there exists a tendency about the behavior of vowels in the context stated above and that whatever derives this generalization should subsume both of these vowel-length rules. The assumption will also extend to the 'invisible' part of the generalization in which no vowel alternation is exhibited. We now need to ask what the behavior of vowels in the context *_CiV* is attributed to. It seems quite natural to start by restating the above generalization in terms of the following more formal conditions:

- (10) In the environment *_CiV*,
- (i) *i* must be short, and
 - (ii) other vowels must be long.

If we assume that English has conditions such as (10), we are able to account for the data presented above in an explanatory way. As observed above, the possible combinations of the target and the environment *_CiV* consist of the following four cases. First, a long *i* [ay] in the environment must shorten in order to meet (10i). A large part of this shortening is equated with what has been called '*i*-Shortening'. Second, a short *i* [i] in the environment *_CiV* is not affected by any process, as it already satisfies (10i). Third, a long vowel other than [ay] remains unchanged because it is in conformity with (10ii). Finally,

In (12) and (13), the vowel in question is a vowel other than *i* and the environment $_CiV$ appears to be met. Thus, the vowels are expected to lengthen in (12) and to remain long in (13). Contrary to our expectation, however, the vowels remain short in (12) and shorten in (13). We are able to account for these data by assuming that *ss* is long or forms a geminate underlyingly. Then we can attribute the behavior of the vowel to the stem-final long consonant. That is, in this case, the environment $_CiV$ is not met. This explains why stem-final vowels other than *i* remain short or shorten before [s].

One may argue that the orthography of words should not directly reflect the underlying representation. However, the assumption above is supported by another process, *s*-Voicing, which accounts for voicing of /s/ observed in the environment V_iV , i.e. when it is preceded by a vowel (long or short) and followed by either /i/ + a vowel or /y/ + a vowel (cf. Yamada 1987). Compare the pairs listed in (15) with those in (14).

- | | | |
|---------|---|--------------------------------------|
| (14) a. | Cauca[s]us/Cauca[ʒ̥]ian | Paris/Parisian. |
| | b. <u>concise</u> /con <u>ci</u> sion | pre <u>ci</u> se/pre <u>ci</u> sion. |
| (15) a. | conf <u>ess</u> /conf <u>ess</u> ion | im <u>press</u> /im <u>press</u> ion |
| | prof <u>ess</u> /prof <u>ess</u> ion | ob <u>sess</u> /ob <u>sess</u> ion. |
| | b. <u>discuss</u> /disc <u>uss</u> ion. | |

(14) shows typical examples of *s*-Voicing. If *ss* in (15) corresponds to a short *s* [s] in the underlying form, it should be subject to *s*-Voicing, since the environment would be exactly the same as that of (14). However, the examples in (15) are not affected by the process. Therefore, it is quite reasonable to conclude that *ss* is long and hence does not satisfy the required condition.

I now turn to a consideration of the applicability of the conditions in (10) to nonderived words, which I assume

conditions in (10) are obligatory in cases where the relevant form evidently includes a suffix, while they are optional when it is not clear whether the form is bimorphemic.

Finally, I would like to emphasize that the analysis provided here is able to capture subregularity observed in English vowel alternations, i.e. the tendency of vowels in the environment $_CiV$ which has been stated in the conditions in (10). Although such conditions as (10) should be regarded as specific to English and not as universal, they actually serve to indicate that 'i-Shortening' and 'CiV Lengthening' are not completely unrelated to each other.

It would surely be more preferable that we incorporate 'i-Shortening' into a more general shortening rule such as *CC Shortening* which requires only that the target be immediately followed by a *CC* cluster (cf. Yip 1987). *CC Shortening* can be said to exhibit clear regularity, since the rule holds for any long vowel in the environment $_CC$. My impression is that *CC Shortening* is necessary for an explanation for a wide range of shortening facts. The shortening in the environment $_CiV$, however, seems to be distinct from *CC* shortening, even if we consider *-ion* to be /y/-initial. The reason is that it refers to the quality of the target vowel. Reference to the target, in addition to the environment, makes the phenomenon less general and more specific, which is the very reason that the shortening in $_CiV$ requires a rule independent of *CC Shortening*. Notice here that there also exists a rule which lengthens vowels other than *i* in the environment $_CiV$. The shortening and lengthening in the environment $_CiV$ have been seen as two distinct unrelated phenomena in previous studies on English segmental phonology. This paper has demonstrated, however, that the shortening and lengthening can be recognized as complementary phenomena in the environment $_CiV$, and succeeded in bringing to light a hidden regularity with

respect to the quality of the target vowel.

3.2. Alternatives

Although we have characterized shortening and lengthening by means of a set of conditions and simple rules, it is possible to account for the phenomena of vowel-length alternation by means of two rules coupled with the Elsewhere Condition (cf. Kiparsky 1982) without altering the effects. Since there seem to be no empirical differences between these analyses, it may be assumed that in principle either of them is possible. However, the analysis presented in this paper can directly express the generalization which is observed when we look at the behavior of vowels as a whole, as well as account for the phenomena straightforwardly.

There is another possible way of accounting for these facts. We may be able to attribute the vowel shortening in $_CiV$ to a phonotactic constraint such as $\ast /ay\check{v}/$ or $\ast /ay\check{z}/$ on the grounds that there seems to be no monomorphemic words containing these sequences in medial position. If such a constraint exists in English phonology, ill-formed sequences such as $\ast /ay\check{v}/$ and $\ast /ay\check{z}/$ would be changed into $/i\check{v}/$ and $/i\check{z}/$, respectively. These sequences becoming influential, other suffixes such as *-ian* can come to trigger shortening by way of analogy in such cases as *crocodilian*.

If this analysis is supported, the following three consequences can be drawn out. The first is that we need not postulate any shortening rule to shorten *i* in the environment $_CiV$ and that we only need to postulate the general lengthening rule which lengthens all vowels in the environment $_CiV$. A second consequence is the reduction of the number of rules needed to account for English vowel shortening. In particular, shortening rules could be reduced to general CC Shortening. Finally, if we take into consideration the relation between vowel quantity and

stress, we can reinterpret the vowel alternation facts in English. It has been generally accepted that a syllable assigned stress tends to be longer than a stressless one. If a vowel is expected to be long in the environment *_CiV*, this tendency follows directly. As for lengthening, the lengthened stem-final syllable always has stress, i.e., either receives stress by suffixation or maintains stress assigned before suffixation, since suffixes such as *-ion*, *-ian*, etc. always place primary stress on the syllable immediately preceding them. The lengthening, then, can be regarded as an unmarked one which lengthens a stressed syllable. Shortening on the other hand shows the following two cases with respect to stress. One case is where the shortened syllable loses stress (*repute > réputable; reside > résident; recite > recitation; etc.). As stated above, this shortening is natural, since the shortened syllable is stressless. The other case is that where the shortened syllable maintains stress (*keep > kept; produce > productive; describe > description; etc.). This seems to be a marked case, since a syllable shortens in spite of its being stressed. However, the shortening here can be attributed to the *CC* sequence immediately after the relevant vowel. Thus, vowels lengthen when assigned primary stress after suffixation, unless they are immediately followed by *CC* sequence, and they shorten when they are stressless.**

Unfortunately, however, we do not have enough evidence thus far to establish the existence of a constraint such as * /ay^Y/ or * /ay^Z/. For this reason, I will not discuss this possibility any further in the present paper.

4. Concluding Remarks

The main contribution of this paper is that it has proposed a new point of view of 'i-Shortening' and 'CiV Lengthening' which provides insight into the nature of these phenomena. To be specific, I have attributed 'i-Shortening'

to the tendency of the vowel *i* and 'CiV Lengthening' to that of other vowels, eliminating the distinction between *-ion* and the other relevant suffixes. I have claimed that there are a set of conditions which restrict the behavior of vowels based on their quality. These conditions have the following advantages. They allow us to state the required rules in a highly simplified manner and to deal with 'i-Shortening' and 'CiV Lengthening' in a unified manner, as opposed to previous analyses which have regarded them as having no relation with each other. They also allow us to clarify contrasting tendencies of *i* and other vowels in the environment *_CiV*, which have not been noticed in previous frameworks.

NOTE

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