Turkish vowel epenthesis

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Introduction

One of the striking features of Turkish morphophonology is the system of C~0 and V~0 alternations at morpheme boundaries, which seem to conspire to prevent the occurrence of a stem-final V and a suffix-initial V next to each other. The classic analysis of this phenomenon was provided by Lees (1961), and has been generally accepted since. Zimmer (1965, 1970), however, noticed a flaw in the Lees analysis, and proposed a correction, which will be discussed in section 2. The present paper argues that there is a second flaw in the Lees analysis, and one that weakens the case for Zimmer's proposed correction. Instead, I propose a more radical reanalysis of the phenomenon, in which most of the V~0 alternations are due not to vowel deletions, as in the Lees analysis, but to vowel epenthesis.This raises some theoretically interesting questions.

1 The V~0 alternation

Turkish,[1] with certain exceptions,[2] does not permit VV sequences within words. Thus, while both V-initial and V-final syllables are permitted, VV sequences are avoided both

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1 The variety of Turkish investigated here is "Modern Standard Turkish", cf. Lees 1961, Lewis 1967.
2 There are four classes of exceptions:
(i) some borrowed roots which originally had a glottal stop either between vowels or at the end of the root (the glottal stop being lost in modern Turkish) have VV root-internally or V+V with a V-initial suffix:

saat	'hour,clock'	<Arabic sa?at
şair	'poet'	<Arabic şa?ir
camii	'mosque-poss'	<cami? + (s)I

(ii) Turkish words with syllable-initial ğ ("yumuşak ge") have VV superficially due to the zero realization of the ğ:

kağıt		'paper'
dağı	< dağ + (y)I	'mountain-acc'
geleceği	< gel + AcAg+I	'come-fut-poss'

Commonly, the first vowel is just pronounced long.
(iii) In compounds (usually, as in English, written as separate words but sometimes written as one word), two vowels can come together:

cezaevi	'jailhouse'	<ceza 'punishment' + ev 'house' + POSS

(iv) The Arabic adjectival suffix -î attaches without modification to consonant-final and vowel-final stems alike:

tarihî	'historical'	cezaî	'punishable'

within (native) morphemes and across morpheme boundary (at a level of representation where "yumuşak ge" and glottal stop are present as consonants). In this paper we are only concerned with the situation at morpheme boundaries.

Morphemes generally can end or begin in either V or C. In order for the *VV constraint to be observed across morpheme boundaries, it is necessary for the language to have some way to let these morphemes get together.

There is a large class of suffixes that are C-initial and have no V-initial variant:

-mAk (infinitive)
-DA   (locative)
-DAn (ablative)
-mIş   (evidential)
-mAlI (necessitative)
-dI   (past)
-sA   (conditional)
-lAr   (plural)

And many more. These are of no interest here.

There is another fairly large class of suffixes which are C-initial following V-final stems and V-initial following C-final stems:

-(n)In	(genitive)	at-ın	araba-nın
-(s)I	(possessive)	at-ı	araba-sı
-(y)Iş	(nominalizer)	gel-iş	yürü-yüş
-(y)AcAk	(future)	gel-ecek	yürü-yecek
-(ş)Ar	(distributive)	üç-er	yedi-şer
-(y)A	(dative)	at-a	araba-ya
-(y)I	(accusative)	at-ı	araba-yı
-(y)An	(relative)	gel-en	yürü-yen

Since the buffer consonant is not predictable (usually it is /y/, but not always) it is traditional (in generative studies of Turkish phonology) to assume that there is a rule deleting the initial C of such suffixes when immediately preceded by a C. This rule, of course, can only apply to the specified suffixes; in other words it expresses a lexically as well as phonologically conditioned morphophonemic alternation. We will not be interested in these suffixes any more either.

The class of suffixes that we are interested in is the ones that exhibit a V~0 alternation. These are usually cited in grammars as having an initial vowel (generally high, but otherwise unspecified) followed by a C or perhaps more:

-(I)m   1.sg.possessive
-(I)n   2.sg.possessive
-(I)n   reflexive
-(I)ş   reciprocal

To account for these alternations, the classical analysis (Lees 1961:40) assumes that there is an underlying initial V in these suffixes that vanishes when preceded by a vowel:

at + Im	=> atım	baba+Im	=> babam
horse+1.sg.poss		father+1.sg.poss	
karpuz+Im	=> karpuzum	çene+Im	=> çenem
watermelon+1.sg.poss		chin+1.sg.poss	
kemig+Im	=> kemiğim	keçi+Im	=> keçim
bone+1.sg.poss		goat+1.sg.poss	
göl+Im	=> gölüm	büro+Im	=> bürom
lake+1.sg.poss		office+1.sg.poss	

It is always the suffix-initial element that disappears, since the remaining V is whatever the stem has, not the one the suffix has. Note that the suffix-initial V is [+high, 0back, 0round]: a high vowel unspecified for backness and rounding. When the vowel surfaces, which it does following a C-final stem, it receives its backness and rounding features via vowel harmony. When the suffix is added to a V-final stem, it is the stem vowel that remains. This can be seen when the stem-final vowel is low.

Thus the classical analysis of the suffix-initial C~0 and V~0 alternations assumes two rules deleting suffix-initial segments: C->0 / C+_ for a lexically specified class of C-initial suffixes, and V -> 0 / V+_ for (supposedly all) V-initial suffixes.

2 The -Iyor problem

The progressive suffix -Iyor (called 'momentary' by Lees 1961) poses a difficulty for the Lees analysis, which will be outlined in this section.

Since the progressive suffix begins with a vowel, we expect the suffix-initial vowel to be deleted when adjacent to a vowel-final stem, and indeed it seems to be:

| eri+Iyor | => | eriyor | eri = melt |
| yürü+Iyor | => | yürüyor | yürü = walk |

But when the stem-final vowel is low, something else must happen, because the remaining V is invariably high:

ara+Iyor	=> arıyor	*arayor	ara = seek
dene+Iyor	=> deniyor	*deneyor	dene = try
ara+mA+Iyor	=> aramıyor	*aramayor	
dene+mA+Iyor	=> denemiyor	*denemeyor	

Lees (1961:55) proposes to account for this via an independently necessary rule of vowel raising before /y/, which can be seen in

| ara+yAcAk | => arıyacak | -(y)AcAk = future |
| dene+yAcAk | => deniyecek | |

There are two difficulties with this analysis, however. The first, which was noticed by Zimmer (1965), is that the raised vowel in other instances of V-raising does not undergo rounding harmony, while the initial vowel of -Iyor always does:

| öde+yAcAk | => ödiyecek | *ödüyecek | öde = pay |
| söyle+yAcAk | => söyliyecek | *söylüyecek | söyle = say |

The second difficulty is that the V-raising rule is in most cases optional (both in speech and in writing):

| ara+yAcAk | => arayacak or arıyacak | ara = seek |
| dene+yAcAk | => deneyecek or deniyecek | dene = try |

But in -Iyor forms, the V-raising would have to be obligatory, since the V in question is always high (and, as noted above, always undergoes VH):

ara+Iyor	=> arıyor	*arayor
dene+Iyor	=> deniyor	*deneyor
öde+Iyor	=> ödüyor	*ödeyor, *ödiyor

Zimmer (1965), to evade the first problem, proposed that just in the case of -Iyor, a special morphophonemic rule comes into play which deletes any stem-final V immediately preceding -Iyor. This rule would apply before the suffix-initial V->0 rule, thus bleeding it, and the underlying high V of the -Iyor suffix would survive to undergo VH (and of course would remain high). Note that this would evade the second problem as well, since there would be no V-raising involved.

Zimmer (1970) revisits the problem. Citing an observation by Lloyd Swift (p.c. to Zimmer), he notes that the special morphophonemic rule deleting a V preceding -Iyor would delete the only V of a CV- root, of which there are at least two in the language:[3]

| de + Iyor | => diyor | de = say |
| ye + Iyor | => yiyor | ye = eat |

In these cases, after stem-final V-deletion there would be no stem vowel left for the suffix to harmonize to. Swift's suggestion was to retain the Lees analysis and assume one additional rule rounding a V that occurs next to a morpheme boundary and is flanked by round vowels in the adjacent syllables.[4]

Base	öde + Iyor
V->0	öde + yor
V raising	ödi + yor
Rounding	ödü + yor
Surface	ödüyor

Zimmer notes that his regressive V->0 rule could be rescued by specifying that it does not apply to CV stems. Then the derivation of 'diyor' would be:

Base	de + Iyor
V->0	de + yor
V raising	di + yor
Surface	diyor

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3   There may be a couple of others, which will be discussed in section 4.
4   This analysis is essentially that assumed by Lewis (1967), p. 20.

But he proceeds to argue against that analysis, and in favor of the one suggested by Swift, on the grounds that the regressive V->0 rule (covertly or overtly) makes reference to a specific morpheme and has no visible phonological motivation, whereas the Swift analysis contains only phonologically plausible rules. The fact that the new rounding rule only gets to apply when the right context V is the /o/ of the -Iyor suffix can be viewed as accidental, while the regressive V->0 rule clearly is designed to apply in the presence of that suffix and that suffix only.

There is a remaining difficulty, however: the Swift-Zimmer account, at the apparently modest cost of one additional rule, evades the VH problem, but it re-introduces the V-raising problem. For the Lees analysis, even as modified by Swift/Zimmer, still relies on V-raising to make the stem-final V high after the suffix-initial V->0; and, as seen above, such Vs must end up high. But V-raising is in general optional, so it would have to be stipulated to be obligatory before the -(I)yor suffix but optional before the -(y)AcAk future suffix, the -(y)ArAk participial suffix, the -(y)An relative suffix, and many others. It looks like the -Iyor suffix still needs to be specifically mentioned, which is what Zimmer was trying to avoid.[5]

3 A Different proposal: Vowel epenthesis

The discussion in section 2 appears to lead to the conclusion that somewhere in the grammar a phonologically unmotivated reference to the -Iyor suffix is inescapable. Here I would like to explore the possibility that instead of being exceptional, the -Iyor morpheme is actually telling us something about the overall phonology of Turkish.

The reason the -Iyor morpheme appears exceptional is that it seems to go against the general pattern for V-initial suffixes, in which the suffix-initial vowel is deleted and the stem-final vowel remains, as assumed by Lewis (1967), Lees (1961, 1966), Zimmer (1965, 1970), and many others. I propose a reanalysis of the phonology of suffixes with initial V~0 alternation under which the alternation is due to vowel epenthesis rather than vowel deletion.[6] Thus, for example, the 1.sg.poss suffix is basically -m, and epenthesis provides the vowel when needed to break up an illegitimate final cluster of consonants:

kedi + m	=> kedim	kedi = cat
büro + m	=> bürom	büro = office
kaz + m	=> kazım	kaz = goose
ip + m	=> ipim	ip = rope

This will take some working out, as we shall see, but let me point out here that this analysis provides an explanation for a generalization which would otherwise be mysterious,

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5   The behavior of the V-raising rule is quite complex (cf. Lewis 1967:20; Lees 1966:54-55), and it may in the end be necessary for it to have some morphologically conditioned restrictions; but the point here is that the Swift-Zimmer analysis does not evade the necessity of specific morphological reference to -Iyor.

6   The analysis of V~0 suffixes in terms of epenthesis is assumed in a few sources (e.g. Kager 1999:373ff, Inkelas and Orgun 1995:785, but without discussion; I don't believe it has ever been worked out in detail.

namely that suffix-initial V~0 alternation (-Iyor aside) occurs mostly with those suffixes that can be analyzed as a single consonant, and of those occurs only with the ones that cannot combine with a previous consonant to form a legitimate final cluster.[7]

Under this analysis, the -Iyor suffix is exceptional in being the only suffix to trigger the regressive V-deletion rule of Zimmer (1965); but now this exceptionality can be considered accidental: -Iyor happens to be the only (productive) suffix in Turkish that begins with a vowel.

Here are the specifics of the proposed analysis:

(a) -Iyor is the only (productive) V-initial suffix
(b) Regressive V-deletion: a stem-final V is deleted when adjacent to a suffix-initial V.
(c) The remaining V~0 suffixes are almost all single Cs.
(d) V-epenthesis: inserts a high vowel (unspecified for backness and rounding) to break up an illegitimate CC cluster.[8]
(e) V-epenthesis feeds Vowel Harmony.

Assumptions (b), (c), and (d) are going to require further discussion, but that will be postponed to section 4. First let us see how the proposed analysis deals with straightforward cases.

As noted above, almost all the V~0 suffixes can be analyzed as consisting of a single C. Here is a partial list:

-m   1.sg.possessive
-n   2.sg.possessive
-ş   reciprocal
-n   reflexive
-l   passive
-r   aorist (but see section 4)

(The verbal agreement suffixes -m (1sg), -n (2sg), -k (1pl) only attach to stems ending in the past -DI or conditional -sA, so they never have V-initial forms.)

In the Lees analysis, all of these suffixes have high vowels (unspecified for backness and rounding) in the underlying representation, which get deleted when preceded by a V. In the analysis proposed here, a high vowel (similarly unspecified for backness and roundness) is inserted epenthetically when the affixation of the single-C morpheme would result in an illegitimate final cluster. For example:

anla + ş + mAk   => anlaşmak   anla = understand
koş + ş + mAk   => koşuşmak   koş = run

It is instructive to observe the alternations of the (regular) causative morpheme. It has two main allomorphs,[9] /t/ and /DIr/, which are distributed as follows:

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7   I rely here on the fact that only a few combinations of consonants constitute legitimate syllable-final clusters in Turkish. These are liquid + voiceless obstruent (türk, harf), a few in fricative + voiceless stop (aşk, üst), and some in glide + obstruent (aleyh, teyp). (These last ones are rare and borrowed.)
8   There is a V~0 alternation in certain roots which is analyzed by some (e.g. Lees 1961:37-38) as epenthesis. This will be discussed in section 4.

/t/ after polysyllabic stems ending in vowels or liquids
/DIr/ elsewhere

ye+CAUS+PST	=> ye-dir-di	ye = eat
al+CAUS+PST	=> al-dır-dı	al = take
azal+CAUS+PST	=> azal-t-tı	azal = decrease
imzala+CAUS+PST	=> imzala-t-tı	imzala = sign
imzala+CAUS+CAUS+PST	=> imzala-t-tır-dı	

Note that the /t/ allomorph never triggers V-epenthesis because it is always preceded either by a vowel or by a liquid, and [liquid]+t is a legitimate final cluster in Turkish.

The derivational suffix -t that appears in 'ayırt', 'geçit' works similarly, in that it is just /t/ when preceded by a vowel or a liquid, and /It/ otherwise.

There are some suffixes that do not consist of simply a C but still appear to behave in accord with the proposed analysis.[10] These suffixes, under the proposal advanced here, all begin with CC, followed by a V and perhaps another C:

-msI forms adjectives from adjectives and nouns:

kara 'black'	karamsı 'blackish'
mağara 'cave'	mağaramsı 'cavernous'
rapor 'report'	raporumsu 'report-like'
duvar 'wall'	duvarımsı 'wall-like'

/ms/ is not a legitimate final cluster. When -msI is added to a V-final stem, the /m/ syllabifies with the preceding V and the cluster is broken up. When the stem ends in a C, this becomes impossible and epenthesis supplies a vowel for the /m/ to syllabify with. As in the single C cases, the site of the epenthesis is always the beginning of the suffix.

-mtrak works similarly:

ekşi 'sour'	ekşimtrak 'sourish'
beyaz 'white'	beyazımtrak 'whitish'

There is a not very productive verb-forming suffix with the same behavior:

iyi 'good'	iyimse 'be optimistic'
kötü 'bad'	kötümse 'be pessimistic'
az 'little'	azımsa 'consider inadequate'
iç 'inside'	içimse 'internalize'

If we assume that the underlying forms of these suffixes begin with an illegitimate consonant cluster, the V-epenthesis rule will be triggered whenever they are attached to a C-final stem.

Other suffixes of this type include -ncI, -ntI (sekizinci, söylenti).

So the V-epenthesis hypothesis seems to account for the straightforward cases of the V~0 alternation. The next section will be devoted to some issues raised by this analysis.

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9   I ignore a few irregular causatives of specific roots, which are idiosyncratic and must be listed.
10 Cf. Lewis 1967:58, 230.

4 Some issues

Assumptions (b), (c), and (d) of the analysis proposed in section 3 require some discussion.

4.1 CV roots

If we are to adopt assumption (b), we need a story about what happens with CV stems in combination with -Iyor. One option would be to adopt Zimmer's (considered and rejected) proposal that the regressive V->0 rule be formulated not to apply to CV stems. This would not be so bad, because though the progressive V->0 rule would again be needed to get rid of the suffix-initial V, it seems that for most speakers the V of these CV-roots raises obligatorily before a suffix-initial /y/, whether it is the -Iyor suffix or not (diye, diyecek, *deye, *deyecek). But I do not like to have to appeal to a rule that only applies in the case of two forms, so I will explore a few other options. Suppose the regressive V->0 rule does delete the V of a CV stem:

de + Iyor => d + Iyor   de = say

The apparent problem is that the underspecified high vowel of the suffix now has no preceding V to harmonize with, and thus its backness and roundness features will not be filled in. I will present here a couple of possible solutions for this dilemma, and without firmly adopting one suggest nevertheless that this particular problem need not be fatal for the proposed analysis.[11]

For the two CV verb roots in common use, a simple way out would be to propose that when an underlyingly underspecified vowel does not get its unspecified features filled in by VH, those features are filled in with the default values (-back, -round). This would work because those two roots (de-, ye-) have vowels with those default values.

The viability of this approach turns on what happens with the two less common CV verb roots ko- and sı- (and others if they exist). ko- is a variant of koy-, and speakers and writers alternate between the two apparently freely. The standard progressive form of this verb is 'koyuyor', corresponding to its C-final variant. Alongside this we encounter 'koyor', especially in informal contexts, and even 'kuyor'.[12] We never encounter *kiyor,

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11 Parenthetically, we can dispose of one approach that will not work. We might assume that the underspecified V of -Iyor gets its features by VH *before* V->0. This looks initially promising, if you are willing to specify rule orders; since the regressive V->0 rule applies only before the -Iyor suffix, it should be safe to order it late enough to permit VH to take place previously. This won't work, however, because this ordering would lead to the wrong prediction in cases where the elided stem V is unround and the preceding V round:

gülümse + Iyor => gülümsüyor (*gülümsiyor)   gülümse = smile

The initial V of -Iyor always harmonizes with the *surface* V that precedes it, when there is one.

12 For some of this investigation I have relied on Google searches to determine what forms are in use. This is of course tricky, because what people write and post on the web is of varying quality (some people can't spell, for example). But I assume that if thousands of instances of a spelling are found, it must be in use. I also assume, since the writing system of modern Turkish is nearly phonemic, and people are accustomed to spelling things the way they think they sound, that the commonly occurring spellings reflect commonly occurring pronunciations. Thus I assume it is safe to take the spellings that people use

which is what would be expected if the suffix-initial vowel simply received default values for its unspecified features.

This is clearly a mess. I suggest provisionally that 'koyor' is a reduced form of 'koyuyor', arising from a late rule of laziness the effects of which are usually seen elsewhere in the same texts where 'koyor' appears. For example, for 'büyüyor' we find 'büyor', for 'soyuyor' we find 'soyor', for 'boyuyor' we find 'boyor'. The variant 'giyor' for 'giyiyor' is so common that we find injunctions warning people not to spell it that way.

As for 'kuyor', I found it seldom enough that it could just be an error. If it is real, it could just be the optional raising of V before /y/, which as we have seen is late anyway.

I tried to investigate the remaining CV verb sı-, which means something like 'fit, be suitable'. Unfortunately when I tried to look for its progressive form with Google, I was immediately taken to a lot of Turkish porn sites. It seems there is a current progressive form 'siyor', which I did not investigate further. Assuming that the progressive form of sı- is sıyor, again the insertion of default values would yield the wrong result. An alternative that would work for de-, ye-, and sı- would be to assume that rather than one of the vowels being deleted, the stem-final V and the suffix-initial V are merged, with a constraint ranking that ensures that when the two Vs differ in a feature specification, it is the value of the suffix V that predominates.[13] Since the suffix-initial V is specified only for +high, the resulting V will always be high, but will otherwise have the feature values of the root-final V.

To conclude this discussion of the CV roots problem: for de- and ye- it would be sufficient to say that underspecified vowels get default values when the environment does not provide them; alternatively we could assume that the two vowels are merging, with the +high feature of the suffix V guaranteed to be preserved in case of conflict; for ko- we can reasonably assume that the variant 'koyor' is derived from 'koyuyor' by an optional rule that elides a non-initial /yV/ syllable when it is followed by another /yV/ syllable.

Finally, what if none of the above attempts to make sense of the CV- roots problem work out? The final solution would be to simply specify that the progressive form of the root de- is 'diyor', the progressive of ye- is 'yiyor', and the progressive of ko- and sı- is whatever it is. It clearly must be possible to include such specifications in a grammatical description, though we avoid them if possible. In the framework of distributed morphology, it would involve fusion of adjacent morphemes and a few specific Vocabulary Insertion rules.

4.2 The Aorist

Assumption (c) requires us to say something about the Aorist suffix, and the small class of derivational suffixes that have the form -VC, where V is low. Those will be treated in section 4.3.

(especially the unconventional ones) as evidence about phonological outputs. Here I should also mention that none of the native speakers of Turkish that I consulted admit to knowing either /si/ or /sı/ as a verb root.

13 Contra a claimed OT universal (cf. McCarthy and Prince 1995); but see Ussishkin (2000), Kurisu (2001), Alderete (1999), and Hargus and Beavert (2006) for some counterexamples to that universal.

The aorist suffix has the peculiarity that while following V-final stems it is just -r, following C-final stems it has two further allomorphs: -Ir and -Ar.

ara + AOR	=> arar	ara = seek
gör + AOR	=> görür	gör = see
kaç + AOR	=> kaçar	kaç = escape

The Aorist suffix takes the form:

(a) /r/   after V-final stems
(b) /Ir/   after polysyllabic or polymorphemic C-final stems
(c) /Ir/   after a small list of C-final monosyllabic roots
(d) /Ar/   elsewhere

Within the current analysis, we have to say that the Aorist suffix has two underlying allomorphs: /r/ and /Ar/. The /Ar/ allomorph is selected by all but twelve monosyllabic roots; the /r/ allomorph occurs elsewhere.

This is stipulative, but I don't know of any less stipulative analysis that accounts for the facts.[14]

4.3 -VC derivational suffixes

There is a small class of suffixes that appear to have the shape -VC, where V is a low vowel:

ölç+Ak	ölçek	'scale'	ölç = measure
gör+Av	görev	'duty'	gör = see
dik+Ay	dikey	'perpendicular'	dik = set up
az+Al	azal	'decrease'	az = little

If these are treated as -C suffixes in the proposed system we have a problem because it looks like a low vowel would have to be epenthesized:[15]

ölç + k   => ölçek
gör + v   => görev

If they are treated as -VC suffixes with an underlying low vowel, we might expect the stem-final vowel to be deleted when these suffixes attach to a a V-final stem. Interestingly, I can find few examples of such suffixes even putatively attached to V-final stems. Lewis (1967) cites 'büyük', but it is not clear that this adjective, which means 'big', is derived from the verb 'büyü', which means 'become big'.

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14 The passive suffix also needs a bit of explication. Like the Aorist, it has two variants: /l/ and /n/. The /n/ variant occurs after V-final stems and stems ending in /l/; otherwise /l/ occurs. Thus the /l/ variant will always induce an epenthetic vowel, while the /n/ variant will do so only when immediately preceded by an /l/.

15 Most of these low vowel suffixes were borrowed by the neologizers from other Turkic languages. I don't know whether they were productive in those languages.

In fact, while these suffixes were favorites of the language reformers, none of them are productive, and it would not be unreasonable to regard such words as 'görev', 'ölçek', 'azal' as essentially monomorphemic.

I will take the same approach to the Arabic suffix -î, which (so far as I know) attaches only to Arabic roots. As far as Turkish is concerned, the adjectives in -î are just lexically listed.

4.4 Cyclicity

Assumption (d) of section 3 leads to an interesting consequence about the organization of the phonology. As we have seen, the V-epenthesis hypothesis accounts for a wide range of cases, both where epenthesis occurs and where it doesn't, on the basis of the assumption that epenthesis is triggered by the need to break up an illegitimate final consonant cluster. To maintain this analysis, it will be necessary to make two interesting assumptions about the plurals of the 1st and 2nd person possessive forms of nouns.

arabamız	'our car'
arabanız	'your car'
evimiz	'our house'
eviniz	'your house'

Most grammars (e.g. Lewis 1967) give the plural possessive suffixes as monomorphemic (-ImIz, -InIz) (while noting that -Iz might be regarded as a pluralizer). In the analysis proposed here, the initial V should not be underlying, but epenthesized; for that to work, though, the suffix must not be monomorphemic (it would be /mIz/, /nIz/) because then there would be no illegitimate cluster to break up:

ev + mIz

should just happily become *evmiz, since the /m/ would be the onset of the second syllable, and there is nothing wrong with v-m across a syllable boundary:

evmiş	'it was a house'
dövmek	'to beat'

We must assume, first, that these possessive plural forms involve two suffixes, not one:[16]

/m/	1st.poss	/n/	2nd.poss
/z/	pluralizer[17]		

So that the underlying morphemes in 'evimiz' are

ev + m + z

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16 A similar analysis will apply to the pluralized 2nd person agreement forms:

al + dI + n + z   => aldınız

17 Lees (1961) also assumes that the pluralizer is a separate suffix (pp 24-25).

and second that V-epenthesis proceeds cyclically, first applying to break up the v-m cluster:

evim + z

and then again to break up the m-z cluster:

evimiz

(Vowel harmony can happen cyclically or not, it does not matter here; but there is other evidence that VH applies cyclically from the root outward.)

4.5 V-epenthesis in roots

Perhaps the most interesting question raised by this line of analysis concerns the relation between the suffix-legitimizing epenthesis proposed here and the similar-looking alternation in roots. A number of roots end in CC, where CC is not a legitimate final cluster, as long as a V-initial suffix follows:

akıl	'intelligence'	aklı	akılda
oğul	'son'	oğlu	oğulda
beyin	'brain'	beyni	beyinde
ağız	'mouth'	ağzı	ağızda

This phenomenon too might be viewed as an instance of vowel epenthesis triggered by an illegitimate syllable-final cluster. (This is what Lees (1961:37-38) assumes; See also Clements and Sezer (1982), which argues strongly for an epenthesis account of these alternations.) If the underlying representation of 'akıl'   is 'akl', the affixation of a V-initial suffix will legitimize the root-final CC cluster by permitting the second C to be syllabified as the onset of the following syllable. A C-initial affix will not permit this, as there are no complex onsets in Turkish. This might or might not be the same process that applies in the case of suffixes; but if it is, it is either not cyclic here, or more likely there is something special about roots, such as that there is no cycle on a root.

akıl 'intelligence'	ömür 'life'
akılda LOCATIVE	ömürde LOCATIVE
akla DATIVE	ömre DATIVE

If the root is analyzed as containing an underlying illegitimate final consonant cluster (akl, ömr), epenthesis can be assumed to provide a high vowel to break up the cluster when the root is not adjacent to a V-initial suffix. For 'akl', the derivation will be:

akl + yA	(the underlying form of the Dative suffix is /yE/)
akl + A	(suffix-initial C->0/V+_)
akla	(VH; epenthesis is not triggered)

Note that there is a derived environment effect: if this epenthesis is the same one as we have postulated for the V~0 suffixes, it must not apply within the root before consideration of any suffixes (i.e. there cannot be a cycle containing the root alone), for then epenthesis

would always apply and there would be no alternation. This is seen even more clearly in the case of a V~0 suffix:

```
beyn + m
--------              (V-epenthesis does not apply to break up /yn/)
beyn + Im             (V-epenthesis does apply to break both /yn/ and /nm/)
beynim                (Vowel Harmony)
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This certainly looks like a derived environment effect (though somewhat different from the effects described in Kiparsky (1973)); in any case, for the analysis proposed here to work, V-epenthesis must not apply to a root if it can apply in a root-adjacent suffix. This looks initially quite weird, but perhaps it is not so weird. In both cases, the function of epenthesis is to fit a morpheme to its environment: in the case of the root, the relevant environment is the adjacent suffix (or lack of one); for the suffix, the relevant environment is the stem that it attaches to. It makes sense that the root needs to see the phonological shape of the suffix to its right to determine whether to epenthesize; thus an epenthesis cycle on the root itself would not make any sense at all. For the suffix, our analysis suggests that the function of epenthesis is to fit the shape of the suffix to its preceding environment, without regard to its following environment. This is why we assumed a cyclic mode of application. Everything points to this: if the two cases of epenthesis are the same process, it must apply cyclically, but there is no cycle that just includes the root (when there are affixes). When it does apply on the first cycle out from the root, it inserts a vowel which solves both problems at once (the root becomes legitimate, and the suffix simultaneously becomes legitimate). Finally, if there are no suffixes at all, V-epenthesis gets to apply to produce the form that the word has in isolation. Maybe that means there is a Word cycle, though there is no Root cycle. Miraculously, all of this makes sense in the level-ordered system of Inkelas and Orgun (1995): they propose that a root-final consonant is invisible to phonological operations at the root level, but is visible thereafter. Thus V-epenthesis cannot apply at the root level; it can apply if the environment at the next level requires it, which will be the case if there is a consonant-initial suffix attached. Finally, there is a word-level round in which epenthesis will apply if the root has no suffixes at all.

4.6

In section 4, we have considered five issues raised by the V-epenthesis analysis proposed in section 3. First, the problem of CV- roots can be reduced, at worst, to the stipulation of progressive forms for four verbs. Second, the Aorist suffix has a low-vowel allomorph which cannot be the result of V-epenthesis; this allomorph is selected by a majority of monosyllabic C-final roots. Third, the remaining -VC derivational affixes are non-productive and there is no sign that they combine productively with V-final stems. Fourth, the V-epenthesis rule must apply cyclically. Fifth, if the epenthesis that affects certain roots is the same thing, there cannot be a root cycle for epenthesis. There must, however, be a word cycle.

5 Conclusion

The analysis proposed here satisfies Zimmer (1970)'s desire not to have a rule that specifically mentions the -Iyor suffix. The unusual behavior of the V~0 alternation in the presence of this suffix is due to its being the only (productive) suffix in the language that happens to begin with a vowel. Thus the fact that it is the only suffix to trigger the regressive V->0 rule (or whatever alternative, cf. section 4.3) is accidental.

The analysis makes sense of the fact that all other (productive) suffixes that exhibit the V~0 alternation are analyzable as consisting of a single C or beginning with an illegitimate CC sequence, thus triggering V-epenthesis just when the addition of the suffix would result in an illegitimate final cluster.

For the analysis to work, the /z/ pluralizer in the possessive and 2p agreement systems must be considered a separate morpheme, and the V epenthesis rule must apply cyclically from the stem outward. Further, if the epenthesis appealed to here is the same as the epenthesis that occurs in certain roots, the rule must be subject to a very particular derived environment effect.

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