

*The treatment of long vowels in word games**

Robert M. Vago

Queens College and the Graduate Center, City University of New York

1 Introduction

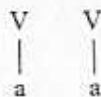
In the current nonlinear model of CV phonology (Clements & Keyser 1983), phonological representations are organised into several levels or tiers, of which the following three are the most significant: the central CV tier (skeleton), whose units, C and V, are autosegmentally associated with the units of the syllable tier on one end and with the units of the segmental tier on the other. The segmental tier itself is organised into subtiers of distinctive features; the internal structure of the syllable tier is subject to considerable debate in the literature. In addition, CV-level units may be linked to melodies on separate autosegmental tiers in the case of supra-segmental phenomena like tone and vowel harmony.

Within the CV phonology framework long segments are represented in terms of two timing units, or slots, on the CV tier. Normally, long vowels are represented as VV, geminate consonants as CC; VC long vowels have been suggested for Turkish and Klamath by Clements & Keyser (1983) and for Hungarian by Vago (to appear), VC geminate consonants for Luganda by Clements (to appear). The two CV-level units are tied either to one segment-level unit or to two identical segment-level units. I will call these configurations respectively the many-to-one and the one-to-one representation of length. The two ways to represent long *a*, for instance, are schematised in (1):

(1) a. many-to-one



b. one-to-one



In the great majority of cases long segments are represented in terms of the many-to-one relation. The one-to-one representation seems to be required in certain cases, however: for some long vowels in Cuna (Sherzer 1970), Gokana (Hyman 1982), and Latin (Steriade & Schein 1984), and

for some geminate consonants in Tigrinya (Schein 1981; Kenstowicz 1982), and Malayalam (Mohanam & Mohanam 1984), to mention just a few.

In this article I aim to bring forth external evidence derived from word games (secret languages) in support of the many-to-one representation of long vowels within the nonlinear CV phonology framework.¹ In §§ 2-4 I describe the patterning of long vowels in word games played in three languages: Finnish, Estonian and Bakwiri. In each section I dismiss the one-to-one representation of long vowels, as well as the analysis within the linear or standard generative model (Chomsky & Halle 1968). In the case of the Finnish and Estonian word games, I also discuss implications for the representation of diphthongs in these languages. In § 5 I bring additional word games into consideration, and conclude that the fact that word games can apply on different levels validates the multi-tiered structure of phonological representations.² Throughout the paper, the symbols C and V refer to CV-level units, while the terms CONSONANT and VOWEL refer to segment-level units.

2 Finnish

Several varieties of word games are known to exist in the Finnish language (Ojansuu 1916; Seppänen 1982).³ In one of the games played primarily by children, called *kontti kieli* or *kontinkieli* (*kontti* 'language'), as described in detail by Campbell (1980, 1981), a word is transformed into a four-word phrase: the word *kontti* is placed after a word, and then the entire expression is subjected to an exchange operation according to which the initial C₀V sequences of each word are interchanged. Examples are provided in (2):

- (2) a. *asuu* 'he lives' → *asuu kontti kosuu antti*
 b. *nälkä* 'hunger' → *nälkä kontti kolka nänntti*

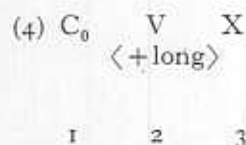
The effects of the exchange operation are apparent in the last two words within each expression; the first two words will henceforth be disregarded. In (2b) it is observed that one of the consequences of the exchange is that a front vowel in the non-initial syllable of the first word assimilates in backness to the back vowel of the preposed initial vowel of *kontti*. This change is due to the well-known vowel harmony process of Finnish. *Kontti kieli* has important implications for the description of vowel harmony, but since I deal with this issue in detail elsewhere (Vago 1984), in the present discussion I will ignore, as much as possible, the changes due to vowel harmony. Rather, I want to concentrate on the significance of the game for the representation of vocalic length. To this end, let us consider the forms in (3):

- (3) a. *riippua* 'to hang' → *kooppua rintti*
 b. *maahan* 'land' (ill. sg.) → *koohan mantti*

We may note that if the initial vowel of the first word is long, then the preposed short vowel of the second word becomes long, and the postposed

long vowel of the first excluded from the exchange.

In a linear theoretical reharmony, can be described



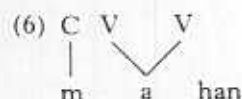
The above rule contains the fact of length in case the initial vowel becomes long and the conditions have to be expressed in a linear theory.

In contrast, CV phonology facts, obviating ad hoc multi-levelled phonology described as in (5):

- (5) *Kontti kieli*
 a. Place *kontti* after
 b. Interchange the

The theory specifies in which unit is moved, both automatic unit is associated are in convention. Therefore, segmental vowel harmony C slot, if any, and V slot

If we follow commonly associating a syllable CV tier, then the facts place. As shown in (6), word entails the movement



(Schein 1981; Kenstowicz 1984), to mention just a few. Evidence derived from word many-to-one representation of logy framework.¹ In §§2-4 I word games played in three In each section I dismiss the well as the analysis within the ky & Halle 1968). In the case also discuss implications for e languages. In §5 I bring id conclude that the fact that s validates the multi-tiered Throughout the paper, the ile the terms CONSONANT and

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nänntti

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antti
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long vowel of the first word becomes short. In other words, length is excluded from the exchange operation.

In a linear theoretical framework the facts of the word game, excluding reharmony, can be described by rule (4), as suggested by Campbell (1981):

$$(4) \begin{array}{ccccccc} C_0 & & V & & X & & \\ & & \langle +\text{long} \rangle & & & & \end{array}$$

$$\begin{array}{ccccccc} 1 & & 2 & & 3 & & \rightarrow & & ko & & 3 & \# & 1 & & 2 & & ntti \\ & & & & & & \langle +\text{long} \rangle & & & & & & & & \langle -\text{long} \rangle & & \end{array}$$

The above rule contains two separate clauses concerning the realisation of length in case the initial vowel of the first word is long: the preposed *ko* becomes long and the postposed long vowel becomes short. These two conditions have to be expressed explicitly under any formulation of the rule in a linear theory.

In contrast, CV phonology offers a straightforward description of the facts, obviating ad hoc stipulations of length. Within the context of a multi-levelled phonological structure, the facts of *kontti kieli* can be described as in (5):

- (5) *Kontti kieli*
a. Place *kontti* after a word
b. Interchange the initial C_0V slots of each word

The theory specifies independently (see Vago 1984) that when a CV-level unit is moved, both autosegments and segments with which that CV-level unit is associated are moved as well. I assume the correctness of this convention. Therefore, rule (5) interchanges the units on both the autosegmental vowel harmony tier and the segmental tier with which the initial C slot, if any, and V slot are associated.

If we follow common practice and represent long vowels by autosegmentally associating a single segment-level unit with the slots VV on the CV tier, then the facts of vocalic length in *kontti kieli* fall directly into place. As shown in (6), the movement of the initial CV slots of the first word entails the movement of the associated segment-level units:⁴

$$(6) \begin{array}{ccccccc} C & V & & V & & C & V & & & C & V & V & & C & V & & \\ | & / & & \backslash & & | & | & & & | & | & & & | & | & & \\ m & & & a & & k & o & & \rightarrow & k & o & & & m & a & & ntti \rightarrow \\ & & & & & & & & & & & & & & & & \\ & & & & & C & V & & & C & V & & & & & & \\ & & & & & | & | & & & | & | & & & & & & \\ & & & & & k & o & & \rightarrow & k & o & & & m & a & & ntti \end{array}$$

As a result of the interchange, the second V slot of the long vowel becomes unassociated. A general convention (cf. Clements & Keyser 1983) associates an empty V slot with a preceding vowel. A single segment-level vocalic unit which is associated with two CV-level (timing) units is interpreted phonetically as a long vowel.

The many-to-one representation of Finnish long vowels is the only one possible within the autosegmental account of length, assuming that (5) is a CV-level rule. The one-to-one representation fails:

(7) C V V C V
 | | | | |
 m a a h a n k o n t t i → *koahan mantti

At this point one might legitimately propose an alternative analysis in which the rule of *kontti kieli* applies exclusively on the segment level. In this formulation, the initial consonant(s) and vowel are interchanged, but not the associated CV-level slots. The problem with this suggestion is that it does not account for the fact that *kontti kieli* triggers reharmony in the first word; cf. (2b). As I show in Vago (1984), harmonic autosegments are mapped on to units on the CV tier.⁵ In this light, if the CV-level units are left intact in *kontti kieli*, we do not expect any harmonic change in the words involved. But this, as we have seen, is contrary to the observed facts. We might get around this problem by stipulating that the movement of segment-level units entails the movement of all associated CV-level units. But then we do not expect any change in the length of the interchanged vowels. Again, this prediction is proven false by the facts. In brief, the correct generalisation seems to be that the rule of *kontti kieli* moves CV-level units and all associated units on the autosegmental and segmental tiers.

The game of *kontti kieli* can be brought to bear in an interesting way on the proper representation of diphthongs in Finnish. According to Campbell (1981), Finnish has three types of diphthongs: underlying diphthongs, diphthongs obtained through the loss of a medial *k* in the weak grade of consonant gradation, and diphthongs derived from long mid vowels. The first two categories of diphthongs, which I will call long, are analysed in the same way as two short vowels, that is, in terms of two vowels, where each vowel is tied to its own V slot (one-to-one association). This analysis receives support in *kontti kieli*. As shown in the forms in (8) and (9), only the first vocoid of these diphthongs is interchanged:

(8) a. V V C V
 | | | |
 a u k i 'open' → kouki antti

b. C V V C C V
 | | | | | |
 v e i t s i 'knife' → koitsi ventti

(9) a. C V
 | |
 h i k e + n +

b. C V
 | |
 p i k e + n +

On the other hand, the diphthongisation rule, these diphthongs, such as which are in free variation

(10) a. /voori/ 'mount
 b. /tee/ 'road' →

In one variant the pre-diphthong are transposed, the diphthong is exchanged, free variation, we make a cut the autosegmental slot and associates the first component is a raised close

(11) *Diphthongisation*

V V
 \ /
 [-high] → [+high]
 [-low] [-low]
 [α round] [α round]

The resultant diphthong occupies a CV-level slot (one-to-one association) and represents unstressed (i.e. non-contrastive) variation.

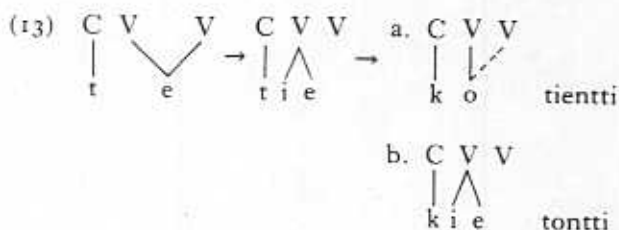
Additionally, the rule of *kontti kieli* has the effect that the diphthong is associated with a complete CV-level slot.

(12) *Kontti kieli*
 c. Branching V n

The second alternant of the diphthong, hence the first V of the initial C, of course, can

reassociated with a segment-level unit from which it had been dissociated by a rule. A general convention is assumed to that effect.

The derivation of the alternant forms in (10b) is shown in (13):



If the branching V slot is moved, we obtain long *koo* as before, by associating the empty second V slot to the preceding vowel. Note that this derivation is possible only under the assumption that the diphthongisation rule leaves the second V slot of the underlying long vowel in place. (The word game rule cannot precede the diphthongisation rule: alternants like *kie tonntti* in (13b) could not be derived.) Now if it turns out that the diphthongisation rule is lexical, in the sense of the Lexical Phonology framework (see for instance Kiparsky 1982), then we have a significant piece of evidence, one that is otherwise difficult to obtain, for letting unassociated CV-level units remain in phonological representations at least through the lexical level, rather than pruning them by convention: the postlexical *kontti kieli* rule (its input consists of words) must have access to an unassociated V slot. On the other hand, if the diphthongisation rule belongs to the postlexical phonology, or in those dialects where the *kontti kieli* rule can precede the diphthongisation rule, all bets are off concerning the preceding remarks on the empty V slot.⁷

In sum, the facts of the *kontti kieli* word game strongly suggest that in Finnish vocalic length should be represented autosegmentally rather than segmentally, and that the autosegmental association between the CV- and segment-level units is many-to-one in the case of long vowels, one-to-one in the case of long diphthongs, and one-to-many in the case of short diphthongs. These results are in accord with those obtained by language internal analysis; see Keyser & Kiparsky (1984); Prince (1984).

3 Estonian

The conclusions from the Finnish word game receive more weight from the treatment of long vowels and diphthongs in an Estonian word game described by Lehiste (1985). To play this game, *pi* is inserted after the first V of a word. (We may ignore here the fact that primary stress is shifted from the initial syllable to the inserted syllable.) If the initial syllable contains a long diphthong, then *pi* is inserted between the two vocoids.⁸ An initial long vowel, however, is not broken up into two elements; rather, the vowel of *pi* bears the length and the long vowel is shortened.

The patterning of *ir* is exemplified in (14):

- (14) a. sada 'hundred'
b. laulus 'in the'
c. saada 'send'

In a linear framework following (ignoring st

- (15) # C V
<+
1 2

That is, if the first vowel of the inserted

vowel is shortened. The problem is that though it derives within CV phonology, the game applies on the CV level. If the rule refers to segmental initial words, we must shorten the word. But in that case the vowel is long. For no word of many-to-one or one-to-many derived. For example:

- (16) a.
$$\begin{array}{c} \text{C} \quad \text{V} \quad \text{V} \\ | \quad \diagdown \quad / \\ \text{s} \quad \text{a} \end{array}$$
- b.
$$\begin{array}{c} \text{C} \quad \text{V} \quad \text{V} \\ | \quad | \quad | \\ \text{s} \quad \text{a} \quad \text{a} \end{array}$$

Let us assume rather than one-to-one in a word. In that case the one-to-one associator leaves the many-to-one structure obtained by

- (17) *
$$\begin{array}{c} \text{C} \quad \text{V} \quad \text{C} \quad \text{V} \\ | \quad | \quad / \quad | \\ \text{s} \quad \text{a} \quad \text{p} \quad \text{i} \end{array}$$

The above representation is ill formed; it contains crossing association lines, which are universally prohibited (cf. Goldsmith 1976). To remove the violation, we assume that the long vowel is dissociated from its second V slot; this is the most economical route (i.e. it involves the least number of dissociations) to a well-formed representation. (Also, a dissociated *pi* would presumably not be realised.) The empty V slot then becomes associated with the preceding vowel by convention, as before. The correct output *sapiida* is thus obtained:

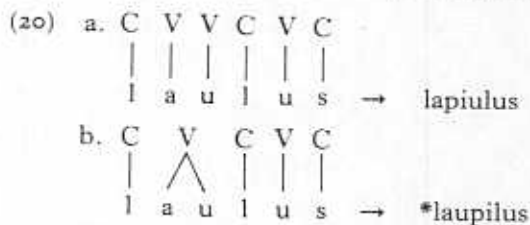


One might query why, after the rule of the game has applied, it is representation (17) that is obtained and not (19):



By way of justification, it can be noted that, after the offending (first) association line of the long vowel is cut, vocalic length is lost and an initial consonant cluster is created, thereby destroying the expected pattern of *pi* words. (17), therefore, is a preferred intermediate representation to (19).¹⁰

Now that we have shown that the rule of the *pi* game applies at the CV level of representation, it is a trivial matter to demonstrate that diphthongs must have the one-to-one autosegmental representation, not the one-to-many, as in the case of short diphthongs in Finnish. For example:



In sum, the *pi* word game supports the analysis of Estonian long vowels and diphthongs in terms of the many-to-one and one-to-one associations, respectively.

4 Bakwiri

As described by Hombert (1973, 1976), young speakers of Bakwiri on the southern slopes of Mount Cameroon play a word game in which the last syllable of a word is exchanged with the initial one.¹¹ Some examples of bisyllabic words are given in (21):

- (21) a. mǎzǎ 'viper' → zǎmǎ
 b. mǎkǎ 'plantain' → kǎmǎ

Bakwiri has a le that when a short becomes long, and it becomes short:

- (22) a. Pèèzé 'b'
 b. Pèzèè 'it'

There is a fur considered. As exchanged syllable the transposition associated units or assuming that tone to slots on the CV word game does not the word game course movement of a syllable movement of associated Bakwiri word game course, we explain.

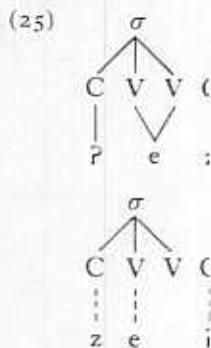
It cannot be the the CV level media affect the latter introducing ad hoc the domain of the.

The rule of the (23) Exchange the word

The form in (24) one vowel only:

(24) liòbá 'door'

The many-to-one as the following structure units are



Bakwiri has a length contrast in vowels. The following forms indicate that when a short vowel is moved into the position of a long vowel it becomes long, and, conversely, when a long vowel displaces a short one it becomes short:

- (22) a. ʔèèzé 'bone' → zèèʔé
 b. ʔézèè 'it is not' → zéʔèè

There is a further fact of the Bakwiri word game that must be considered. As exemplified by the forms in (22), the tonal patterns of the exchanged syllables do not change. In §2 it was assumed, and justified, that the transposition of a CV-level unit entails the transposition of all associated units on the segmental and autosegmental melody levels. Now assuming that tonal melodies, just like harmonic melodies, are mapped on to slots on the CV tier, and taking into account the fact that the Bakwiri word game does not change tonal patterns, we arrive at the conclusion that the word game cannot move CV-level units. If we assume that the movement of a segment-level unit does not automatically trigger the movement of associated units on other levels, we may safely claim that the Bakwiri word game is played on the segment level. At the same time, of course, we explain why vocalic length functions independently in the game.

It cannot be the case that the word game moves syllable nodes: since the CV level mediates between the syllable and segment levels, no rule can affect the latter two levels to the exclusion of the CV level (without introducing ad hoc stipulations). Rather, the syllable functions to delimit the domain of the segment-level units to be moved.

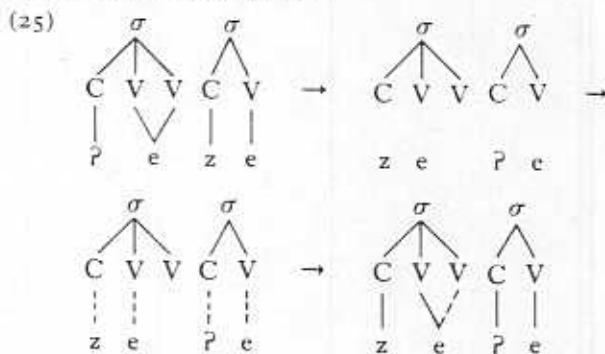
The rule of the word game can now be stated informally as follows:

- (23) Exchange the segmental units of the initial and final syllable of a word

The form in (24) shows that rule (23) cannot be formulated so as to move one vowel only:

- (24) liòβá 'door' → βáalió¹²

The many-to-one representation of long vowels in Bakwiri is feasible, as the following derivation of (22a) demonstrates (tones and syllable structure units are omitted):



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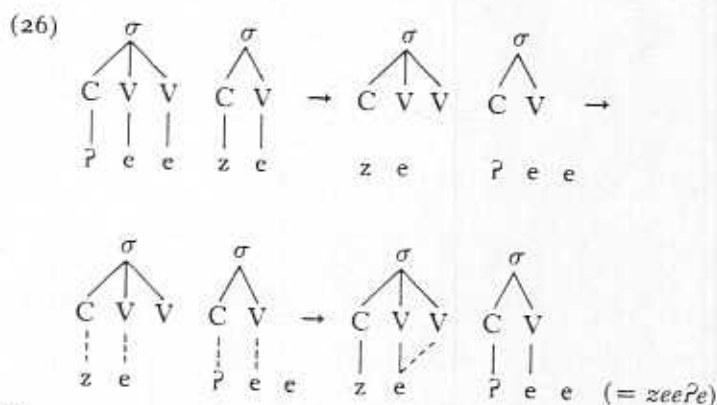
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lysis of Estonian long vowels and one-to-one associations,

ng speakers of Bakwiri on the word game in which the last tial one.¹¹ Some examples of

It might also be possible to analyse Bakwiri long vowels with one-to-one association:



The output in (26) is obtained by applying rule (23), left-to-right linking by convention, spreading a vowel to a following empty V slot by convention, and leaving a floating vowel unrealised by convention. (Note that the many-to-one representation is required anyway.) However, the patterning of double vowels (one-to-one association) shows (cf. (24)) that Bakwiri must have a rule that, following the word game, incorporates a final floating vowel into the final syllable. The existence of this rule would mitigate against the one-to-one representation of long vowels in Bakwiri, unless the incorporation rule is restricted to apply only to those floating vowels which are distinct from the vowel that precedes. In any event, in the face of the available evidence from many different languages, it should not be controversial to claim that the many-to-one analysis of tautomorphic long vowels is unmarked, and the one-to-one marked.

In sum, the Bakwiri word game suggests that the many-to-one analysis of long vowels in Bakwiri is likely, although the one-to-one representation cannot be ruled out entirely. The fact that the word game leaves both the length and tone of the displaced vowels unaffected is explained in the CV phonology framework: the CV tier, where length is expressed and to which tonal melodies are attached, is independent of the segmental tier, where the rule of the game is applied. It is obvious that the description of the facts in a linear theoretical model, with explicit statements on length and tone, is not a viable alternative.

5 Conclusion

The word games discussed in this article either permute or affix phonological material. In this concluding section I briefly consider a number of other permuting and affixing word games that exploit the CV- *vs.* segment-level dichotomy of CV phonology, as reflected in suprasegmental aspects of vowels.

Finnish *kontti kie* units are permuted as seen in the follo 1973, 1976):

- (27) a. Thai: kôr
b. Burmese:

In the Thai and I initial consonants, i must assume that t that admits hierarc affecting CV-level u

The Bakwiri wo suprasegmental feat a suprasegmental f (Conklin 1956):

- (28) a. salá:mat 't
b. dí:to 'here
c. kapatíd 'si
d. magadá 'l

In (28a) the order interchanged; in (28c) is preposed. In each stress. Segment-level reference to the syllable in the first two exan syllables are lengther as reported by Hom *nká:mbò* 'grandfather (Clements to appear 'flower' → *limuki*. As but not CV units, as *mweezi* 'moon' → *ziin*.

The Estonian *pi ga* Finnish word game m in a game played by t discussed in McCarth consonant sequence of *gay-*. For example, *bi:z* length is lost. This fact units of a word (not another Hanunóo wor with the last syllable, above becomes *na:biw* the CV or the segment

In summary, the wo

Finnish *kontti kieli* exemplifies the class of word games in which CV-level units are permuted. Thai and Burmese also have word games of this sort, as seen in the following examples (Haas 1969; as reported by Hombert 1973, 1976):

- (27) a. Thai: kôn jàj 'big bottom' → kàj jôn
 b. Burmese: mí bòw 'fire place' → mòw bí

In the Thai and Burmese word games successive syllables, exclusive of initial consonants, are interchanged. Since tones are moved as well, we must assume that the games are played on the CV level (or, in a theory that admits hierarchical syllable structure, on the level of the rhyme, affecting CV-level units as well).

The Bakwiri word game rearranges segment-level units and leaves suprasegmental features (length and tone) intact. The same treatment of a suprasegmental feature (stress) is observed in Tagalog word games (Conklin 1956):

- (28) a. salá:mat 'thanks' → tamá:las
 b. dí:to 'here' → dó:ti
 c. kapatíd 'sibling' → tidpaká
 d. magandá 'beautiful' → damagán

In (28a) the order of the segments is reversed; in (28b) the vowels are interchanged; in (28c) the syllables are reversed; in (28d) the final syllable is preposed. In each case, some segmental material is transposed, but not stress. Segment-level application, in the last two cases also making reference to the syllable as the domain, seems justified. (The long vowels in the first two examples are rule-derived: stressed vowels in non-final syllables are lengthened.) Cf. also a word game in Sanga (Coupez 1969; as reported by Hombert 1976), where the tone patterns are unaltered: *nkàómbò* 'grandfather' → *mbòónkà*. Similarly, in a Luganda word game (Clements to appear) the order of syllables is reversed: e.g. *kimuli* 'flower' → *limuki*. As Clements suggests, the game moves segmental units, but not CV units, as evidenced by the fact that length is invariant: cf. *mweezi* 'moon' → *ziimwe*.¹³

The Estonian *pi* game is an example of CV-level affixation; see also the Finnish word game mentioned in note 7. Segment-level affixation is found in a game played by the Hanunóo of the Philippines (Conklin 1959; also discussed in McCarthy 1982). In this game, the initial consonant-vowel-consonant sequence of a word, excluding prefixes, is appended to the prefix *qay-*. For example, *bi:ɲaw* 'nick' becomes *qaybiɲ*. It is evident that vocalic length is lost. This fact is explained by removing the first three segment-level units of a word (not counting prefixes) and attaching them to *qay-*. In another Hanunóo word game, the initial syllable of a stem is exchanged with the last syllable, excluding codas. Thus the word for 'nick' given above becomes *na:biw*. The length pattern here is consistent with either the CV or the segment-level application of the rule.

In summary, the word games discussed in this paper support the basic

claim of the CV phonology framework that phonological representations are organised into several independent levels which are related to each other by the principles of autosegmental phonology. Within this conception of phonological structure, long vowels are represented ordinarily in terms of two CV-level units being autosegmentally linked to one segment-level unit. Under this analysis the patterning of long vowels in word games is automatically accounted for, once the level status of a rule is determined. In contrast, a linear analysis must mention changes in length explicitly in each case. This simply means that the patterning of length is accidental, rather than predicted.

NOTES

- * I am thankful to Nick Clements, Ilse Lehiste, John McCarthy, and the anonymous referees of this journal for comments and suggestions.
- [1] For a detailed exposition of word games and their import for nonlinear phonology and morphology, see McCarthy (to appear) and references cited there. Speech errors provide yet another interesting source of external evidence for the nonlinear representation of length; see Stemberger (1984).
- [2] The claims raised in the present study are equally compatible with an alternative nonlinear framework in which the units of the central tier are abstract, unspecified timing slots organised into higher-level prosodic categories; cf. Hyman (1984); van der Hulst (1984), among others. Early in the development of nonlinear phonology length was described in terms of metrical structure; see for example Leben (1980); Ingria (1980); Prince (1980). This position has now been largely abandoned.
- [3] The contents of this section were included in an oral presentation entitled 'On the representation of length' at the 5th International Phonology Meeting, Eisenstadt, Austria, June 1984.
- [4] In (6) and subsequent derivations the syllable and autosegmental tiers are omitted.
- [5] Tone also is mapped on to the CV tier. Thus, in the segment-level Bakwiri word game discussed in §4, segmental units are moved, but not tones.
- [6] There exist dialects in which all diphthongs, no matter their source, pattern alike; see Campbell (1981: 178, n. 8). In these dialects the diphthongisation rule is formulated differently. Cf. also Seppänen (1982: 11), who cites /peen/ *pien* 'ditch' → *koen pintti*. (I am indebted to András Kornai for bringing Seppänen's work to my attention.)
- [7] Campbell (1981: 176) refers to a Finnish word game which 'truncates each word after the first vowel, lengthens it, and adds *-ver* to it'. For instance: *tule* 'come' → *tuuver*. The facts are readily described in the CV phonology framework: following short vowels, *-ver* is assumed to be preceded by an empty V slot which becomes linked to a preceding vowel by convention, thus bringing about a phonetically long vowel.
- [8] Estonian also contains overlong vowels and diphthongs. See Prince (1980) for a metrical analysis of the overlength phenomenon.
- [9] Lehiste quotes the forms in the *pi* game phonetically; I use standard orthography instead.
- [10] An anonymous referee has suggested that there might be a universal convention which preferentially applies to rightmost links in delinking. Nick Clements has pointed out to me another possibility: the second V slot of long vowels can be unassociated underlyingly and then become linked to the vowel unit of *pi* following the application of the game.
- [11] I am indebted to John Ohala for bringing the Bakwiri word game to my attention.

- [12] Speakers are unab
- [13] Geminate consonants and analysis of geminate (McCarthy rearranged. For example the following pattern observed that only position.

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phonological representations which are related to each other. Within this conception, represented ordinarily in terms linked to one segment-level long vowels in word games is thus of a rule is determined, changes in length explicitly, and lengthening of length is accidental,

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might be a universal convention in delinking. Nick Clements has and V slot of long vowels can be added to the vowel unit of *pi* following

Bakwiri word game to my attention.

- [12] Speakers are unable to play the game in the case of some double vowels.
 [13] Geminate consonants pattern the same way: e.g. *jjuba* 'dove' → *bbaju*. The facts and analysis of geminate consonants are identical in a Bedouin Hijazi Arabic word game (McCarthy 1982), in which the consonants of verbal stems are freely rearranged. For example, the derivational class II stem /kattab/ 'write' undergoes the following permutations: *battak*, *takkab*, *tabbak*, *bakhat*, *kabbat*. It is readily observed that only the segmental composition of geminate changes, but not their position.

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Review Article

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Hans Basbøll
Odense University

Ian Maddieson, from the
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