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Alignment and locality in the typology of affixing language games

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Abstract: This paper contributes to the discussion around the (extra-)grammatical status of language games (or ludlings). We collected over 60 games which are based on the affixation of a dummy morpheme, which is infixed and iterated in most cases. While some are obviously reduplicative, closer investigation reveals that all the games involving iterativity function like reduplication. Our optimality-theoretic analysis concentrates on the explanation of shape, segmental content, placement and iterativity of the dummy affix and employs only constraints standardly assumed in the literature on reduplication. We show that no ludling-specific constraints or stipulations are necessary to account for this typology and make predictions on limitations that presumably apply to typological variation with regard to language games. Ludlings are thus variations of grammatical constraint rankings.

Keywords: phonology, language games, reduplication, iterativity, affix position

1 Introduction

In secret languages, word games, language games or ludlings (Laycock 1972) (henceforth LGs) existing words of a given language are concealed by inserting, exchanging, switching or repeating phonological material (see the classifications in Laycock 1972; Davis 1993, Botne and Davis 2000). LGs are often used in studies about language as they are considered to use specifically linguistic, not "meta-linguistic", tools and units. (Compare, e.g., Davis 1993; Bagemihl 1995; Botne and Davis 2000; Vaux 2011; Borowsky 2012; for overviews).[1] The hypoth-

1 However, the claim that language games should be regarded as a valuable source for linguistic investigation is controversial, cf. Dressler (2000), Zwicky and Pullum (1987), Zwicky (1980) and Ohala (1986).

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esis is that LGs "extend, modify, or exaggerate attested natural language processes" (Bagemihl 1995). This is demonstrated among other things by the fact that not all conceivable language disguises are found. There are clear limits in variation and these limits are shaped by constraints on specifically linguistic representations and processes: For example, there are no "rules" based on a count of single sounds or of syllables (e.g. insertion of a phoneme/syllable after the third segment/syllable in each word or transposition of the third sound of a word irrespective of it being the onset or the nucleus).

In the following, we will present a survey of language games concentrating on the insertion type, that is, language games employing game or dummy affixes for the purpose of speech disguise. We will provide an optimality-theoretic analysis of affix placement including infixation that distinguishes only between L/R-aligned affixation and L/R-anchoring of the base. Together with phonotactic constraints, the analysis accounts for the linear ordering of the game affixes without syllable constituent-specific alignment constraints: No language game-specific alignment/anchoring to onset, nucleus, coda or morae (as proposed by Yu 2008) is needed.

We also focus on the puzzling property of LGs to insert dummy affixes not only once, but iteratively, into the base word. Single or multiple occurrences of the dummy affix in the source word are correlated with the segmental make-up of the affix: Non-iterative affixes are almost never reduplicative (Yu 2008), but we find many iterative affixes which contain reduplicated material which points to a relation between iterativity and reduplication. In our analysis, iterativity is a side effect of reduplication-specific constraints like RED-Base-Locality and Faithfulness. This means that iterative dummy affixes are always reduplicative even in the presence of iterative infixation with only fixed segments: In this case, we assume reduplication together with The Emergence of The Unmarked effects (TETU, McCarthy and Prince 1994) in the reduplicant (see Inkelas and Downing 2015 for a typological overview of reduplication patterns) as well as reduplication with lexically fixed segmentism (Alderete et al. 1999).

The variation in the exact location of infixes, as after each onset/before each nucleus or between syllables has been a matter of discussion in the literature as well. Some authors (e.g., Yu 2008; Geiger 2015; Geiger 2016) propose very specific constraints that place the dummy affix (based on metrical and rhythmical output constraints). The analysis proposed here, affix placement and its typological variation emerges from the interaction of the above-mentioned alignment constraints, constraints on the relation between reduplicant and base and phonotactic markedness constraints.

The paper is structured as follows. Section 2 provides an overview over language games and highlights the affinities between language games and prosodic morphology. Section 3 introduces a typology of language games and illustrates their core properties. In Section 4, we develop an OT account of the core properties of these LGs, their infixal nature, iterativity, and affix positioning. This is briefly compared with previous accounts, in particular Yu (2008) and Piñeros (1998) in Section 5. In this Section, we also provide examples of iterative and infixing regular morphology to bolster our claim that iterative infixing LGs don't require LG-specific constraints. Section 6 concludes the paper.

2 Prosodic morphology and language games

As already mentioned above, language games are mostly considered to be a valuable source for a better understanding of phonological phenomena in natural languages. A research field which often uses language games as evidence for linguistic phenomena, specifically the phonological component of the grammar, is the theory of *Prosodic Morphology* (McCarthy and Prince 1986 [1996] et. seq.), which focuses on processes like truncation, reduplication and infixation in which morphology is expressed or governed by phonology. At the "edge" of prosodic morphology, the boundaries between morphological processes found in "natural languages" and "artificial" mechanisms used in game languages are often blurred. Many researchers analyze phenomena like expletive (McCarthy 1982), Homeric (Yu 2004) and Diddly infixation (Elfner and Kimper 2008) or *shm*-reduplication (Nevins and Vaux 2003) with the same tools hypothesized for natural languages. Also, the same nomenclature (i.e., reduplication, infixation, truncation) is applied and the division into "natural" vs. "artificial" is based on purely semantic or pragmatic grounds. Over the years, many researchers have exploited the parallels between language games and morpho-prosodic processes like reduplication,[2] truncation and infixation in order to explain, on the one hand, the mechanisms in language games and bring them more in line with natural languages, and, on the other hand, also to test assumptions of linguistic theory against this type of data (see e.g. Piñeros 1998; Borowski 2012; Itô et al. 1996; Sanders 2000; Smith 1998; Botne and Davis 2000; Yu 2008).

2 See, e.g., Yip (1982) who showed that a certain type of Chinese secret language (so called *fanqie*-language, Chao 1931) which traditionally has been described with the help of a metalinguistic device, that is, the "unnatural" splitting of the syllables into onset and rime together with affixation of prespecified segments in both parts, is better analyzed as reduplication.

One form of prosodic conditioning of morphology regards the linear ordering of morphological units: It is often observed that phonology determines the position of affixes either by attracting affixes to the prominent, that is stressed, position in the base or by subordinating the tendency of an affix to be a prefix or a suffix to the prosodic well formedness of the output: So called phonological (or flexible) affixes are infixed into the base in order to improve the syllable structure of the output form. A well-known example for this form of prosodic optimization is the vowel initial prefix *-um* in Tagalog, which skips initial consonants and is placed inside the base in order to avoid marked coda consonants.

(1) Tagalog: *um*-affixation (McCarthy and Prince 1993):

alis	→	***um**-alis*	*'leave'*
tawag	→	*t-**um**-awag*	*'call' perf. actor trigger*
gradwet	→	*gr-**um**-adwet*	*'graduate'*

In Optimality Theory (Prince and Smolensky 1993 [2004]), this tendency toward unmarked structures in morpho-prosodic processes, such as reduplication and truncation, is explained by a specific ranking hierarchy: Faith-IO >> markedness >> Faith-BR/T which results in the emergence of the unmarked (TETU; McCarthy and Prince 1994).

Prosodic optimization can also pertain to the segmental level. For instance, Alderete et al. (1999) analyze invariant segments in a reduplication pattern in Yoruba as "emergent" default segments, that is, phonologically unmarked segments that replace marked segments in the domain of reduplication.

(2) Yoruba (Akinlabi 1984; Pulleyblank 1988; Alderete et al. 1999): Phonologically conditioned default segments

gbóná	***gbí**- gbóná*	*'be warm, hot'/'warmth, heat'*
dára	***dí**-dára*	*'be good'/'goodness'*

The same appearance of unmarked segments is often observed in the dummy affixes inserted in language games[3]: Overall in our survey, the most frequent

3 The notion "affix" refers in LGs to a very "abstract" unit, with impoverished, only expressive meaning. There are however other types of morphological processes like truncation, the formation of blends or echo-words with which LGs share the property that the semantic meaning of the added "morpheme" is difficult to describe and in which phonology drives morphology.

fixed segments employed in onset position are segments with low sonority[4]: labial plosives [b, p] (15 cases) and the labiodental fricatives [f, v] (15 cases), the next frequent fixed segments used in onset position are: velar plosives [k, g] (12) and alveolar plosives [d, t] (8). The fricatives [s, z, ʃ] (8 occurrences) are then still more frequent than the nasals [m, n] (only 5 cases) and the liquid [l] (4). The rhotic [r] is never found as a fixed segment in onset position, the glottal fricative [h] only once. As a whole, plosives (35) are more often used than fricatives (24), followed by nasals (5) and liquids (4). We observe a complex CC-onset only three times [dr, gr, ʃm].[5] In the case of "word initial" onsets, that is, dummy affixes prefixed to the base (only 9 cases) we find only plosives (5) and fricatives (4), all of them voiceless, except one ([d]).[6]

In some language games, dummy consonants are infixed such that they surface in the coda: (e.g. *late, then* -> *late-fal then-al*). We never find plosives employed as coda consonants in dummy affixes: in this case liquids are employed [l,r] (9), or the nasal [n] (2).

The language games thus follow what has been proposed in the literature regarding markedness of segments in combination with syllable position (e.g., Vennemann 1988; Prince and Smolensky 1993/2004): low sonority segments are preferred in the onset position of the dummy affixes. In coda position, segments with higher sonority are required. Piñeros (1998) thus analyzes these fixed segments in Jerigonza language games based on Spanish as epenthetic default consonants.

In this section, we highlighted the strong tendency to prosodic optimization, observed in morpho-prosodic processes like reduplication and truncation. In the following (Section 3), we show that these properties are echoed in the manipulations observable in LGs and thus LGs are analyzable as morpho-prosodic processes. Also, other phenomena like prosodic conditioning of infixation and anchoring to prominent positions are explained in Section 4. Prior to this, we will give an overview over the data and present a typology of LGs concentrating on – as already explained in the introduction – LGs which insert some phonological material which we call game or dummy affixes.

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4 A word of caution is indicated: The analysis is based on written transcriptions coming often from not phonetically trained authors. For instance, Lebanese: *kitá:b*->*zà-kitá:b* and Cuna: *maceret*->*cimácicécirét* have been taken for fricatives. Those language games that are based on orthography are left out.

5 The second member of the complex onset is not counted in the overview.

6 These data are confirmed by and large by Frazier and Saba Kirchner (2011) who analyze only fixed consonants in onset position. Botne and Davis (2000) also found the prevalence of labial [p] in language games with reduplication (imposition-type games in these authors' terminology) and propose the following hierarchy: labial obstruents < coronal continuants < velar/coronal stops.

3 The data

LGs can provide valuable linguistic data of essentially two types: One type of data is experimentally controlled with materials and "toy grammars" (Vaux 2011) conceived by researchers in order to gather data about a broad range of issues including learnability, acquisition of phonotactics etc. (see Vaux 2011 for an overview over the different methodologies applied to language games and artificial grammars).

The other type consists of "naturalistic data", that is, data from LGs based on the languages of the world which have developed sometimes over hundreds of years and have been handed down from generation to generation in oral tradition. The speakers of these "secret languages" often belonged to a socially isolated group of people related to a specific (ambulant) work environment, such as, e.g., the workers in the docks of Hamburg during steam navigation, who used the so called *Ketelkloppersprook* (based on Low-German, cf. Siewert 2002), or the rafts men working on the river Aare crossing Bern (Switzerland), originators of the so called *Matteänglisch*, based on Alemannic German (Matteänglisch 1977: 104). This type of data is often well documented in the sociolinguistic literature and provides detailed data and descriptions of each speech disguise under investigation. Other precious sources for the collection of this type of naturalistic data are existing collections of language games and examples given in the theoretical literature on the topic (e.g. Laycock 1972, Sherzer 1982, Lewalter 1911; Bächtold 1914; Bagehmil 1995; Jespersen 1922; Botne and Davis 2000; Davis 1993) and since the advent of internet sources also blogs or discussion platforms run mainly by adolescents, see appendix.

By searching through the sources mentioned above, 86 structurally different types of language games spread over 16 different, mostly Indo-European languages have been retrieved. 23 games based on transposition or truncation are left out, leaving 63 games of the insertion type for analysis.

The data are tagged according to:

- the segmental make-up of the inserted affix (fixed vs. reduplicated segments)
- single or multiple affixation (affixation after/before/within the first/last/stressed/or each syllable)
- the locus for affixation (prefixing or suffixing; edge-oriented vs. stress-seeking)

For the following analysis, the LGs are divided in two big groups according to the segmental make-up: affixes containing reduplicated segments (group A) vs. affixes containing only fixed segments (group B). Both groups are then divided into subgroups (A. (1), A. (2) etc.) identified through the criterion iterative affixation vs. single affixation. (The subgroup A. (3) is based on complete reduplication with partial fixed segmentism.) In the following table, examples for each group and subgroup are given (the numbers in round brackets give the number of examples present in the data base, for references see the appendix):

(3) Distribution of language games according to segmental make up, iterativity and position: group A (reduplicative affixes)

A. Reduplicative affixes with partial fixed segmentism (24 games)	
(1) Multiple infixation with partial reduplication (20 games)	
a. Infixing into each syllable (12)	German: *karten* -> *kabarteben* 'cards' Italian: *parlare*-> *pafarlafarefe* 'talk', *ombrello* -> *ofombrefellofo* 'umbrella'
b. Before each syllable (1)	French: *je suis jeune* -> *fejefuisuisfeujeune* 'I am young'
c. After each syllable (1)	Spanish: *adios* -> *akamadikimioskomo* 'good bye'
d. Reduplication of each rhyme, after each syllable (6)	Portuguese: *portugal* -> *porportupugalpal* 'Portugal' French: *Crois-tu qu'il m'aime?*-> *Crois-vois tu-vu qu'il-vil m'aime-vaime*? 'Do you think he loves me?'
(2) Non-iterative infixes with partial reduplication (4 games)	
a. To stressed vowel (1)	Spanish: *Córdoba* -> *Cogasórdoba* 'city name' *colectivo*->*colecti-gasívo* 'bus'
b. After the first or the stressed vowel? (1)	English: *míssed the bástard* -> *milfíssed the balfástard* (=2a?)

c. Next to the stressed vowel or before the last syllable? (1)	Egyptian Arabic: *yeddihali* -> *yeddihatinali* 'you gave it to me' (=2a?)[7]
(3) Non-iterative complete reduplication with partial fixed segmentism (1)	English, Yiddish: *baby* -> *baby-shmaby*

(4) Distribution of language games according to segmental make up, iterativity and position: group B (affixes with complete fixed segmentisn)

B. Affixes with complete fixed segmentism (39 games)		
(4) Iterative infixation with complete fixed segmentism (27 games)		
a. After each syllable (13)	English: German:	*monday* -> *monvedayve* *Wenn meine Mutter wüßte* -> *Wennbo meibonebo Mutboterbo wüßbotebo* 'If my mother knew'
b. Before each nucleus (6)	Dutch: English:	*en mannetje* -> *epen mepannepetjepe* 'a male$_{(dim)}$' *Morgan* -> *Mubórgubán*, *string*-> *strubíng*
c. Before each syllable (6)	Hausa: Spanish:	*-tsíntsíyáa* -> *dàtsíndàtsídàyáa* 'broom' *hola*-> *pehopela* 'hello' *adios* -> *peapedipeos* 'good bye'
d. After each consonant (2)	English: talk -> *tongalongkong* (based on alphabetic characters – excluded)	

7 In the descriptions, there are not always enough examples available in order to determine whether the affix is attached after the first or the stressed vowel, respectively, before the last syllable or next to the stressed vowel (compare examples in A (2) b. and c. In general, only few descriptions contain diacritics for stress. In A (1) a. three games are included in which the description provided only words with open syllables. It is, thus, not possible to determine whether the affix is infixing into the source syllable or suffixing. It has to be said that there is variation not only between speakers (see also Bertinetto 1987), also intra-speaker variation is observed: for instance, in A (1) a.examples can be found, in which the dummy affix is inserted in one case before the coda and in another case after the coda. Our analysis, however, can account for this kind of variation.

(5) Non-iterative with complete fixed segmentism (12 games)		
a. After each word (4)	English: Finnish:	*mary had* -> *marygree hadgree* *mika sinun nimesi on* *mika-kontti sinun-kontti nimesi-kontti on-kontti* 'What is your name?'
b. Before each word (2)	Lebanese:	*kitá:b* -> *zakitá:b* 'book'
c. After the first (potential) onset (2)	Swedish: Tagalog:	*Hur är läget*? -> *Hallur ärall lalläget*? 'How are you?' *tiná:pay-> t-um-í:napáy* 'bread'
d. After first syllable (2)	Japanese: Finnish:	*watákuši wá ŋakó e íkimásu* -> *wánosátakuši wánosá ŋanosákó enosá ínosákimásu* 'I'm going to school.' *jonglööri-> jongtälööri* 'juggler'
e. After last onset (2)[8]	Indonesian: French:	*kasakóla* -> *kasakolárka* 'school' *chapeau* -> *chapal* 'hat' *zero->zeral* 'zero'

The data show that there are strong correlations between:
– Reduplication and iterativity; cf. group A (1):

If the dummy affix contains a reduplicated element (the vowel) it is used nearly always iteratively, while non-iterative affixes are almost never reduplicative (Yu 2008; Frezier and Saba Kirchner 2011), which points to a connection between iterativity and reduplication. The few exceptions in which the dummy affix with reduplication is *not* used iteratively are analyzable as stress seeking: cf. group A (2). In our collection, there are no games using a single dummy affix containing a reduplicated element, added as a prefix or a suffix to the whole source word, or infixed into the source word, but not to the stressed syllable. By contrast, we find single dummy affixes with complete fixed segmentism attached before or after the source word or attached after the first (potential) onset or after the first syllable (or vowel): cf. group B (5); see e.g. Japanese: *watákuši-> wá^{nosá}takuši.*

– Segmental make-up of the dummy affix and its placement

8 With overwriting of the nucleus of the source syllable.

Affixes that don't split syllables are always CV, never VC or just V or C. A dummy affix of the VC-type is a so-called phonological infix (consider also the Tagalog example in [1]). In this case, the affix which is by tendency a prefix is infixed into the source word[9] if in this way a suboptimal syllable structure is avoided. Compare the Dutch example in (9):

(5) Insertion of a VC-affix.
en straat → *ep*en str*ep*aat Dutch ('a street')
(Inserted material is in italics.)

The dummy affix *-ep-* is prefixed to the initial word *en* given that infixation would not improve syllable structure (*e.-ep-n* is not better than *e.pen*). The fact that the resulting form is *e.p-en* and not *e.n-ep* shows that the dummy affix is left aligned. By contrast, in the second source word *straat* the dummy affix is infixed, as the skipping of the onset leads to a better syllable structure in the derived form (*stre.paat* is better than *ep.straat*, not violating the markedness constraint ONSET and violating *CODA only once. Furthermore, from the point of view of syllable structure, *stre.paat* is as good as *straa.tep* but the affix is a prefix and not a suffix. In the case of dummy affixes with CV-shape, skipping initial segments is of no help and is thus not observed: they are prefixed or suffixed to the source word and – in the case of multiple affixes – to each source syllable, cf. Hausa: *tsíntsíyáa* -> *dàtsíndàtsídàyáa* 'broom', or Spanish: *adios*->*pe-a-pe-di-pe-os* or English *Monday* ->*mon-ve-day-ve*.

Infixation is observed also with affixes containing a reduplicated vowel.[10] It is not clear if the shape of the dummy affixes with reduplicated elements (vowels) is CV_{RED} or $V_{red}C$. If we assume $V_{red}C$, this would mean that in words with onset, these dummy affixes also skip the onset in order to improve syllable structure (German: *rot* ->*r-o.b-ot* 'red' is better than *ob.rot*), while in the case of vowel initial words, syllable structure would not be improved by infixation: (compare: German: *in* ->*i.b-in* vs. *i-ib-n* 'in'). If we assume that the shape is CV_{RED}, the dummy affix is almost never prefixed or suffixed. We analyze infixation in this case as a form of anchoring: Taking the German example, the dummy affix (the fixed consonant *b* and a copy of the vowel) is infixed into

9 If it is an affix with multiple occurrences, it is inserted into each syllable of the source word, see below.

10 In group A (1) we find one example in which the dummy affix containing a reduplicated vowel is added before the source word and before each syllable within the source word, cf. A (1) b. or after the source word (and after each syllable within the source word, cf. A (1) c., however, our analysis can account also for these really marginal types.

the source word, which means that the edges of the source word and the derived game form correspond. The affix is left-aligned, but the higher ranked anchor constraint drives it into the syllable, after the nucleus allowing for a well-formed syllable structure (see below, Section 4.1.)

4 Infixation, iterativity, and affix positioning as constraint interaction

In this section, we give an OT analysis of the major properties of LGs, invoking mostly constraints that have been used in the literature on prosodic morphology and which are by and large well established. We first account for infixation with two motivations, stem anchoring and phonotactic constraints, i.e., as a TETU effect. Section 4.2 accounts for the iterative nature of most LGs by recourse to mechanisms from reduplication and its local nature. While the reduplicative nature of LGs is uncontroversial for those in which we find copying of base material this is less obvious in cases in which the affixes have invariable content. We account for this in Section 4.3 with the same mechanism that has been used for fixed segmentism in reduplication patterns (Alderete et al. 1999), i.e., morphologically/lexically fixed segments and TETU effects in the reduplicant. In 4.4 we address non-iterative patterns with reduplicative properties, which we attribute in the case under discussion to stress related positional BR-Faithfulness. In Section 4.5 we return to the issue of affix position and discuss affixes that don't split syllables. We conclude that the underlying form of the affix as either –CV– or –VC– determines if it potentially splits syllables between onset and rime or not. Finally, Section 4.6 briefly discusses the general properties of the set of constraints used in this section.

4.1 Infixation

In Section 3, we saw that placing some part of the base of affixation at the left edge is facultative in some language games. On the other hand, left-oriented affixes are placed as far on the left as possible in most cases as well. In OT terms, we can formalize this as left alignment. The affix should coincide with the left edge of the derived form. Though the left edge of the derived form should as well coincide with the left edge of the base. This conflict is resolved by ranking the two requirements on a language-specific basis. For ease of distinction we formalize left alignment of the base as anchoring (McCarthy and Prince 1995) and edge orientation of the dummy affix as alignment (McCarthy and Prince 1993). There are other morphological processes governed by alignment and anchoring, one of these is for instance truncation. Alber (2010) and Alber and Arndt-Lappe (2012) analyze Anchor-L, the constraint responsible for anchoring a truncation morpheme to the left edge of the base, as an alignment constraint while AnchorStress, the constraint responsible for anchoring the truncation morpheme to the stressed syllable of the base, is defined as a faithfulness constraint.

There are reasons to assume that the base of affixation is a surface form. Mohanan (1982) argues that LGs are word-based. Bagemihl (1988) discusses the issue in some detail and concludes that LGs neither access the underlying nor the surface form. However, his surface form is the representation at the end of a long multi-levelled derivation that takes syntactic structure and phrase-level phonology into consideration. In most cases LGs are operations on fully inflected forms and blind to the internal morphological structure of the base. Crucially, the cases Bagemihl discusses that could lead to the assumption of LG operations applying earlier than the word level involve some kind of inflectional reduplication and transposition word games (i.e., types of LGs not under consideration here). We thus conclude that the edge orientation in infixing LGs is a type of transderivational correspondence, i.e. Base-Output edge faithfulness (formalized here as Anchoring constraints). The most important one requires that the left edge of the LG word should correspond to the left edge of the original word. The dummy affix does not have a correspondent surface base form, and for this morpheme it is a matter of aligning two different entities, the dummy morpheme and the prosodic word, at one edge or both, which justifies the use of alignment, rather than anchoring, i.e., a kind of markedness rather than correspondence.

(6) Edge mapping constraints[11]
  a. ANCHORL: ‘Assign one violation mark for every segment at the left edge of the derived word that is not at the left edge of the base word.’
  b. ALIGNL(affix, wrd): ‘Assign one violation mark for every segment separating the left edge of the affix and the left edge of the word containing it.’
  c. ALIGNR(affix, wrd): ‘Assign one violation mark for every segment separating the right edge of the affix and the right edge of the word containing it.’

11 Note that we depart from the original definitions of both Anchoring and Alignment to take heed of issues raised in McCarthy (2003) and Hyde (2012), specifying the intervening category in addion to the categories to be mapped, their dominance relation, and the relevant edges (L/R).

In the Swedish example analysed in (7) the affix *-all* is placed after the first consonant if there is one, or rather after the first potential onset, as we can see from looking at the base *är* in the example in tableau (7), which doesn't have an onset. Simply prefixing the affix would violate ANCHORL, as illustrated by candidates (a) and (b). The onsetless base also shows that the relevant constraints determining the placement must be ANCHORL and ALIGNL rather than the constraint demanding syllables with consonantal onsets (Onset), Whether *-all* is prefixed or suffixed to *är* doesn't matter to ONSET. Either candidate would violate it equally, since both morphemes start with a vowel.

(7) Infixation by edge anchoring (Swedish example: *Hur är läget*? 'How are you?')

	/hur är -all/	ANCHORL	ALIGNL
	a. allhur allär	*!*	
	b. hurall allär	*!	***
	c. hurall ärall		***,*!*
☞	d. hallur ärall		*,**

However, ONSET and other phonotactic wellformedness constraints do play a role in the placement of LG affixes, as is illustrated with our Dutch example. This game is by and large the same as the Swedish one. The crucial difference lies in the placement of the affix with a vowel-initial base. In this case, the Dutch dummy is prefixed, while the Swedish one was placed after the first consonant/potential onset, yielding *är-all*, rather than **all-är*, i.e., *host-affix*, in Swedish, and *ep-en* rather than **en-ep*, i.e., *affix-host*, in Dutch. We can conclude from this that ANCHORL dominates ALIGNL in Swedish, while the ranking is reversed in Dutch. In addition, ONSET, the markedness constraint demanding a consonantal onset for each syllable, dominates ALIGNL at least in Dutch, since otherwise ALIGNL would enforce prefixation of the dummy rather than infixation after the first onset, as in the mapping of / mannetje + ep / to *mepa*... rather than **epma*... It is Onset that decides between candidates (a) and (c) in (9) in favour of (c).

(8) Onset: 'Assign one violation mark for every syllable that starts with a vowel.'

(9) TETU I: Onset as a reason for infixation (Dutch example: *en mannetje* 'a male$_{(dim)}$')

	/en mannetje –ep/	ONSET	ALIGNL	ANCHORL
a.	epen epmannetje	*,*!		*, *
b.	enep mannetjeep	*	**!, 7	
☞ c.	epen mepannetje	*	*	*

General phonotactic constraints determining surface structures of the language in question seem to dominate the Alignment and Anchoring constraints for the LGs, since we haven't found any game that is not phonotactically structure preserving. In the Swedish game just discussed, for example, the base *är* and the affix -all- could as well be linerarizd as **ä-all-r* rather than *ärall* to reduce the number of violations of AlignL. This would, however, violate constraints on Swedish syllable phonotactics that the attested form satisfies, such as a vowel hiatus and a sonority trough in the rime.

This is schematically summarized in (10). PHONOM-A are phonotactic Markedness constraints that exert their influence on the language in general, while PHONOM-B constraints are those phonotactic Markedness constraints that show no or only a residual effect. The classic example would be ONSET, in a language that doesn't require every syllable to start in a consonant, but still syllabifies all intervocalic consonants as onsets with the following vowel (Prince and Smolensky 1993 [2004]).

(10) TETU ranking for phonotactic effects on dummy affix
PHONOM-A >> IO-FAITH >> (PHONOM-B) >> LG CONSTRAINTS >> PHONOM-C

Such subaltern phonotactic constraints also shape the dummy affixes themselves. They rarely contain consonant clusters, and if they do they are usually structured such that the cluster is distributed over two syllables, as in the English game inserting *–Vlf-* or *–lfV-* to yield, e.g., *milfissed* from *missed*. In our database, we have only three languages that use affixes that surface with complex onsets, English Gree and Shm (e.g., *talkgree Greegree, baby-shmaby*) and French Dregue (e.g., *vous êtes un fou* ->*vousdregue êtesdregue undregue foudregue* 'you (polite/plural) are a fool').

As the reader might have noticed, tableau (9) presented the Dutch pattern as though it involved one single affixation. The complete pattern, however, affixes *–ep–* iteratively. The correct output of *mannetje* is *mepannepetjepe* We turn now to the discussion of this affix iteration and will shortly provide a more complete analysis of the Dutch LG.

4.2 Iterativity and copying

We assume that iterativity is a side effect of reduplication. The dummy affix is realized by as many exponents as are necessary to copy all the vowels of the base form, minimizing violations of BR-MAX-V. The constraint definition is given in (11).

(11) BR-MAX-V: 'Assign one violation mark for every vowel in the Base that is not present in the Reduplicant.'

Infixation disrupts the input chain of segments. This violates the constraint CONTIGUITY (McCarthy and Prince 1995; McCarthy and Prince 1999). A definition is given in (12).

(12) CONTIGUITY: 'Assign one violation mark for every pair of adjacent segments in the input that is not adjacent in the output.'

In the Spanish LG that yields *akamadikimioskomo* from *adios* 'good bye', -kVmV- is inserted after every syllable (therefore ...*oskomo* rather than *...*okomos*). The two V slots in the affix are filled with copies of the preceding base vowel. We assume that these vowels are reduplicants of the preceding vowel, since, in Spanish, epenthetic vowels would surface as a mid front vowel and not as copies of nearby vowels. One typical feature of a Spanish accent in English is that words starting in sC sequences, such as *school* are realised with an initial mid front vowel, i.e., *eschool*, not with a copy of the nearest vowel *[usku:l]. We take this as evidence that *e* is the epenthetic vowel in Spanish.

The following tableau illustrates how high ranking BR-MAX-V causes iterative infixation. Placement of the last dummy after the last consonant rather than next to the last vowel is an effect of lower ranked CONTIGUITY. The candidate with suffixation (d) has one violation of CONTIGUITY less than the candidate which places the last dummy as close as possible to the base vowel it reduplicates.

(13) Iterativity (Spanish example: *adios* 'good bye')

	/adios – $kV^{RED}mV^{RED}$/	BR-MAX-V	CONTIGUITY	ALIGNL	ALIGNR
a.	adioskomo	*!*		*****	
b.	akamadios	*!*	*	*	****
c.	akamadioskomo	*!	*	*	
d.	akamadikimiokomos		***!	*	*
☞ e.	akamadikimioskomo		**	*	

The grammar in (13) doesn't fully explain the pattern. CONTIGUITY could be entirely satisfied by suffixing reduplicants, as shown in the next tableau.

(14) Iterative suffixation (Spanish example: *adios* 'good bye')

	/adios – $kV^{RED}mV^{RED}$/	BR-MAX-V	CONT	ALIGNL	ALIGNR
☞ e.	akamadikimioskomo		**	*	
☜ f.	adioskamakimikomo			5	

This never happens because another aspect of reduplication is amplified in LGs, locality. Recall that reduplication always copies adjacent material, i.e., there is no opposite edge reduplication, in which, for example, a prefixal reduplicant copies material from the end of the base. There have been several proposals in the literature to formalize this observation directly into a constraint that demands locality between reduplicative material and base material (e.g., Riggle 2003; Nelson 2003). Such constraints might also be responsible for some of the observed truncations in the reduplicants. E.g., if a reduplicant is systematically only one CV sequence, independent of the length of the base, this might be caused by the requirement that the reduplicated segments have to be as close as possible to their respective correspondents in the base. This Locality requirement was formalised as a violable constraint by Riggle and Nelson. A definition is given in (15).

(15) LOCALITY: 'Assign one violation mark for every segment between a segment in the Base and its correspondent in the RED.'

Tableau (16) illustrates the effect of the LOCALITY constraint. CONTIGUITY prefers candidate (f), because the output correspondents of the input base form a contiguous string. LOCALITY is violated by every segment that intervenes between a reduplicated segment and its base. Since this yields a high number of violations we have given the numbers of intervening segments per reduplicant, separated by commas, rather than the usual asterisks. Candidate (a) minimises the number of violations of LOCALITY compared to candidate (f) as much as is possible while still respecting the phonotactic restrictions of Spanish.

(16) Iterative infixation (Spanish example: *adios* 'good bye')

	/adios – $kV^{RED}mV^{RED}$/	LOCALITY[12]	CONTIGUITY	ALIGNL	ALIGNR
☞ e.	akamadikimioskomo	1, 1, 2	**	*	
f.	adioskamakimikomo	5, 7, 10		5	

In this example, we already encountered partially fixed segments. If the affix is a reduplicant, why don't the consonants/k/and/m/change according to the base? In this case, we can safely assume that the consonants of the affix are specified in the input, while the vowels are underspecified, resulting in copying of the vowels but not the consonants from the base.

4.3 Iterativity with fixed segmentism

In many word games, the affixes don't alternate at all, that is, we don't find any copying effects. In such cases, these affixes have some striking properties. At least some of their segmental content is unmarked in some sense, as discussed in Section 3. This is also what we find in reduplication to various degrees. Some reduplicative processes display a reduced segment inventory compared to the rest of the language at hand. Above we identified the vowels as the main target of copying. Consonants in dummy affixes are usually invariant. We will come back to this after discussing vowels. Invariant vowels in dummy affixes are very often front mid or schwa. We use the cover constraint *MARKV as a placeholder for all sorts of Markedness constraints that enforce vocalic unmarkedness, such as *[labial], *[high] etc.

(17) *MARKV: 'Assign one violation mark for every vowel that is not "e".'

This M constraint can be freely ranked with Faithfulness to vowel features, determining whether we find a default vowel or copies of base vowels in the dummy affix.

(18) BR-IDENT(F): 'Assign one violation mark for every vowel feature in Base and RED that is not identical.'

12 For the sake of simplicity, when computing violations of LOCALITY we only count the segments intervening between the base vowel and its first reduplicated correspondent.

IO-Faithfulness, guarding the faithful realization of input features of the base dominates Markedness, since the base vowels are usually not neutralized. We thus get the following ranking for fixed segmentism as a TETU effect.

(19) TETU in LG reduplicants: IO-IDENT(F) >> *MARKV >> BR-IDENT(F)

With this background, we can return to our Dutch example. The affix/ep/now can be assumed to consist of two different types of fixed segments. The vowel is fixed by markedness and the consonant is lexically prespecified. In our example word *mannetje*, in (20), most vowels are schwa anyway. Candidate (d), however, faithfully copies the/a/of the first syllable in the base to the dummy affix. This is punished by Markedness constraints and the candidate with an invariant schwa in all exponents is chosen as optimal. All these schwas are copies of the base vowels, they just don't all match in feature content.

(20) Vowel neutralization in the Dutch *ep* LG (*en mannetje* 'a male$_{(dim)}$')

	/mannetje – V^{RED}p/	ONSET	ALIGNL	BR-MAX-V	*MARKV	BR-IDENT(F)
	a. epmannetje	*!		**		*
	b. mepannetje		*	*!*		
	c. mepannetjepe		*	*!		
☞	d. mapannepetjepe		*		*!	
☞	e. mepannepetjepe		*			*

In tableau (20), we take the iterativity of the process for granted. Now that the quality of the vowel is accounted for, we can look at the issue of iterativity again.

The number of vowels copied from the base can easily be maximized by conventional reduplication, as by candidate (21a). This candidate represents a real language game (as in, e.g., English *shm*-reduplication). However, in iterative games, such as the Dutch one under discussion here, the maximum number of vowels is copied with a minimum distance to its base segment. As discussed in the previous subsection, we assume that this minimal distance is enforced through a LOCALITY constraint (15). The separation of the reduplicated vowels from their bases by the reduplicated consonants adds to the violation marks of LOCALITY. Since nothing enforces copying of consonants, LOCALITY chooses between the two candidates that copied all vowels by preferring the one in which they are all closest to their base segments, i.e., performs better on (b), with only three violations, while (a) incurs 18 violations.

(21) Iterativity in the Dutch *ep* LG (*en mannetje* ‘a male$_{(dim)}$’)

	/mannetje –V^{RED}p/	BR-MAX-V	LOCALITY	CONTIGUITY
a.	m-e$_{1'}$nne$_{2'}$tje$_{3'}$p-a$_1$nne$_2$tje$_3$		6!, 6, 6	*
☞ b.	m-ep-ann-ep-etj-ep-e		***	***
c.	m-ep-annetje	*!*	*	*

For the sake of simplicity, we assumed here that the consonant is lexically prespecified. However, this is not necessarily the most insightful analysis. In many LGs, the invariable consonant is a labial of some sort or an alveolar (see Section 3). In our database, we observe that a majority of dummy consonants that end up in onset position are obstruents and often labial, while consonants that are prosodified as codas are predominantly alveolar sonorants. As already noted in Section 3, this conforms with observations about Markedness in the two syllable margin positions in the literature (e.g., Itô 1986; Vennemann 1988; Prince and Smolensky 1993 [2004]; and many more). Onsets favour low sonority and codas favour high sonority consonants. Furthermore, first language acquisition often starts with labial consonants. We can thus conclude that fixed consonants in LGs are often not lexically prespecified but rather determined by Markedness. An example of this kind is also our core example from English in the next subsection. In the –*Vlf*– game, which derives e.g., *balfastard* from *bastard*, we see exactly this kind of Markedness effect. Of the two consonants in the dummy affix, the one that invariably ends up as a coda is an alveolar sonorant and the one that always ends up in onset position is an obstruent.

We will discuss this example in the following subsection, because now we have another potential problem. If iterative infixation is always reduplication, even if the affix doesn’t alternate according to the segmental qualities of its host, why do we find copying effects in non-iterative dummy affixation as well?

4.4 Non-iterative infixation with partial fixed segmentism

In the data Section, we introduced word games that don’t have iterative affixation and still contain some copied material, as in the example *milfíssed* *the balfástard*. Strikingly, in this example, the determiner is not affected by affixation. As sketched above already, we analyse this pattern as affixation of a partially prespecified reduplicant to the stressed vowel (though see the comment immediately above on whether there necessarily has to be any prespecification involved). English determiners are usually unstressed clitics. Accordingly, if affixation is anchored to the stressed syllable we don't expect an affix on unstressed functional elements, such as determiners. The pattern is remotely reminiscent of English expletive infixation, as in *Cali-fuckin'-fornia*, which places the infix left-adjacent to the main stress. However, since this sums up everything these processes have in common we analyse this pattern in line with other reduplication games. The fact that the dummy is anchored to stress and only copies the stressed vowel is captured here by positional BR-Faithfulness. We relativize our general BR-Max-V constraint to the stressed syllable.

(22) BR-Max-ˈV: Assign one violation mark for every stressed vowel in the Base that is not present in the Red.

Tableau (23) shows a grammar that ranks this positional constraint high enough, and its more general version low enough, to produce the observed effect. The crucial constraint that reduces the number of reduplicants to the stressed vowel is Locality. Any violation of Locality that can be avoided is avoided unless it entails a violation of BR-Max-ˈV. Violations of general BR-Max-V that arise as the cost of avoiding violations of Locality, are tolerated. The second reduplicated vowel in candidate (c) is two segments away from its correspondent, which entails two additional violations of Locality compared with candidate (d), which reduplicates only the stressed vowel. The absence of a reduplicant of the second vowel in candidate (d) incurs a violation of BR-Max-V. This violation is less severe than the violations of Locality of candidate (c). Thus, candidate (d) is chosen over candidate (c). Candidate (b) reduplicates the right vowel to avoid a violation of high ranking BR-Max-ˈV. Its fatal flaw is to have placed the dummy at the end of the word (avoiding violations of Contiguity, which is not displayed and has to rank low). The long distance of the reduplicant to the corresponding vowel renders candidate (b) suboptimal with regard to Locality compared to the performance of candidate (d) on this constraint. Candidate (a) ties with (c) on Locality, but it has reduplicated the wrong vowel, i.e., not the stressed one, which violates BR-Max-ˈV. This violation is fatal for candidate (a).

(23) Non-iterative reduplicative infixation

	/bastard –V^{RED}lf/	BR-MAX-ˈV	LOCALITY	BR-MAX-V
a.	$ba_1sta_2lfa_2rd$	*!	**	*
b.	$ba_1sta_2rda_1lf$		***!**	*
c.	$ba_1lfa_1sta_2lfa_2rd$		**,*!*	
☞ d.	ba_1lfa_1stard		**	*

4.5 Iterative infixation and syllable integrity

In the previous subsection, we only looked at affixes which split syllables neatly between onset and rime. This is not always the case. Some LG affixation processes insert the affix between syllables. In our analysis, this difference is accounted for by the segmental ordering of the dummy affix. Affixes that don't split syllables are always CV, never VC or just V or C, while affixes that split syllables are always VC. In many cases, however, it is impossible to say if an affix splits existing syllables or is placed in between. Consider this Italian infixation pattern: *lunatici* 'weirdoes' – *lugusúnagasátighisícighisí* (Bertinetto 1987). Should this be analyzed as *lu-gusú-na-gasá-ti-ghisí-ci-ghisí* or *l-ugus-ún-agas-át-ighis-íc-ighis-í*? However that may be, in this subsection we look at an example that clearly doesn't split up syllables (see Section 5 for more discussion of Bertinetto's game and the variability in affix positioning he found). This can be diagnosed because of its invariant form. Even if the invariant vowel in a dummy affix is a copy of a base vowel and only invariant because of stricter markedness requirements in the reduplicant, we can say that the invariant vowel has to be part of the reduplicant rather than a neutralization effect on base vowels, since that is what we find in grammatical reduplication as well.

Recall our Hausa example *tsíntsíyáa* -> *dàtsíndàtsídàyáa* 'broom'. Syllable integrity emerges from phonotactic constraints. As we noted earlier the phonotactic constraints active in a language are never violated in language games. If the ludling deviates from the syllable structure in a language, then it does so only by being less marked than what is allowed elsewhere in the language in question. If the Hausa dummy affix/dV^{RED}/were inserted right after the first consonant/onset this would result in a consonant cluster, as illustrated in (24)

c. Consonant clusters are only allowed in Hausa if they are heterosyllabic. Complex onsets and codas are not attested (Newman 2000).

The same holds for the placement of all following affixes. However, there is one special case. The second *-da-* could likewise be placed before the nasal coda of the second syllable rather than after it (see 24f). We don't see any reason to rule out such a candidate universally. In our analysis, this syllable integrity effect is due to LOCALITY. The second affix contains the reduplicant of the second vowel in the base and has to be as close to its correspondent vowel as possible. That is the reason why it is infixed in the first place. Placing it before the preceding coda consonant would result in an additional violation of LOCALITY.

(24) Syllable integrity (Hausa example: tsíntsíyáa 'broom')

	/tsíntsíyáa, -dV^{Red}/	PHONO-TACTIC	BR-MAX-V	LOCALITY	ALIGNL	ANCHORL
☞ a.	dàtsíndàtsídàyáa			*,*,*		*
b.	tsídàndàtsídàyáa			*,*,*	*!*	
c.	tsdínàdàtsídàyáa	*!		*,*,*	*	
d.	dtsínàdàtsíyáa	*!		*,*,*		*
e.	dàtsíntsíyáa		*!*	*,*,*		*
f.	dàtsídàntsídàyáa			*, **, *!		*

Another case of emergent syllable integrity comes from a language game from Latin-America called Jerigonza (Piñeros 1998). Piñeros describes three "dialects", the Costa Rican version, the Colombian variety and the Peruvian version, which all differ subtly in the placement of the affix. The Peruvian form differs additionally in the form of the affix, which has a different invariable C and also an invariable V. One of Piñeros' examples is given in all three varieties in (25).

(25) Jerigonza forms of *cancion 'song'*

Costa Rica:	ca-pa-ncio-po-n	(dummy –pV– after each nucleus)
Colombia:	cam-pa-ciom-po	(dummy –pV– after each syllable)
Peru:	cha-can-cha-cion	(dummy –cha– before each syllable)

The interesting case for our discussion of syllable integrity is the Colombian variety. While the other two varieties can be analysed straightforwardly with our basic anchoring and alignment constraints, and Locality, the Colombian pattern seems to require some form of syllable integrity, as directly expressed in Piñeros' analysis by his proposal of a language game-specific CONTIGUITY constraint, given in (26). However, we argue that this game-specific constraint is unnecessary.

(26) O-CONTIGUITY(σ): 'The segments of a syllable in J[erigonza] standing in correspondence with the segments of a syllable in SF [Source Form] form a contiguous string.' (Piñeros 1998: 67)

In his analysis Piñeros explains the iterativity of the affixation in terms of foot form. Every syllable in the source form is aligned with the left edge of a foot in the game form and feet have to be bisyllabic. We discuss the disadvantages of this analysis in the next subsection. However, while we think that bisyllabicity is not a requirement on Spanish feet, foot form is relevant here. Spanish is generally agreed to have trochees. While a trochee consisting of a heavy (H) and a light (L) syllable is considered typologically pretty bad (Hayes 1995), a LH trochee is even worse. We attribute the positioning of the dummy in Colombian Jerigonza between syllables to the constraint(s) responsible for this effect, henceforth short *(ˈLH).[13]

(27) Hierarchy of uneven trochees
(ˈHL) > (ˈLH): (ˈcam-pa)-(ˈciom-po) > *(ˈca-pa-n)(ˈciom-po)

The following tableau shows the problem. No ranking of our constraints placing affixes and stems at edges selects the Colombian candidate (a). Competing candidate (b) has a subset of the violations of (a). The violations that (a) has in addition to those it shares with (b) are given as little stars instead of the usual asterisks.

13 Of course one could conduct a more thorough analysis and replace this placeholder by the Weight-Stress Principle (Prokosch 1939; Prince 1990). For the sake of clarity and brevity we don't want to distract the reader with this kind of detail here.

(28) Colombian Jerigonza

/cancion + RED/	AlignR	AnchorL	AlignL	Locality	AnchorR
× a. (cam-pa)-(ciom-po)			**✱	*✱,**	**
b. (ca-pa-n)(ciom-po)			**	*,**	**
c. (ca-pa-n)(cio-po-n)	*		**	*,*	
d. (pa-can)-(po-cion)	***	**		*,*	
e. (pa-can)(ciom-po)		**		*,**	**
f. (ca-pa)-(po-ncion)	****			*,**	

The situation becomes more obvious in a comparative tableau (Prince 2002), displayed in (29). Candidates are ordered in mark data pairs and the cells under the constraints only show whether and how the respective constraint decides on the winner-loser pair in the row. Constraints favouring the loser are marked L and constraints favouring the winner are marked W. Pair (a) doesn't have a single W mark for any of the constraints, which indicates that there is no constraint that favours candidate *cam-pa-ciom-po* over candidate *ca-pa-nciom-po*, while all other competitors are excluded by AlignR or AnchorL.

(29) Comparative tableau for the Colombian Jerigonza problem

/cancion + RED/	AlignR	AnchorL	AlignL	Locality	AnchorR
a. cam-pa-ciom-po > ca-pa-nciom-po			L	L	
b. cam-pa-ciom-po > ca-pa-ncio-po-n	W		L	L	
c. cam-pa-ciom-po > pa-can-po-cion	W	W		L	
d. cam-pa-ciom-po > pa-canciom-po		W		L	
e. cam-pa-ciom-po > ca-pa-po-ncion	W		L	L	L

The following tableau has the constraint against iambic uneven trochees *('LH) added to the grammar and shows how it eliminates form (b). Candidates (c-e) show that the constraint does a lot of additional work in Colombian Jerigonza. Candidate (f) shows that it doesn't do all the work.

(30) Colombian Jerigonza foot form

	/cancion + RED/	*('LH)	AlignR	AnchorL	AlignL	Locality	AnchorR
☞ a.	(cam-pa)-(ciom-po)				***	**,**	**
b.	(ca-pa-n)(ciom-po)	*!			**	*,**	**
c.	(ca-pa-n)(cio-po-n)	*!*	*		**	*,*	
d.	(pa-can)-(po-cion)	*!*	***	**		*,*	
e.	(pa-can)(ciom-po)	*!		**		*,**	**
f.	(ca-pa)-(po-ncion)		*!***			*,**	

A full analysis requires the ranking of more constraints to account for exhaustive footing in Jerigonza forms and to eliminate candidates that delete or epenthesize segments to achieve optimal feet, which we will not discuss here to keep the argument as simple as possible. The important point is that our analysis doesn't require a LG-specific constraint on syllable contiguity or any other LG-specific constraint, and none of these additional aspects of the analysis requires the stipulation of Jerigonza-specific constraints either.

We thus conclude that the sporadic phenomenon of affix placement respecting the syllable boundaries of the base form is an epiphenomenon of the effect of other phonotactic and prosodic constraints, just as we concluded for syllable constituents in Section 4.1.

4.6 An OT typology of word games

We suspect that our database is far from exhaustive in representing the full typology of language games. For the patterns we found, however, we have provided an analysis that makes use of constraints that are relevant for prosodic morphology, i.e., truncation and reduplication. However, on the basis of this analysis we make predictions regarding the potential typological range. As shown above, the order of consonant and vowel in the dummy affix is free, which complies with the Richness of the Base Hypothesis. Whichever order the segments come in, the pattern is always syllable structure preserving in the sense that word games never create syllable structures that go beyond the phonotactic restrictions of the language in which the game is used. We thus assume the following meta-ranking for LGs (31). The higher ranked group of constraints, MARKEDNESS-A, is the set of Markedness constraints that determine the language's foot form and placement, syllable structure, and segment inventory in the ranking that has to be assumed for the language in question to account for its regular patterns. The constraint sets labelled with an A together constitute the language's core grammar. The set referred to as LG constraints, are the alignment, anchoring, and BR-Faithfulness constraints that determine the positioning of the dummy affix(es), which are always below the IO-Faithfulness constraints. Often some of the constraints referred to as MARK-B, i.e., other phonotactic and system delimiting constraints, outrank the LG constraints, resulting in effects such as Colombian emergent syllable contiguity or the preference for sonorants in codas and obstruents in onsets.

(31) LG meta-ranking
MARK-A >> IO-FAITH-A >> MARK-B >> LG CON'S >> MARK-B' >> IO-FAITH-B

Thus, the ranking of LG constraints with regard to each other is only one factor determining the positioning of dummy affixes. The respective language's phonotactics and foot structure also determine the anchoring of dummy infixes within the prosodic structure. Whenever they break up the original syllabification of the base this happens to optimize the prosodic structures of the derived form. We thus don't expect a game that systematically positions a dummy affix between the consonants of complex codas or inserts a VC sequence before every syllable or the like. Consider the latter option. Placing VC before every syllable potentially results in additional, avoidable, violations of the constraints ONSET and *CODA. An input word, e.g., *bacalao*, combined with a hypothetical dummy affix –*Vp*- would have to surface as *apbaapcaaplao*. This starts with an onsetless syllable, it has two potential vowel hiatuses, which are either syllabified in a way that incurs more violations of ONSET or with additional long vowels. In addition, the *p* of the affix is a coda on at least two occasions and potentially participates in the creation of a complex onset at least once in this form. A hypothetical LG-specific constraint ALIGN(σ, L, *pa*, R) ('Align the left edge of every syllable with the right edge of a *pa*.') would account for this pattern. As we have shown above, LGs just don't behave in this way. The inventors of LGs don't seem to make up new constraints from the available constraint templates. They 'recycle' the constraints that are there already.

Coming back to the LG constraints we have proposed that two types of constraints are important, the edge constraints ALIGN(affix, wrd)L/R and ANCHORStemL/R, and a subset of BR constraints, BR-MAX-V as well as its sister BR-MAX-ˈV, and LOCALITY. These constraints interact with each other, with CONTIGUITY, and to some degree with Markedness constraints.

The factorial typology of these eight constraints gives us 40,320 different rankings. If we add one Markedness constraint only, this number surges to 362,880. This doesn't result in the prediction of the same number of distinct language games. For example, all rankings that have CONTIGUITY in the top stratum or only modestly high in the hierarchy, that is, above BR-MAX-V, rule out iterativity (b versus a).

(32) Major LG parameters
   a. Infixation: LOCALITY, BR-MAX-V >> CONTIGUITY
   b. Pre-/suffixation only: CONTIGUITY >> LOCALITY >> BR-MAX-V
   c. Iterativity: BR-MAX-V >> LOCALITY, ALIGNR/L
   d. Stress-anchoring: BR-MAX-ˈV >> LOCALITY, ALIGNR/L >> BR-MAX-V

The ranking of ALIGNR/L above all other constraints could, at first glance, be expected under (b) as well. However, it does not necessarily exclude infixation. Recall that the Alignment constraints are satisfied as soon as there is one exponent of the relevant affix at the designated edge. Additional exponents elsewhere in the chain don't cause violations in this case.

Instead of discussing all the rankings of ALIGNR/L and ANCHORR/L and their formal properties, we return to the example of microvariation in affix placement in Latin American Jerigonza, as reported by Piñeros (1998) to start the typology. In Costa Rican, the dummy –*pV*– is placed after the nucleus of each syllable, and before the coda if there is one. In the Colombian variety, the dummy is placed after each syllable, and in the Peruvian version a dummy precedes every syllable. (Note that in Peruvian all segments of the dummy are fixed while the vowel copies the preceding vowel in the other varieties.)

(33) Jerigonza forms of *cancion* 'song'

Costa Rica:	ca-pa-ncio-po-n
Colombia:	cam-pa-ciom-po
Peruvian:	cha-can-cha-cion

These varieties thus differ only in the placement of the affixes. And this variation in placement can be modelled with our edge constraints. Costa Rican has the two ANCHOR constraints on top of the hierarchy, as shown in tableau (42). This (with the constraints on reduplication exerting their pressure in the background, represented here by LOCALITY) places the dummy right after every nucleus. Recall that only some exponent of an affix has to be at a designated edge to satisfy an alignment constraint. There can be more exponents of the same morpheme further afield from the designated edge without any consequences. Furthermore, we defined the segment as the intervener category for our edge mapping constraints. (We count orthographic < ci > in *cancion* and < ch > in *–cha–* as one segment.)

(34) Costa Rican Jerigonza: ANCHORL, ANCHORR >> ALIGNL, ALIGNR, LOCALITY

/cancion + RED/	ANCHORL	ANCHORR	LOCALITY	ALIGNL	ALIGNR
☞ a. ca-pa-ncio-po-n			*,*	**	*
b. cam-pa-ciom-po		*!*	**,**	***	
c. pa-can-po-cion	*!*		*,*		***
d. ca-pa-ncion-po		*!*	*,*	**	
e. pa-cancion-po	*!*	**	*,**		
f. pa-po-cancion	*!***		3, 4		6
g. ca-pa-po-ncion			*,**!	*	****

The Peruvian game version has ALIGNL and ANCHORR top ranked, as shown in (35).

(35) Peruvian Jerigonza: ALIGNL, ANCHORR >> ALIGNR, ANCHORL, LOCALITY

/cancion + RED/	ALIGNL	ANCHORR	ALIGNR	ANCHORL	LOCALITY
a. ca-cha-ncio-cha-n	*!*		*		*,*
b. can-cha-cion-cha	*!**	**			**,**
☞ c. cha-can-cha-cion			***	**	*,*
d. ca-cha-ncion-cha	*!*	**			*,**
e. cha-cancion-cha		*!*		**	*,*
f. cha-cha-cancion			6!	****	3 + 4
g. cha-ca-cha-ncion			****!	**	*,**

The Colombian dialect of Jerigonza, was discussed above. The one thing we were able to say about edge mapping constraints then was that ALIGNR has to outrank the others, or at least ALIGNL. Tableau (30) is repeated here as (36) for direct comparison with the other two varieties.

(36) Colombian Jerigonza: ALIGNR >> ANCHORL, ANCHORR, ALIGNL, LOCALITY

	/cancion + RED/	*('LH)	ALIGNR	ANCHORL	ALIGNL	LOCALITY	ANCHORR
☞ a.	(cam-pa)-(ciom-po)				***	**,**	**
b.	(ca-pa-n)(ciom-po)	*!			**	*,**	**
c.	(ca-pa-n)(cio-po-n)	*!*	*		**	*,*	
d.	(pa-can)-(po-cion)	*!*	***	**		*,*	
e.	(pa-can)(ciom-po)	*!		**		*,**	**
f.	(ca-pa)-(po-ncion)		*!***			*,**	

The discussions in the preceding subsections provide two more partial rankings of our edge mapping constraints. For Hausa (Section 4.5), which places the first dummy before the first syllable of the base, we assumed ALIGNL (and LOCALITY) to outrank ALIGNR and ANCHORR/L.

The analysis of Swedish (Section 4.1) required ANCHORL to dominate ALIGNL (and the other two edge constraints), since the –VC– affix is placed after the first syllable of the base if that doesn't start in a consonant. Dutch (also 4.1), in comparison, places the dummy at the front in the same situation, requiring ALIGNL to dominate ANCHORL (and the other two edge constraints).

The English LG, inserting –*Vlf*- next to the stressed syllable, was analysed as an instance of LOCALITY outranking BR-MAX-V. Ranking one of the Alignment constraints above LOCALITY and LOCALITY above BR-MAX-V results in non-iterative prefixation or suffixation, as attested in the English LG gree, which turns a word like *Mary* into *Marygree*, by suffixing one dummy, or by our Lebanese example that prefixes *za-* to every word, as in *kitá:b* ->*zakitá:b* 'book'. In the varieties of Jerigonza above, LOCALITY has to be dominated by BR-MAX-V, since they are iterative.

Iterativity was also one of the differences between the Swedish and the Dutch LG that we discussed in some detail for the subtle difference in the placement of the first exponent of the dummy. While the Dutch LG is iterative, placing a dummy after every onset, the Swedish LG only places one dummy after the first onset.

5 Infixing iterative LGs in context

In this section, we review two OT analyses of iterative infixation that at first glance look similar to the one proposed here, Piñeros' (1998) and Yu's (2008) analyses. For discussion of further approaches, see Yu (2008). Piñeros and Yu base their analyses on the insight that prosodic wellformedness plays a key role in the shaping of LG patterns, as do we. This insight is reiterated by Geiger (2015)

To account for iterativity, Yu concludes that the affixal consonant is aligned with a mora, the copy vowel emerges to create wellformed syllable structure and is a copy in avoidance of epenthesis. This is the exact opposite of our analysis, in which the (copy) vowels are reduplicants and both iterativity and infixation are side effects of the requirement to reduplicate each base vowel and to do this as close to its corresponding base segment as phonotactically possible. In addition, the infixation location is determined by one more independent factor, the ranking of the edge mapping constraints. Thus, we don't have to stipulate a game-specific and language-specific alignment constraint. Evidence against such a direct approach comes from the LG discussed in Bertinetto (1987). Bertinetto presents a LG with iterative infixation of *–gVˈsV-* to his subjects, who are then asked to judge new forms. He finds variation in whether subjects prefer infixation before or after coda consonants in words such as *campo*, with some preferring *camgasapogoso* and others *cagasampogoso*. If these subjects had generalized after exposure to, e.g., *cosa* -> *cogososagasa* that the LG is based on an Alignment constraint requiring the affix to follow the nucleus they wouldn't have displayed this kind of variation. In addition, forms that reduplicate the coda consonant as well, not just the vowels, are also considered licit by some of his subjects, i.e., *camgasampogoso* from *campo*. Note that this results in an additional unstressed heavy syllable, increasing prosodic markedness. If the vowels in the dummy receive their content by vowel copy, the additional consonant needs to be explained independently. If such LGs are reduplication patterns, the additional consonant is expected, since the implicit goal of every reduplication process is to reduplicate as much material from the base as possible.

It should be noted, however, that Yu's approach is based on limited coverage of the attested typology, as is Geiger's (who examines one LG, Löfflisch). We come back to this after sketching Piñeros' approach.

For Piñeros, the copy vowel is there to improve prosodic structure in a slightly different way and it is a copy to avoid epenthesis, as in Yu's account. Piñeros accounts for iterativity by interpreting the patterns in Jerigonza as the requirement to have a left foot edge at the left edge of every syllable from the source form. His constraint ANCHOR-\$-L (every syllable of the base has to be the left edge of a foot) conspires with FOOTBIN(\$\$) to expand every syllable into a foot. This foot needs more segmental material to form the second syllable required by foot binarity, and this is what causes iterativity. The placement of the dummy within or next to syllables, before or after, is regulated by several foot-source syllable alignment and anchoring constraints.

Piñeros' proposal, can account for games in which the iterative dummy affix is CVCV, as in the Spanish *–kVmV-* game (*adios* → *akamadikimioskomo*) or games in which we find only one copying dummy affix (*balfastard*).

Furthermore, for each language with a LG involving vowel copy, it has to be established whether vowel copying is actually preferred over V epenthesis in general in the language at hand. In Spanish, one could suspect that the epenthesis of a mid front vowel before word-initial sC clusters is productive (e.g., *España* 'Spain'), as we already considered above. This would thus require stipulation of additional game-specific constraints that regulate preference of vowel copy in the context of the language game while epenthesis of a default vowel is preferred elsewhere. Piñeros also assumes bisyllabic feet for Spanish without further discussion, which ignores the apparent quantity sensitivity of the language's stress placement (e.g., Oltra-Massuet and Arregi 2005; Roca 2006; Martínez-Paricio 2013; references there).

In our account, both iterativity and copying emerge as effects of the reduplicative nature of the LGs, and it is not necessary to stipulate LG-specific constraints that position the dummy affix in a certain position with respect to every syllable or require every syllable in the base to be at a foot edge. As Yu (p. 517), we think that "iterative infixation can be treated on par with canonical affixation processes in natural languages". Since iterative infixing LGs look very unlike common morphological operations, we are aware that the claim that there are no LG-specific constraints would be even stronger with further empirical support. As a reviewer points out, affixation is not normally iterative in the way these LGs are. We find iterativity for example in Jita (Downing 2004). The causative morpheme *–y-* is added after the verb stem and iterated after every affix that follows. Consider the forms in (37). We start with the verb 'to buy', to which then successively the causative/-y/, the applicative/-ir/and the reciprocal/-an/are added. The glide/-y/ causes palatalization of a preceding/r/to [s]. We see an effect of this on the verb root even if the glide coalesces with a following/i/, as in (37c and e). The forms in (37c-e) show that the causative is realised after every morpheme or syllable onset, which looks very much like what we find in iterative infixing LGs (though, see Downing 2004 for an elegant analysis in terms of paradigm optimization).

(37) Jita causative doubling

a.	/gur-a/	gura	'to buy'
b.	/gur-y-a/	gusya	'to sell'

c. /gur-y-ir-a/ gusi:sya
d. /gur-y-an-a/ gusya:nya
e. /gur-y-ir-an-a/ gusi:sya:nya ‘to sell to each other’

Another pattern that involves multiple infixing reduplication can be found in Tigre (Rose 2003). In the examples in (38), the reduplicants are underlined as given by Rose (2003: 114). The language does not only allow up to three reduplicants, they are also all infixed, which is quite unusual, since reduplication is predominantly prefixing.

(38) Tigre infixing multiple reduplication
dəgm-a: ‘tell, relate’
dəga:gəm-a: ‘tell stories occasionally’
dəga:ga:gəm-a: ‘tell stories very occasionally’
dəga:ga:ga:gəm-a: ’tell stories infrequently’

In the Central-American language Ulwa (Green 1999), we find an infixation pattern, that is very similar to the English –*alf*- LG (*bastard* -> *balfastard*), in which the dummy is placed next to the stressed syllable. The Ulwa infix is placed to the right of an iambic foot (McCarthy and Prince 1993; Yu 2008).

(39) Ulwa affixation to foot
bás-*ka* ‘hair’
saná-*ka* ‘deer’
sú:-*ka*-lu ‘dog’
siwá-*ka*-nak ‘root’
aná:-*ka*-la:ka ‘chin’

While we analysed the English infixing LG as reduplication of the stressed vowel consistent with our general proposal, we don’t think that this necessarily is the only option. A LG like this might exploit the same kinds of constraints, as such grammatical processes rely on, e.g., Alignment-to-foot, as discussed in Yu’s (2007) brilliant survey of infixation.

6 Conclusions

The analysis of the type of language games we have discussed in this paper seems to require direct reference to syllables and to syllable constituents, or, as in Yu’s (2008) analysis, to moraic structure in LG-specific constraints. Despite potential generalisations, such as “the dummy affix is placed after each onset/before each nucleus/in the stressed syllable" etc., a closer examination of these games from the perspective of Prosodic Morphology yields very economic results, since infix placement is emergent from the interaction of more general constraints. In our OT analysis, we only made use of constraints that are commonly used in analyses of regular grammatical reduplication and truncation patterns. The positioning of infixes emerges from the interaction of Alignment constraints that place affixes at the left or right edge with Anchoring, which demands mapping of edges of derived forms with the edges of base forms, as well as phonotactic constraints and reduplicative Locality, which causes iterativity.

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Appendix (table of mentioned language games arranged according to source languages in alphabetical order and with references)

Danish	*Du er lille arsen -> Durbe erbe lirbe lerbe arbe serbe.*[14] 'Your are a small donkey.'	Jespersen 1922
Dutch	*en mannetje -> epen mepannepetjepe* 'a male$_{(dim)}$'	http://en.wikipedia.org/wiki/Language_game
Egyptian Arabic	*yeddihali -> yeddihatinali* 'you gave it to me'	Davis 1993
English	*míssed the bástard -> milfíssed the balfástard*	Laycock 1972
English/Yiddish	*Revolution-> revolution-shmevolution*	Laycock 1972
English	*monday ->monvedayve*	Laycock 1972
English	*Morgan -> Mubórgubán, string->strubíng*	Sherzer 1982,

(*continued*)

14 With overwriting of the coda.

(*continued*)

English	talk -> *tongalongkong*	Laycock 1972
English	*mary had -> marygree hadgree*	http://www.factmonster.com/ipka/A0769354.html,%2004.04.2015
Finnish	*mika sinun nimesi on ->* *mika-kontti sinun-kontti nimesi-kontti on-kontti* 'What is your name?'	Pound 1963, cit. Botne and Davis 2000
Finnish	*jonglööri-> jongtälööri* 'juggler'	Davis 1993
French	*je suis jeune -> fejefuisuisfeujeune* 'I am young'	http://www.infos-du-net.com/forum/260536-31-parler-langue
French	*Crois-tu qu'il m'aime?->* *Crois-vois tu-vu qu'il-vil m'aime-vaime*? 'Do you think he loves me?'	Niceforo 1897
French	*chapeau -> chapal* 'hat' *zero->zeral* 'zero'	Laycock 1972
German	*Kannst du mir sagen ->* *Kabannst dubu mibir sabageben* 'can you tell me'	https://de.wikipedia.org/wiki/SpielspracheBächtold 1914, Matteänglisch 1897
German	*Wenn meine Mutter wüßte ->* *Wennbo meibonebo Mutboterbo wüßbotebo* 'If my mother knew'	Siewert 2002
Hausa	*tsíntsíyáa -> dàtsíndàtsídàyáa* 'broom'	Alidou 1997, cit. Botne and Davis 2000
Indonesian	*kasakóla -> kasakolárka* 'school'	Pound 1963, cit. Botne and Davis 2000
Italian	*andare->afandafarefe* 'to go' *ombrello->ofombrefellofo* 'umbrella'	https://it.answers.yahoo.com/question/index?qid = 20081124134113AAbXS9o
Italian	*Mano->magasá nogosó* *Lunatici-> lugusú nagasá tighisí cighisí*	Bertinetto 1987
Japanese	*watákuši wá ŋakó e íkimásu ->* *wánosátakuši wánosá ŋanosákó enosá ínosákimásu* 'I'm going to school.'	Yu 2008
Lebanese	*kitá:b -> zakitá:b* 'book'	Pound 1963, cit. Botne and Davis 2000

(*continued*)

(*continued*)

Portuguese	*portugal->porportupugalpal* 'Portugal'	Silva, Claudia p.c.
Spanish	*adios* -> *akamadikimioskomo* 'good bye'	http://linguistlist.org/issues/5/5-764.html
Spanish	*Córdoba* -> *Cogasórdoba* 'city name' *colectivo->colecti-gasívo* 'bus'	https://en.wikipedia.org/wiki/Rosarigasino
Spanish	*hola->pehopela* 'hello'	http://linguistlist.org/issues/5/5-764.html
Spanish	*cancion-> ca-pa-ncio-po-n* 'song' *cancion-> cam-pa-ciom-po* 'song' *cancion-> cha-can-cha-cion* 'song'	Piñeros 1998
Swedish	*Hur är läget*? -> *Hallur ärall lalläget?* 'How are you?'	https://en.wikipedia.org/wiki/Language_game
Tagalog	*tiná:pay-> t-um-í:napáy* 'bread'	Cinclin 1956, cit. Botne and Davis 2000

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