Infixed Reduplication under Kalin's Infixation Process

James Cooper Roberts

***Abstract*—Infixed reduplication is a morphophonological process where a word in whole or part is copied and re-inserted into the word. A previous article (which this work is based primarily on) posits a specific order for the infixation process, simplified as follows: Concatenation > Exponent Choice > Linear Displacement > Prosodification. However, the author of said work does not directly address infixed reduplication in their study. This raises two important questions. When in the infixation process does reduplication occur? Furthermore, is this timing universal, or is there variation across languages? In this study, I examine this issue by first establishing a typology for infixed reduplicants based on the timing of reduplication relative to linear displacement. Diagnostic tools to determine a reduplicant's category are also provided. I then analyze infixed reduplication phenomena from 33 different languages and classify them. Ultimately, I find that the time reduplication occurs is not consistent across languages. The paper concludes with an overview of the implications of the current study and avenues for further inquiry.**

***Index Terms*—Infixation process, infixed reduplication, linguistics, prosodic morphology**

I. Introduction

Infixed reduplication (alternatively called internal reduplication) is a morphological phenomenon where a word in part or whole is copied and said copy is re-inserted into the word. This process is particularly interesting for prosodic morphologists as it is the synthesis of several other prosodic phenomena, namely infixation, reduplication, and truncation. Investigations by Yu found that nearly 50 languages have been described to exhibit some kind of infixed reduplication phenomena [1]. However, it is possible that the true number of languages that exhibit this trait is significantly higher.

An example from Samoan, an Austronesian language, are captured in (1) below.

(1) Samoan Plural Agreement

a.	alófa	a:lolófa	'love'
b.	galúe	ga:lulúe	'work'
c.	atamái	atamamái	'clever'

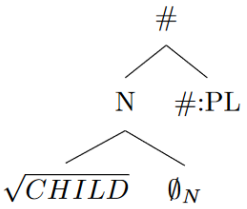
Infixation and reduplication (as both separate and interacting processes) have been the subject of much linguistic inquiry for some time now. However, it is only recently that anyone has posited an ordering of events for the infixation process. Kalin proposes that infixes are actually prefixes or suffixes underlying. These morphemes have special requirements—referred to as pivots—that specify where it is realized in the surface representation [2]. These pivots can be segmental (e.g., to the immediate left of the second vowel, to the right of the first consonant) or prosodic (e.g., to the right of the syllable with primary stress, to the left of a high tone) in nature. Under Kalin's model, the morphemes are pushed to this location via a process called linear displacement which occurs after vocabulary insertion but before regular phonology. The complete process is outlined in (2).

(2) The Infixation Process à la Kalin [2]

a. Build the abstract morphosyntactic structure.
b. Bottom-up realization: apply the following cycle of morphology and morphonology to the most embedded unexponed morpheme:
   i. Concatenation
   ii. Exponent Choice
   iii. Linear Displacement
   iv. Prosodification
c. Apply surface phonology. (repeat (a)-(c) for every phase/spell-out domain.

Under the current understanding of reduplication, reduplicants are introduced to the phonology the same way as any other morpheme. What makes them special is that their phonemic segments are underspecified. Instead, they copy some or all of the segments of whatever they are affixed to. This is accomplished with an instruction called *RED* introduced during vocabulary insertion. *RED* then copies the segments it desires from the root. The sample derivation in (3) shows *RED* in action.

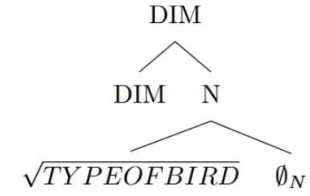
(3) Walpiri *kurdukurdu* 'children'



Vocabulary Insertion Rules
√CHILD ↔ *kurdu*
#:PL ↔ *RED*

Some reduplication processes only copy a part of the root (e.g., a foot, syllable, mora). Thus, *RED* can have specifications on what to copy. An example of partial reduplication is captured in (4) where *RED* copies the first bisyllabic foot it encounters.

(4) Walpiri *kurdukurdu* 'children'



Vocabulary Insertion Rules
√TYPEOFBIRD ↔ *ṭilparku*
DIM ↔ $(\sigma\sigma)_{FT}$*RED*

Manuscript received October 8, 2022; revised December 20, 2023; accepted February 25, 2023.

J. C. Roberts is with Boston University, Boston, MA 02215 USA.
E-mail: cooper.roberts10@gmail.com (J.C.R.)

doi: 10.18178/ijlll.2023.9.2.388

Reduplicants are like any other affix; the only difference is that they insert a set of copying instructions instead of segmental phonemes. Given that they are introduced to the syntax in the same way as other morphemes, it is reasonable to conclude that they are also subject to Kalin's model. However, infixed reduplicants are conspicuously absent from the paper. This raises an important question: for infixed reduplicants, when in the process does reduplication occur? Furthermore, is this ordering universal, or is there variation cross-linguistically?

In this article, I aim to provide an answer to the above questions. I will establish a typology for infixed reduplicants based on when their reduplication process occurs relative to linear displacement. With this typology, I provide several diagnostics to differentiate these categories. The bulk of this paper is dedicated to classifying infixed reduplication phenomena from 33 different languages. Finally, I conclude with some commentary on my findings and the implications for the topic as a whole.

II. Theoretical Groundwork

A. Introducing a Typology

As stated in Section I, *RED* is introduced to the syntax via vocabulary insertion. Assuming Kalin's model is correct, it is impossible for the reduplication process to precede exponent choice. Therefore, I propose that there are two possible categories for infixed reduplicants. I will refer to those whose reduplication process precedes linear displacement as *Type P* infixed reduplicants. Those whose reduplication process follows linear displacement will be referred to as *Type F* infixed reduplicants[1]. The process order of both types is outlined in Table I.

TABLE I: Ordering of Infixation & Reduplication Process by Category

Type P	Type F
Concatenation	Concatenation
Exponent Choice	Exponent Choice
Reduplication	Linear Displacement
Linear Displacement	**Reduplication**
Prosodification	Prosodification

B. Introductory Case: Samoan & Nonce-Samoan

To best illustrate the differences between Type P and Type F infixed reduplicants, it is necessary to compare two minimally-different phenomena (i.e., they are identical apart from their status as Type P or Type F). Unfortunately, my research suggests that there is no such minimal pair; let us instead compare the Samoan examples in (1) with a similar construction in Nonce-Samoan. Nonce-Samoan is a hypothetical variety that is identical to Samoan in nearly every aspect. The only difference is that Nonce-Samoan's plural agreement morpheme is a Type P reduplicant, while standard Samoan's is a Type F reduplicant. As can be seen in (5–6), this difference is far from arbitrary.

(5) Samoan Plural Agreement

a. alófa a:lolófa 'love'
b. galúe ga:lulúe 'work'
c. atamái atamamái 'clever'

(6) Nonce-Samoan Plural Agreement

a. alófa a:lolófa 'love'
b. galúe ga:lulúe 'work'
c. atamái atamamái 'clever'

(7) AGR ↔ $(CV)_{\sigma}RED$

Pivot: immediate left of stress-bearing syllable

While (5a) and (6a) are identical, the same cannot be said for (5b–5c) and (6b–6c). The rewrite rule for plural agreement (formalized in (7) introduces an operator that duplicates the first consonant-vowel string it finds. If reduplication precedes linear displacement, the reduplication operator will select a different string to copy than if reduplication succeeded it.

C. Metrics for Categorization

As illustrated in the previous dichotomy, the difference between Type P and Type F reduplicants is a subtle yet consequential one. Thus, techniques and metrics to distinguish the two are necessary. In this section, I provide several figurative litmus tests to discriminate the two. These techniques are utilized in the analyses presented in the current study, but they should also be used for future investigations of reduplication phenomena as they are discovered.

Of course, it is important to include more than one word in an analysis. The Samoan/Nonce-Samoan case shows how Type P and Type F reduplicants can realize a word identically; if an investigator were to examine only *alófa/a:lolófa*, it would be virtually impossible to determine if the morpheme were Type P or F. What betrays Samoan plural agreement's status as Type F is the fact that the reduplicant shares segments with its pivot in all cases. In constrast, Type P reduplicants generally have phonemes from a word boundary or very near the word boundary.

A key diagnostic for Type P morphemes is total reduplication. The current theory of reduplication states that *RED* scans in one direction and copies segments from a root until it is satisfied. If this model is correct, then it would be impossible for a Type F morpheme to reduplicate an entire word after it has already been infixed. Subsequently, a total reduplication must be of Type P. A hypothetical case of pluralization a nonce language is captured in (8–9).

(8) pataka papatakataka

(9) #:PL ↔ *RED*

Pivot: immediate left of second syllable

D. Theoretical Assumptions

Before moving forward, I will state two theoretical assumptions I employ in this analysis. The first is in regard to the Marantz Generalization [3] under the model for infixation Kalin (forthcoming) proposes. Marantz [3] proposes that, typically, prefixed reduplicants copy from left-to-right and suffixed reduplicants copy from right-to-left. It is important to remember that this is referred to as the Marantz *Generalization*, not Marantz's *Law*; there are several recorded examples that contradict this pattern.

Regardless, this generalization is helpful for the purposes

[1] P for **p**recede and F for **f**ollow, if it was not already obvious.

of this study. Infixes have traditionally been analyzed as though they could copy in either direction. Assuming that Kalin is correct in positing that infixes are underlying prefixes or suffixes, it is reasonable to conclude that infixes that are underlying prefixes copy left-to-right, while those that are underlyingly suffixes copy right-to-left. For the purposes of this study, I will assume such for each case in my analysis unless convincing evidence to the contrary is found.

The second assumption is in regard to the identity of the infix and its distance to a word boundary. Because the idea of infixes being {pre-/suf-}fixes is a novel idea, there is (to my knowledge) no published work discussing ways to determine the underlying position of an infix. It seems most logical to conclude that infixes closer to the left edge of a word are underlyingly prefixes and those closer to the right edge are suffixes.

Example (10) illustrates the motivation for this generalization. (10a-c) each have a different number of syllables. The distance from the left edge of the word to *-ni-*'s pivot remains consistent (one syllable). However, the same cannot be said for the right edge of the word. If I were to posit that the plural morpheme was underlyingly a suffix, I would also have to assume that the linear displacement process is aware of the entire root (and thus, knows when to stop displacing *-ni-*). It seems much more likely, then, that this morpheme is underlyingly a prefix.

(10) Invented Example

a. pataka panitaka 'cat(s)'
b. badagalu banidagalu 'dog(s)'
c. chitichitbanban chinitichitibanban 'flying car(s)'
d. #:PL ↔ *ni*
Pivot: after first syllable

III. Analysis

This section is dedicated to the categorization of infixed reduplicants according to the typology established in Section II.A. Evidence motivating the classification is taken primarily from Yu [1]; however, I refer to several alternative sources for select cases.[2] For each applicable example, sample predictions from the opposite type are provided as further evidence for the classification. Where necessary, I elaborate on my judgements. In total, 33 languages are examined, selected to maximize the genetic diversity of the sample[3].

A. Type F Reduplicants

Type F infixed reduplicants are named for the fact that their reduplication process follows linear displacement in Kalin's infixation process. Generally speaking, these reduplicants often share segments with an immediate neighbor.

The Samoan examples in the previous sections set a precedent for several other Austronesian languages included in this study. Chamorro has two infixed reduplication processes,[4] the first of which fits snugly into the Type F category.

(11) Chamorro continuative [5, 6] via [1]

a. sága sásaga 'stay'
b. hugángo hugágango 'play'
c. Continuative ↔ *(CV)σRED*
Pivot: before stressed syllable
d. Type P prediction: *huhúgango

The nominal plural construction in Amis, another Austronesian language, is also a Type F infixed reduplicant. In contrast to Chamorro, this morpheme is underlyingly a suffix and copies from right to left.

(12) Amis Nominal plural [7] via [1]

a. luma? lumaluma? 'house(s)'
b. kaput kapukaput 'group(s)'
c. #:PL ↔ *(μμ)RED*
Pivot: after final V
d. Type P predictions: *lumama??, *kapuputt

Amis' linguistic relative Pazeh employs an identical pattern to express pluractionality.

(13) Pazeh pluractional [8] via [1]

a. ubuut ubuubuut 'to fart (repeatedly)'
b. magizem magizegizem '(very) strong'
c. #:PL ↔ *(μμ)RED*
Pivot: after final V
d. Type P predictions: *ubuuuutt, *magizezemm

Another right-to-left copying infix is found in Kamaiurá plural constructions. *RED* copies a disyllabic foot after being infixed to the immediate right of the final vowel.

(14) Kamaiurá pluractional [9, 10] via [1]

a. omokon omokomokon 'he shook it repeatedly'
b. jeumirik jeumirimirik 'I tie it up repeatedly'
c. #:PL ↔ $(\sigma\sigma)_{FT}RED$
Pivot: after final V
d. Type P predictions: *omokomokonn, *jeumirimirikk

Nakanai is an interesting case, partially for the fact that the purpose of this construction is not known. More relevant to this study, though, is that it varies whether *RED* will duplicate one or two syllables. Either way, it is most definitely a Type F reduplicant.

(15) Nakanai ??plural ??nominalization [10] via [1]

a. burulele burulelele 'sliding on buttocks'
b. tuluga tulugaluga 'sandal'
c. ?? ↔ *(CV)OR(CVCV)RED*
Pivot: before stressed foot
d. Type P predictions: *burubulele, *tutuluga

West Tarangan, another Austronesian language, employs a Type F reduplicant in another construction of unknown purpose.

(16) West Tarangan ?? [11] via [1]

a. singálta singalngálta 'flying fish'
b. ?? ↔ *(CVC)RED*
Pivot: before stressed syllable
c. Type P predictions: *singsingálta

The Niger-Congo language Kinande uses infixed

[2] The works of Prof. Alan Yu, specifically [1, 4], are excellent resources for data pertaining to infixed reduplicants. Much of the data in this paper was retrieved from Appendix III of [1].

[3] See appendix for list of languages investigated.

[4] See (43) for the second

reduplication to mark pluractionality. Here, *RED* copies an entire foot after being placed at the immediate left of the first consonant.

(17) Kinande pluractionality [12] via [1]

a. ohera oherahera ‘pick for’
b. huma humahuma ‘beat’
c. Pluractional ↔ *(σσ)$_{FT}$RED*
Pivot: before first consonant
d. Type P predictions: *oohehera

Kinande’s linguistic relative SiSwati employs an identical construction for discussing pluractionals.

(18) SiSwati pluractionality [12] via [1]

a. enyela enyelanyela ‘be hurt’
b. engetisa engetingetisa ‘cause to increase’
c. Pluractional ↔ *(σσ)$_{FT}$RED*
Pivot: before first consonant
d. Type P predictions: *eenyenyela, *eengengetisa

In the Misumalpan language Ulwa, the adjective distributive morpheme is a Type F reduplicant. Coincidentally, its pivot and copying instructions are identical to Samoan plural agreement’s; \textit{RED} copies the CV to its right after being infixed to the left of the stressed syllable.

(19) Ulwa adjective distributive [13] via [1]
a. baráska barárásla ‘black(-ADJ)’
b. saháwka sahaháwka ‘nake(-ADJ)’ [sic]
c. AdjDist ↔ *(CV)RED*
Pivot: before stressed syllable
d. Type P predictions: *babaráska, *sasaháwka

Frequentative constructions in Tigrinya (a Semitic language) involve an infixed reduplicant whose pivot is after the first syllable. It copies the first CV string it finds after being infixed, but replaces the vowel with /a/.

(20) Tigrinya frequentatives [14] via [1]
a. səbərə səbabərə ‘break in pieces’
b. Freq ↔ *(Ca)RED*
Pivot: after first syllable
c. Type P prediction: *səsabərə

Harari frequentative constructions are derived in the exact same manner as its relative Tigrinya’s.

(21) Harari frequentatives [14]
a. zələla zəlaləla ‘jump a lot’
b. k’ədəda k’ədadəda ‘tear a lot, again’
c. Freq ↔ *(Ca)RED*
Pivot: after first syllable
d. Type P predictions: *zəzaləla, k’əkadəda

Ngizim is a Chadic language, making it distantly related to Semitic languages. Interestingly, it marks pluractionality with an infixed reduplication strategy identical to those from Harari and Tigrinya above.

(22) Nigizim pluractional [15] via [1]
a. gEnu gEnanu ‘get many’
b. dEgEru dEgagEru ‘pound floor’
c. Pluractional ↔ *(Ca)RED*
Pivot: after first syllable
d. Type P predictions: *gEganu, dEdagEru

Adjectival constructions in the Pama-Nyungan language Uradhi are accomplished by a reduplicant infixed after the first vowel.

(23) Uradhi adjectives [16] via [1]

a. wampawampampa ‘float’
b. ikya ikikya[5] ‘speak’
c. Freq ↔ *(CV)RED*
Pivot: after first vowel
d. Type P prediction: *wawampa

The Chadic language Hausa exhibits two infixed reduplication phenomena that behave similarly. Both the nominal plural morpheme and the pluractional morpheme are Type F infixes that are inserted after the first syllable. The pluractional morpheme can copy the CVC or CVG (glide) to its right, while the plural morpheme is limited to copying CVC. Given the similarity between these two, it is natural to wonder if they are actually underlyingly the same morpheme; however, the literature makes a distinction between the two. While it may be interesting to investigate in the future, I will assume that they are two separate phenomena for the purposes of this study.

(24) Hausa pluractional [17] via [1]

a. rikita rikirkita[6] ‘tangle, confuse someone’
b. farautafaraurauta ‘hunt’
c. Pluractional ↔ *(CVC)OR(CVG)RED*
Pivot: after first syllable
d. Type P predictions: *rikrikita, *farfarauta

(25) Hausa nominal plural [17] via [1]

a. cikuna cikunkuna ‘bell(y/ies)’
b. #:PL ↔ *(CVC)RED*
Pivot: after first syllable
c. Type P prediction: *cicikuna

Another Chadic language, Bole, employs a Type F reduplicant in its pluractional constructions. This infix copies a single consonant after it is displaced past the first syllable.

(26) Bole pluractional [18]

a. bulaa bullaa ‘dig (little by little)’
b. Pluractional ↔ *(C)RED*
Pivot: after first syllable
c. Type P prediction: *bublaa

Paiwan (Austronesian) plural forms are realized by an infixed reduplicant embedded after the final vowel. *RED* copies two mora to its left, which would generate incorrect plural forms if the morpheme were Type P.

(27) Paiwan plural [19] via [1]

a. kuva kuvakuva ‘type of bean/large bean’
b. ʔulavav ʔulavalavav ‘mouse/mice’
c. daŋas daŋadaŋas ‘upper side/bedside’
d. #:PL ↔ *(μμ)RED*
Pivot: after final vowel
e. Type P prediction: *ʔulavalavv

The Uto-Aztecan language Sonora Yaqui uses Type F reduplicants in intensive constructions. *RED* copies a

[5] This y/i alternation is due a phonological process [1]

[6] Sound changes due to a phonological process.

neighboring CV after being infixed before the final syllable.

(28) Sonora Yaqui intensive [20]

a. tekipanoa tekipapanoa ‘to work’
b. naamuke naamumuke ‘to get drunk’
c. Intensive ↔ *(CV)RED*
Pivot: before final syllable
d. Type P predictions: *tekipanonoa, *naamukeke

The Salishan language Shuswap employs an infixed reduplicant in dimunitives that at first glance may resemble a Type P underlying prefix. However, this analysis falls short for word-initial consonant clusters as in (\ref{cluster}). The solution is to instead analyze the morpheme as a Type F underlying suffix. This generates the correct predictions regardless of the syllable onset.

(29) Shuswap diminutive [20, 21] via [1]

a. pésəlkʷe pépsəlkʷe‘(small) lake’
b. cq’élp cqéq’lp ‘(small) tree’
c. DIM ↔ *(C)RED*
Pivot: after stressed vowel
d. Type P predictions: *pékʷsəlkʷe, *cq’éplp

Identical phenomena exist in Thompson Salish and Lilloet, both of which are closely related to Shuswap.

(30) Thompson Salish diminutive [22] via [1]

a. sxén sxéxn-ʔx ‘(small) rock (hill)’
b. kᵖˣáxʷekᵖˣákᵖˣxʷe ‘(small) box’
c. DIM ↔ *(C)RED*
Pivot: after stressed vowel
d. Type P prediction: *sxénn, *kᵖˣáxʷxʷe

(31) Lilloet diminutive [21] via [1]

a. p’aʔxʷ p’´əp’ʔaxʷ ‘(little bit) more’
b. səmɣáw səmɣ´əɣəw ‘(little) lynx’
c. DIM ↔ *(C)RED*
Pivot: after stressed vowel
d. Type P prediction: *p’´əxʷaʔxʷ, *səmw´əɣəw

B. Type P Reduplicants

Type P infixed reduplicants are called such because their reduplication process precedes linear displacement. Oftentimes, they share segments with the left or right edge of a word.

Two shining examples of Type P morphemes come from the Chimakuan language Quileute. Infixed reduplicants of this variety can be found in the language’s frequentative and distributive/plural constructions. The first copies only the word-initial consonant, while the latter copies the word-initial consonant and adds the vowel /e:/. However, they share a pivot (which is to the immediate right of the first consonant).

(32) Quileute frequentative [10]

a. qa:le? qaqle? ‘he failed (frequently)’
b. tˢiko tˢitˢko ‘he put it on (frequently)’
c. Freq ↔ *(C)RED*
Pivot: after first syllable
d. Type F predictions: *qalle?, *tˢikko

(33) Quileute distributive/plural [10]

a. qa:watˢqa:qe:watˢ ‘potato’
b. t’a:dax t’a:t’e:dax ‘tail (of a bird)’
c. k’a?t’la k’ak’e:t’la ‘stones’
d. #:PL ↔ *(Ce:)RED*
Pivot: after first syllable
e. Type F predictions: *qa:we:watˢ, *t’a:de:dax, *k’at’e:t’la

Levantine Arabic also exhibits a Type P infixed reduplicant. Based on the findings of McCarthy and Prince, Cowell [10, 23], Yu [1] reports that the pivot is before the final vowel. While his report is not incorrect, it does cause some trouble for the assumptions I established in Section 2.4. The infix is closer to the right edge of the word, which would normally suggest that it is underlyingly a suffix. However, analyzing it as a suffix generates incorrect predictions regardless of whether it is Type P (*bardad) or Type F (*barrad). Therefore, it must underlyling be a prefix. I elect to reanalyze the pivot as `before second vowel’ as this terminology fits better with my previously established generalization for infixes. Additionally, I was unable to find any attested examples of this construction with more than two syllables, so this terminology refers to the exact same location as `before final vowel.’ This aside, the infix always matches the initial consonant of the word, suggesting that it is Type P.

(34) Levantine Arabic intensification [10, 23] via [1]

a. barad barbad ‘shaved unevenly’
b. sarah sarsah ‘criticized severely’
c. Intensify ↔ *(C)RED*
Pivot: before second vowel
d. Type F predictions: *bardad, *sarhah

In Zuni medio-passive constructions, a copy of a stem’s initial consonant is infixed before a final vowel. Yu [1] labels the pivot as ‘before the final vowel.’ Like several of the above examples, positing that it is underlyingly a suffix generates inaccurate results (*chollo, *litti, *tommo). However, according to Newman [24], this construction only occurs with verbs of a certain morphological class that have the canonical pattern CVCV. Considering this paper’s assumptions regarding pre-/suffixhood and directionality, it is more kosher—yet equally truthful—to say that the pivot is `before the second vowel.’

(35) Zuni mediopassives [10, 24]

a. cholo cholcho(+?a) ‘it makes irregularly crackling sounds’
b. liti litli ‘to make a scratch’
c. tomotomto(+k?ea) ‘making noise on the skin drum’
d. $V_{mediopassive}$ ↔ *(C)RED*
Pivot: before second vowel
e. Type F predictions: **chol[]o, **tom[]o, **lit[]i

Koasati (Muskogean) punctual verbs are marked with a Type P reduplicant. I posit that the morpheme must underlying be a prefix despite its adjacency to the right edge; analyzing it as a suffix bears incorrect forms regardless of type (*alotnó:kan, *alotkó:kan). The pivot is either after the second syllable or after a stressed syllable. These two points coincide in the data on hand, so further investigation is necessary to posit the “true” pivot.

(36) Koasati punctual [25] via [1]

a. aló:tkan alotló:kan‘to be full’
b. copóksin copokcó:sin ‘to be a hill’

c. polóhkin polohpó:kin 'to be circular'
d. Punctual ↔ *(Co:)RED*
Pivot: ??after stressed syllable/??after second syllable
e. Type F predictions: *alotkó:kan, *copoksó:sin, *polohkó:kin

C. Reduplicants of Indeterminate Category

For some of the infixed reduplicants, it is impossible to tell the type to which they belong based on the data and diagnostic tools available. One such case of this ambiguity is the Djingili (an Australian language) plural construction. *RED* copies the first vowel-consonant string it finds and inserts it after the first consonant. However, because there are no vowel-initial roots in the language [1], it is impossible to determine if reduplication occurred before or after infixation.

(37) Djingili plural (nominal) [16, 26, 27] via [1]

a. badaura badadaura '(very) good'
b. #:PL ↔ *(VC(C))RED*
Pivot: ??after first consonant/??before first vowel

The Salishan language Lushootseed uses infixed reduplicants in `out of control' constructions. It suffers from the exact same issue as Djingili plurals...

(38) Lushootseed 'out of control' [10, 28] via [1]

a. gwedil gwededil 'just sitting around'
b. stubsh stububsh 'man/men'
c. OoC ↔ *(VC)RED*
Pivot: before first vowel

...as do Mangarayi (Australian) intensifiers…

(39) Mangarayi intensification [29, 30] via [1]

a. gurjag gurjurjagji '(having a lot of) lilies'
b. Intense ↔ *(VC(C))RED*
Pivot: after first consonant

...Kugu Nganhcara (Australian) durative/iterative constructions...

(40) Kugu Nganhcara durative/iterative [30] via [1]

a. thena thenena 'stand'
b. pukpe pukukpe 'child'
c. Durative/Iterative ↔ *(VC)RED*
Pivot: after first consonant

...and Wardaman (Australian) nominal plurals.

(41) Wardaman plural [6] via [1]

a. marluga marlarluga 'old m(a/e)n'
b. #:PL ↔ *(VCC)RED*
Pivot: after first consonant

The Austronesian language Timugon Murut expresses frequentatives and augmentatives with a infixed reduplicant before the stressed foot. With the data available, though, it is impossible to tell if reduplication occurs before or after linear movement.

(42) Timugon Murut aug./freq. [10] via [1]

a. búlud bubúlud 'hill/ridge'
b. abálan ababálan '(often) bathes'
c. ompódon ompopódon '(always) flatters'
d. Aug/Freq ↔ *(CV)RED*
Pivot: before stressed foot

Chamorro adjectival intensification is encoded with a reduplicant following the final vowel. If the infix is underlying a suffix that copies from right to left, Type P and Type F models generate the same results for the examples in (43).

(43) Chamorro adj. intensification [5] via [1]

a. dankolo dankololo'(very) big'
b. metgot metgogot '(very) strong'
c. AdjInt ↔ *(CV)RED*
Pivot: after final V

Korean onomatopoeic constructions are ambiguous for similar reasons.

(44) Korean onomatopoeic constructions [32] via [1]

a. culuk cululuk'dribbling'
b. allok allolok 'mottled'
c. Onomatopoeia ↔ *(CV)RED*
Pivot: after final V

Inseño Chumash of the Hokan language family has a curious infixed reduplication phenomena. Not only is the function of the construction unknown, but researchers are uncertain of where the pivot lies. This uncertainty leads to a problem for our typology. The morpheme's proximity to the right edge of the word boundary suggests that it is underlyingly a suffix (and I subsequently assume that it copies from right to left). If the pivot precedes the final syllable, this morpheme is almost certainly Type P. However, if the follows the final CV, it is ambiguous between Type P and Type F. Unfortunately, the category cannot be determined as long as the location of the pivot remains unresolved.

(45) Chumash infixed reduplication [1]

a. yuxwon yuxwowon 'to be high, tall'
b. oxyon oxyoyon 'to be crazy'
c. ? ↔ *(CV)RED*
Pivot: ??before final syllable ??after final CV

IV. Discussion

Returning to the initially-stated research questions, when the reduplication process occurs relative to linear displacement varies from language to language. Logically entailed by this is the fact that the order of events for infixed reduplication is not universal. Thus, it is another item struck from the ever-dwindling list of language universals.

There may even be variation between separate phenomena in the same language; while Chamorro continuatives are most certainly Type F, the jury is still out for Chamorro adjectival intensifiers. If such a language (i.e., a language that had both Type P and Type F reduplicants simultaneously) were to exist, it would have interesting implications about my framework. It would suggest that linear displacement and/or copying rules can specify certain vocabulary items in their

description.[7] This may entail the existence of *readjustment rules*, a theoretical mechanism whose status has been contested [33].

Reduplication timing may not be universal, but this is not the full story. As can be seen in the differences in length between Sections III.A and III.B, Type F is a far more populous category than Type P. This study is not comprehensive, yet there is still a clear asymmetry between Type F reduplicants and Type P reduplicants. It is plausible that this is due to the relative "opacity" of Type F reduplicants compared to Type P [34]. Copying in Type F morphemes is transparent because the morpheme reflects the surface position of the infix; subsequently, it is easier to be acquired. Copying in Type P morphemes is opaque because it is necessary to determine the starting point of the infix in order to identify what it copied. Since there is an extra step involved, it may be that Type P reduplicants are harder to acquire. Over time, it is possible that they are simplified (i.e., become Type F) or dropped altogether. This would explain why Type P phenomena are rarer than Type F.[8]

Naturally, the phenomena examined in this study are only a drop in the bucket compared to the total number of infixed reduplicants that exist now and will exist as language changes with time. Because of this, there is much potential for future investigations into other infixed reduplicants. Even in this paper there are reduplicants that warrant further study. While some are likely to remain ambiguous, a more robust set of data could out one or more of indeterminate class of reduplicants as Type P or Type F. Regardless, the established typology and accompanying diagnostics should prove useful to any future studies.

A tangential result of this study is in regards to infix copying direction. Before [2], it has been assumed that infixed reduplicants can copy segments from either direction. Of course, it was completely reasonable to conclude that this is the case. Now that the general conclusion is that infixes are underlyingly prefixes and suffixes, though, this generalization for infixed reduplicants is needlessly clunky. Kalin's proposal regarding infixes in tandem with the Marantz Generalization provide evidence for the underlying identity of reduplicated infixes. As is demonstrated in my analysis, assuming that there is a fixed directionality for infixed reduplicants can generate elegant models. It is my hope that this assumption is adopted by others for related surveys of the topic.

V. Conclusion

Kalin does not elaborate on how infixed reduplicants fit into the infixation process [2]. The current study primarily sought to rectify this by answering two questions: when infixed reduplicants copy in relation to linear displacement, and whether this trend is universal across all infixed reduplication phenomena. To answer these, I establish a typology for infixed reduplicants based on their time of reduplication. I consider those that reduplicate before linear displacement to be Type P reduplicants and those that reduplicate after linear displacement to be Type F reduplicants. I also provide several criteria for analysis and diagnostics for determining their identities.

I have proven beyond a reasonable doubt that the answer to the second question is no; some morphemes reduplicate before linear displacement while others reduplicate after linear displacement. The findings of this survey suggest that Type F morphemes are more common than the latter, but the reason for this—if there is one—is currently unknown. With some infixed reduplicants, it is impossible to tell when reduplication occurred with the data that is currently available.

While this study is a step towards a better understanding of infixed reduplicants, there is still more research to be done. There are some known infixed reduplication phenomena that are not discussed in this paper, and there will likely be more discovered that require analysis. This study establishes a standard for interpreting infixed reduplicants under Kalin's model for the infixation process.

Appendix

List of Languages Examined

Samoan	Chamorro	Amis
Pazeh	Kamaiurá	Nakanai
West Tarangan	Kinande	SiSwati
Ulwa	Tigrinya	Harari
Nigizim	Uradhi	Hausa
Bole	Paiwan	Sonora Yaqui
Shuswap	Thompson Salish	Lilloct
Quileute	Levantine Arabic	Zuni
Koasati	Djingili	Lushootseed
Mangarayi	Kugu Nganhcara	Wardaman
Timugon Murut	Korean	Chumash

Conflict of Interest

The author declares no conflict of interest.

Acknowledgment

The author would like to extend my gratitude to Prof. Neil Myler of Boston University for his helpful instruction and advice in this study.

References

[1] A. C. L. Yu, "The morphology and phonology of infixation," Ph.D. dissertation, University of California, Berkeley, CA, 2003.
[2] L. Kalin, "Infixes really are (underlyingly) prefixes/suffixes: Evidence from allomorphy on the fine timing of infixation," *Language*, vol. 98, no. 4, 2022, doi: 10.1353/lan.2022.0017
[3] A. Marantz, "Re reduplication," *Linguistic Inquiry*, vol. 13, no. 3, pp. 435–482, 1982.
[4] A. C. L. Yu, *A Natural History of Infixation*, vol. 15, Oxford: Oxford University Press, 2007.
[5] D. M. Topping, *Chamorro Reference Grammar*, Honolulu: University Press of Hawaii, 1973.
[6] E. Moravcsik, "Infixation," in *Morphology: An international handbook on inflection and word-formation*, G. Booij, C. Lehmann, and J. Mugdan, Eds. vol. 1, New York, Berlin: Walter de Gruyter, 2000, pp. 545–552.
[7] J. Ho *et al*., *A Short Description of Formosan Languages: Amis*, Peking: Min Tsu Chu Pan She, 1986. (in Chinese)
[8] R. Blust, "Notes on Pazeh phonology and morphology," *Oceanic Linguistics*, vol. 38, issue 2, pp. 321–365, 1999.
[9] D. Everett and L. Seki, "Reduplication and CV skeletal in Kamaiurá," *Linguistic Inquiry*, vol. 16, pp. 326–330, 1985.
[10] J. J. McCarthy and A. Prince, "Generalized alignment," in *Yearbook of Morphology* G. Booij and J. van Marle, Eds. Dordrecht: Kluwer Academics, 1993, pp. 79–153.

[7] An observation pointed out to me by Neil Myler.

[8] See previous footnote.

[11] R. Nivens, "A lexical phonology of West Tarangan," In *Phonological Studies in Four Languages of Maluku*, D. Burquest, W. Laidig, Eds. Arlington, Texas: Summer Institute of Linguistics & University of Texas at Arlington, 1992.
[12] L. J. Downing, "Verbal reduplication in three Bantu languages," in *The Prosodic-Morphology Interface*, R. Kager, H. V. Hulst, and W. Zonneveld, Eds. Cambridge: Cambridge University Press, 1999.
[13] T. M. Green, "A lexicographic study of Ulwa," Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge, MA, 1999.
[14] S. Rose, "Triple take: Tigre and the case of internal reduplication," *San Diego Linguistics Papers*, 2003.
[15] P. Newman, *Nominal and Verbal Plurality in Chadic*, Dordrecht, Holland: Foris Publications, 1990.
[16] A. H. Fabricius, *A Comparative Survey of Reduplication in Australian*, Munich: Lincom Europa, 1998.
[17] P. Newman, *The Hausa Language: An Encyclopedic Reference grammar*, New Haven & London: Yale University Press, 2000.
[18] A. M. Gimba, "Bole verb morphology," Ph.D. dissertation, University of California Los Angeles, Los Angeles, CA, 2000.
[19] K. Chen and M. Jung-sheng, *A Short Description of Formosan Languages: Paiwan*, Peking: Min Tsu Chu Pan She, 1986. (in Chinese).
[20] S. Anderson, *A-Morphous Morphology*, Cambridge: Cambridge University Press, 1992.
[21] J. P. van Eijk, "VC reduplication in Salish," *Anthropological Linguistics*, vol. 32, issue 3–4, pp. 228–262, 1990.
[22] L. C. Thompson and M. T. Thompson, *Thompson River Salish Dictionary*, 1996.
[23] M. Cowell, *A Reference Grammar of Syrian Arabic*, Georgetown: Georgetown University Press, 1964.
[24] S. Newman, *Zuni Grammar*, Albuquerque: The University of New Mexico Press, 1965.
[25] G. Kimball, *Koasati Grammar*, Lincoln: University of Nebraska Press, 1991.
[26] N. Chadwick, *A Descriptive Study of the Djingili Language*, Canberra: Australian Institute of Aboriginal Studies, 1975.
[27] C. Y. Lin, M. Wu, J. A. Bloom, I. J. Cox, and M. Miller, "Rotation, scale, and translation resilient public watermarking for images," *IEEE Trans. Image Process.*, vol. 10, no. 5, pp. 767–782, May 2001.
[28] S. C. Urbanczyk, "Patterns of reduplication in lushootseed," Ph.D. dissertation, University of Massachusetts, Amherst, MA, 1997.
[29] F. Merlan, *Mangarayi*, Amsterdam: North-Holland, 1982.
[30] K. Kurisu and N. Sanders "Infixal nominal reduplication in Mangarayi," *Phonology at Santa Cruz*, vol. 6, pp. 47–56, 1999.
[31] I. Smith and S. Johnson, "Kugu Nganhcara," in *The Handbook of Australian Languages: Grammatical Sketches of Bunuba, Ndjebbana and Kugu Nganhcara*, R. M. A. Dixon and Blake, Eds. Oxford, New York: Oxford University Press. vol. 5, 2000, pp. 357–489.
[32] J. Jun "Metrical weight consistency in Korean partial reduplication," *Phonology*, vol. 11 pp. 69–88, 1994.
[33] J. D. Haugen, "Readjustment: Rejected?" *Morphological Metatheory*, vol. 229, pp. 303–342, 2016.
[34] P. Kiparsky, "Abstractness, opacity and global rules (Part 2 of 'Phonological representations')", in *Three Dimensions of Linguistic Theory*, O. Fujimura, Ed. Tokyo Institute for Advanced Studies of Language, 1973, pp. 57–86.