Reductiplicant shape alternations in Ponapean: Evidence against Morphological Doubling Theory*

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1. Introduction

This paper analyzes a set of reduplicant shape alternations in Ponapean (or Pohnpeian; Austronesian; Rehg and Sohl 1981), and examines the ramifications that this pattern has on the architecture of the reduplicative grammar. The Ponapean durative is marked by a prefixal partial reduplication pattern (ibid., §3.3.4, also §2.9.5), which *predictably alternates in length* between one and two moras.[1] The data is previewed in (1):

(1) *Ponapean reduplication*

	Base length			
	1-mora base	**2-mora base**	**3-mora base**	**4-mora base**
1-mora reduplicant		*du-duup* *la-laud* *ke-kens*		*to-tooroor* *lu-luum^{w}uum^w* *so-soupisek*
2-mora reduplicant	*paa-pa* *tepi-tep* *don-dod*	*dun-dune* *sipi-siped* *rer-rere*	*duu-duupek* *mee-meelel* *lil-linenek*	*rii-riaala* *lil-lirooro* *lidi-liduwii*

I argue that the length alternation can be derived solely through the interaction of stress and phonotactics (refining the analysis in Kennedy 2002, 2003), using constraints whose *domain of evaluation spans the base and reduplicant*. In order for this analysis to work, the module of grammar where the shape of the reduplicant is calculated must have access to (i) the *surface properties* of the base, and (ii) the reduplicant's *position* relative to the base.

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[1]The two-mora reduplicants have a variety of segmental shapes, whose distribution is also predictable (consult, e.g., Kennedy 2003, Kurisu 2013). For reasons of space, I will collapse over these alternations.

This poses a potential problem for a theory like Morphological Doubling Theory (MDT; Inkelas and Zoll 2005), where reduplicant shape is (typically) calculated without access to the base. I show that MDT, in theory, has the capability of accommodating this sort of analysis, as long as reduplicative truncation is located in the "Mother Node"—that is, the stage of the derivation where "base" and "reduplicant" are concatenated. This would, however, require that the phonology that applies to the reduplicant be the same as the phonology that applies to the base. The fact that one of the constraints driving the reduplicant shape alternation represents *the emergence of the unmarked* means that this cannot be the case (see Haugen and Hicks Kennard 2011). Therefore, under this analysis, Ponapean reduplication cannot be handled by MDT.

2. A phonological preliminary: Stress and accent in Ponapean

Rehg (1993:29) describes the Ponapean stress and accent system as follows: "*High pitch occurs on the penultimate mora, while primary stress is on the final mora; secondary stress occurs on alternate preceding morae*".[2] Abstracting away from the tonal realization of the accent and focusing purely on the position of stress, we can summarize the stress pattern as in (2), and analyze it with the constraints in (3). Final consonants are non-moraic, while medial coda consonants are moraic ($*C_\mu\# \gg$ WEIGHT-BY-POSITION).

(2) a. Primary stress on rightmost mora [STRESSR$_\mu$ (3a)]
b. R→L alternating secondary stress by mora [*CLASH$_\mu$ (3b), *LAPSE$_\mu$ (3c)]

(3) a. **STRESSR$_\mu$**: Assign one * if the final mora is unstressed. ($*\breve{\mu}\#$)
b. ***CLASH$_\mu$**: Assign one * for each sequence of two *stressed* moras. ($*\acute{\mu}\acute{\mu}$)
c. ***LAPSE$_\mu$**: Assign one * for each sequence of two *unstressed* moras. ($*\breve{\mu}\breve{\mu}$)

The strictly alternating rhythm means that the stress status of the *initial mora* of a root/base is directly dependent on the moraic length of the root/base: **odd** mora count bases have **stress** on the initial mora; **even** mora count bases have **no stress** on the initial mora (they have stress on the peninitial mora). This difference will be crucial in explaining the distribution of reduplicant shapes.

3. Reduplicant shape Alternation: Data and generalizations

Building on McCarthy and Prince 1986, Kennedy (2002, 2003) shows that considerations of **stress and syllable weight** in the base factor into determining the length of the reduplicant (in moras). I argue that reduplicant length can be explained entirely by the stress and weight of the *base-initial syllable*. We can begin to see this by arranging the data in terms of the mora count of the base and the mora count of the reduplicant, as in (4). (One additional data point: 6-mora base *waàn.tùu.ké* → 1-mora reduplicant *<u>wà</u>-waàn.tùu.ké*.)

[2] I will assume that we can scale up from his short description, but these facts should be verified by future fieldwork. Throughout this paper, I will assign stress algorithmically according to this characterization.

(4) *Ponapean reduplication: length alternations* [chart adapted from Kennedy (2002:225)]

	ODD	EVEN	ODD	EVEN
	1-mora base	**2-mora base**	**3-mora base**	**4-mora base**
1-mora reduplicant		**dù**-duúp **là**-laúd **kè**-keńs		**tò**-toò.roór **lù**-luù.m^{w}uúm^{w} **sò**-soù.pi.sék
2-mora reduplicant	**pàa**-pá **tè.pi**-tép **dòn**-dód	**duǹ**-du.né **si.pì**-si.péd **rer̀**-re.ré	**dùu**-dùu.pék **mèe**-mèe.lél **lìl**-lì.ne.nék	**riì**-ri.àa.lá **lil̀**-li.ròo.ró **li.dì**-li.dù.wií

A clear generalization emerges when looking at the mora count of the base: **odd** mora count bases always have **2-mora** reduplicants, but **even** mora count bases may have either a **1-mora** or a **2-mora** reduplicant. Recall that stress is strictly alternating from right to left by mora. This means that odd mora count bases have **initial-mora stress**, but even mora count bases have **peninitial-mora stress**.

Therefore, this generalization about mora count can actually be reduced to stress: bases with **initial-mora stress** always have **2-mora** reduplicants, but bases with **peninitial-mora stress** may have either a **1-mora** reduplicant or a **2-mora** reduplicant. Among even mora count / peninitial-mora stress bases, there is a consistent difference that determines which reduplicant length occurs: if it has an initial **light** syllable (i.e., CV̌), it always has a **2-mora** reduplicant; if it has an initial (super)**heavy** syllable, it always has a **1-mora** reduplicant.

To leverage the stress facts, we need to take note of one further generalization (as pointed out by Kennedy 2002:226): **all reduplicants bear a stress**. Looking at the forms in (4), we see that, regardless of the reduplicant shape or the base length, there is always exactly one stress on the reduplicant.

4. Reduplicant shape alternation: Analysis

We can boil the above generalizations down into an analysis with four component parts. The first is a preference for shorter reduplicants. I implement this using a "size restrictor" constraint,[3] specifically ALIGN-ROOT-L$_{\mu}$ (μ = *mora*), which outranks MAX-BR.

(5)
a. **ALIGN-ROOT-L$_{\mu}$:** Assign one * for each mora which intervenes between the left edge of the root and the left edge of the word.

b. **MAX-BR:** Assign one * for each segment in the base which lacks a correspondent in the reduplicant.

c. **Ranking:** ALIGN-ROOT-L$_{\mu}$ $\gg$ MAX-BR

[3]See Spaelti 1997, Hendricks 1999, Riggle 2006, Zukoff 2016, 2017, *a.o.*, on size restrictor constraints and the "a-templatic" approach to reduplicant (abbrev. RED) shape generally. Templatic constraints could also generate this effect with the ranking **RED = μ** $\gg$ **RED = 2μ** (Zukoff 2016). However, such an approach would ultimately be *completely incompatible* with MDT in this case (see below).

The second component is a requirement that reduplicants bear a stress, which I enforce via the constraint STRESS-TO-RED[UPLICANT] (6a). The third is a ban on moraic clash, implemented with *CLASH$_\mu$ (3b). This constraint will motivate reduplicant extension for bases with initial stress (when coupled with the effect of STRESS-TO-RED). Finally, the last component is a ban on adjacent identical light syllables. I encode this using the constraint *REPEAT(light) in (6b) (discussed further in Section 4.3). This will motivate reduplicant extension for bases with initial light syllables.

(6) a. **STRESS-TO-RED:** Assign one * for each reduplicant without a stressed mora.

b. ***REPEAT(light):** Assign one * for each sequence of two adjacent identical light syllables. $(*[C_\alpha \breve{V}_\beta]_\sigma[C_\alpha \breve{V}_\beta]_\sigma)$

These last three constraints—STRESS-TO-RED, *CLASH$_\mu$, and *REPEAT(light)—all outrank the size restrictor constraint ALIGN-ROOT-L$_\mu$ (as demonstrated below). Their combined effect, for particular root shapes, motivates overriding the preference for short reduplicants to yield otherwise dispreferred 2-mora reduplicants in the non-basic cases.

4.1 Monomoraic reduplicants (the default case)

When STRESS-TO-RED, *CLASH$_\mu$, and *REPEAT(light) can all be satisfied, the default preference for a monomoraic reduplicant is actualized. This happens only when two conditions are met simultaneously: (i) **the base has an even number of moras**, such that the leftmost stress falls on the peninitial mora of the base; *and* (ii) **the base begins with a heavy or superheavy syllable**, such that a monomoraic reduplicant won't yield adjacent identical CV̌ syllables when concatenated with the base. The simplest such case is a monosyllabic base with a long vowel:

(7) *Even mora count bases with initial heavy syllables yield 1μ reduplicants*

/RED, duup/	*(stress profile)*	STRESS-TO-RED	*CLASH$_\mu$	*REPEAT	ALN-RT-L$_\mu$
a. du-duúp	[0-01]	*!			*
b. ☞ dù-duúp	[2-01]				*
c. duù-duúp	[02-01]				**!

Candidate (7a) pointlessly violates STRESS-TO-RED by leaving the reduplicant unstressed. (It also violates *LAPSE$_\mu$ (3c).) Both candidate (7b), with a stressed monomoraic reduplicant, and candidate (7c), with a stressed (on the second mora) bimoraic reduplicant, satisfy all the high-ranked constraints: STRESS-TO-RED, because they stress the reduplicant; *CLASH$_\mu$, because there are no adjacent stressed moras; and *REPEAT(light), because there are no adjacent identical light syllables. This allows the choice to fall to lower-ranked ALIGN-ROOT-L$_\mu$, which will prefer the shorter reduplicant in (7b) to the longer reduplicant in (7c).

4.2 Bimoraic reduplicants for odd mora count bases: *CLASH$_\mu$

For bases with an odd number of moras, the strictly alternating rhythm places a stress on the first mora of the base (*primary* stress in monomoraic bases, *secondary* stress in longer odd mora count bases). This will make it impossible to simultaneously satisfy STRESS-TO-RED and *CLASH$_\mu$ while maintaining a 1-mora reduplicant (i.e., optimizing ALIGN-ROOT-L$_\mu$). In order to satisfy those two high-ranked constraints, the reduplicant is extended to 2 moras:

(8) *Odd mora count bases yield 2µ reduplicants*

/RED, duupek/			STRESS-TO-RED	*CLASH$_\mu$	ALIGN-ROOT-L$_\mu$
a.	du-dùu.pék	[0-201]	*!		*
b.	dù-dùu.pék	[2-201]		*!	*
c. ☞	dùu-dùu.pék	[20-201]			**

Candidate (8a) has an *unstressed* monomoraic reduplicant—this avoids a clash and satisfies the preference for shorter reduplicants, but fatally violates STRESS-TO-RED. Candidate (8b) has a *stressed* monomoraic reduplicant—this also satisfies the preference for shorter reduplicants and now avoids the STRESS-TO-RED violation, but at the expense of creating a fatal clash. Winning candidate (8c) has a bimoraic reduplicant which stresses its first mora—this gives up on having a short reduplicant, but allows for the reduplicant to be stressed without causing a clash. This shows that the reduplicant is extended to 2 moras in case it can optimize the stress pattern. (Winning candidate (8c) shows why the *REPEAT constraint must be restricted to light syllables.)

Three additional candidates are considered in (9). The fact that candidates (9b–c), which divert from the regular stress pattern in favor of a shorter reduplicant, are not optimal shows us that all the stress constraints outrank ALIGN-ROOT-L$_\mu$.

(9) *Odd mora count bases yield 2µ reduplicants (additional candidates)*

/RED, duupek/			STRESSR$_\mu$	*LAPSE$_\mu$	ALIGN-ROOT-L$_\mu$
a. ☞	dùu-dùu.pék	[20-201]			**
b.	dù-duú.pek	[2-010]	*!		*
c.	dù-duu.pék	[2-001]		*!	*
d.	duù.pe-dùu.pék	[020-201]			***!

4.3 Bimoraic Reduplicants for bases with initial light syllables: *REPEAT(light)

If stress were the only determining factor, we'd expect *all* even mora count bases to display 1-mora reduplicants. This is not the case. Any even mora count base with an initial *light syllable* (i.e., $[C\check{V}]_\sigma$) instead has a 2-mora reduplicant. This effect can be captured with the constraint *REPEAT(light), inspired by Yip's (1995) more general *REPEAT constraint.

(10) ***REPEAT(light):** Assign one * for each sequence of two adjacent identical light syllables. ($*[C_\alpha\check{V}_\beta]_\sigma[C_\alpha\check{V}_\beta]_\sigma$) [repeated from (6b) above]

Hicks Kennard (2004) and Haugen and Hicks Kennard (2011) employ this constraint in their analysis of durative reduplication in Tawala (without the restriction to light syllables, because Tawala has no heavy syllables). Tawala is an Austronesian language related to Ponapean (both are in the Oceanic sub-group). Given that the Ponapean reduplication pattern under discussion is indeed the durative, this serves as some suggestive comparative evidence for the use of such a constraint in the analysis. Furthermore, the behavior of *REPEAT in Tawala (Haugen and Hicks Kennard 2011) has similar theoretical consequences as it does in Ponapean (see below).

*REPEAT(light) will motivate extension to a 2-mora reduplicant in case the base begins in a light syllable. Candidates (11a–b) both have 1-mora reduplicants. Regardless of whether that reduplicant is stressed (11b) or not (11a), this results in two *adjacent identical light syllables* (potentially differing in stress; (11b))—that is, the reduplicant and the first syllable of the base. This incurs a fatal violation of *REPEAT(light). Candidate (11c) extends the reduplicant out to 2 moras (in this case, by copying the following nasal as a coda). This makes the reduplicant's syllable and the base-initial syllable no longer identical, satisfying *REPEAT(light). This shows that the reduplicant is extended to 2 moras in case it can avoid a violation of this anti-repetition phonotactic constraint.[4]

(11) *Even mora count bases with initial light syllables yield 2μ reduplicants*

/RED, dune/			STRESS-TO-RED	*REPEAT(light)	ALIGN-ROOT-L$_\mu$
a.	du-du.né	[0-01]	*!	*!	*
b.	dù-du.né	[2-01]		*!	*
c. ☞	duǹ-du.né	[02-01]			**

It will be significant immediately below, when we consider the ramifications of these patterns for the organization of the grammar, that the operation of *REPEAT(light) in reduplication represents a case of *the emergence of the unmarked* (McCarthy and Prince 1994). That is to say, while sequences of adjacent identical light syllables ($[C_\alpha\check{V}_\beta]_\sigma[C_\alpha\check{V}_\beta]_\sigma$) are actively avoided in reduplication, they are freely tolerated elsewhere in the grammar. For example, the root 'to skin/peel' is *rere* (Rehg and Sohl 1981:80). Even though such a sequence is allowed root-internally, it is not permitted across the base-reduplicant juncture or within the reduplicant: the reduplicated durative form of this root is *rer̀-reré* (12b), not **rè-reré* (12a) (ibid.). A candidate like (12c), which lengthens the first root vowel to eliminate all consecutive identical light syllables, is dispreferred to those where the base is faithful. The same would be true of such bases in non-reduplicative contexts.

(12) *REPEAT(light) *as the emergence of the unmarked (TETU)*

/RED, rere/			FAITH-IO	*REPEAT(light)	ALIGN-ROOT-L$_\mu$
a.	rè-re.ré	[2-01]		**!	*
b. ☞	rer̀-re.ré	[02-01]		*	**
c.	rèe-r**èe**.ré	[20-201]	*!		**

[4] *REPEAT(light) is equally applicable in C$\check{V}$-initial *odd* mora count bases (e.g., *padaak* → *pàda-pàdaák*). In these cases, *REPEAT(light) and *CLASH$_\mu$ will *both* advocate for extending the reduplicant to two moras.

5. Theoretical ramifications: Morphological Doubling Theory

The above analysis was implicitly couched in Base-Reduplicant Correspondence Theory (BRCT; McCarthy and Prince 1995), but only lightly so. The analysis relies almost entirely on surface-oriented constraints (i.e., BR-correspondence is not relevant), so it is in theory compatible with any number of constraint-based approaches to reduplication. There is, however, one aspect of BRCT that *is* crucial to the analysis: "**non-encapsulation**".

5.1 Non-encapsulation in the analysis of Ponapean reduplication

The analysis hinges primarily on the operation of *CLASH$_{\mu}$ and *REPEAT(light). These are the constraints which motivate deviation from the default preference for a 1-mora reduplicant. For both of these constraints, the structural descriptions encompass sequences (of moras or syllables, respectively). In the case at hand, the relevant sequences *span the base and the reduplicant*. That is to say, a 1-mora reduplicant is disallowed (and thus extended to 2 moras) if there would be either (i) a **clash** across the reduplicant-base juncture, or (ii) **identical light syllables** across the reduplicant-base juncture.

And note that, while the weight of the base-initial syllable can be ascertained from the underlying representation of the root, the *stress* value of the base-initial mora is *grammatically assigned*, that is, a surface property not an underlying property. This means that the module in which reduplicant length is determined must have access to both the surface properties of the base and the reduplicant's position relative to the base.

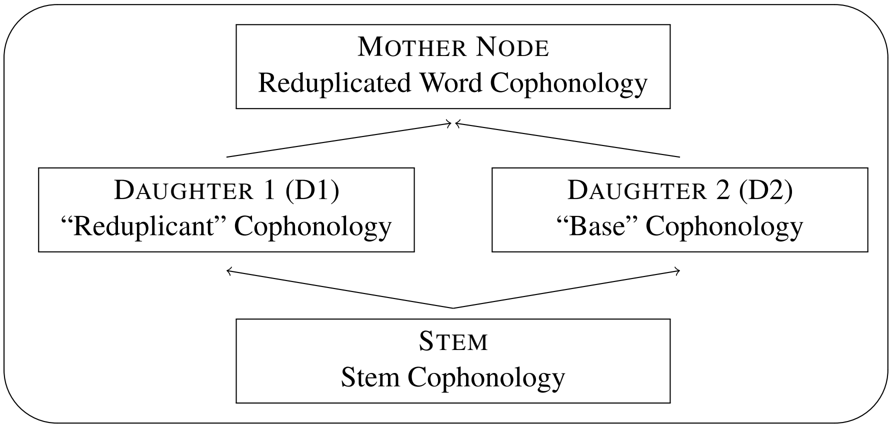
This tells us something about the architecture of the reduplicative grammar. This analysis *is compatible* with a grammar where the reduplicant ($\mathbb{R}$) **is not encapsulated** from the base ($\mathbb{B}$)—that is, information can flow from $\mathbb{B}$ to $\mathbb{R}$. This would include architectures where $\mathbb{B}$ and $\mathbb{R}$ are computed together, or where $\mathbb{B}$ is computed and then $\mathbb{R}$ is computed (with $\mathbb{B}$ visible). On the other hand, this analysis *is not compatible* with a grammar where $\mathbb{R}$ **is encapsulated** from $\mathbb{B}$—that is, no information can flow from $\mathbb{B}$ to $\mathbb{R}$. This would include architectures where $\mathbb{R}$ and $\mathbb{B}$ are computed separately (and $\mathbb{B}$ is invisible to $\mathbb{R}$), or where $\mathbb{R}$ is computed and then $\mathbb{B}$ is computed.

Most theories of reduplication have an architecture of the non-encapsulated type, including BRCT, Stratal OT (Kiparsky 2010), and Serial Template Satisfaction in Harmonic Serialism (STS; McCarthy et al. 2012). There is at least one notable theory of reduplication, however, whose architecture (on its face) would seem to be of the encapsulated type: *Morphological Doubling Theory* (MDT; Inkelas and Zoll 2005).

5.2 Encapsulation and partial reduplication in MDT

The basic approach to reduplication in MDT can be schematized as in (13) below. A single stem is outputted to two separate derivational nodes (the "Daughter" nodes), which are fully **encapsulated** from one another. One of these nodes calculates the "reduplicant" (here, D1), the other calculates the "base" (here, D2). These two nodes may have completely distinct *cophonologies* (Inkelas et al. 1997). The outputs of the Daughter nodes then jointly form the input to a single derivational node (the "Mother" node). This node applies its own cophonology (which, again, may be completely distinct) to its input. There is no explicit distinction in status between material from the respective Daughter nodes, that is, no formal equivalent of "base" vs. "reduplicant". The Daughter outputs are concatenated according to this cophonology.

(13) Reduplication in MDT



Typically, partial reduplication is the result of *truncation* phonology applying in one of the Daughter nodes (i.e., the "Reduplicant" cophonology). But this won't work for Ponapean, for the following reason. Since Daughter 1 cannot see Daughter 2 (because they are fully encapsulated from one another), violations from *CLASH$_\mu$ and *REPEAT(light) can only be accrued when the output being evaluated contains (linearly ordered) material from both "reduplicant" (D1) and "base" (D2). Therefore, the decision to truncate to one mora vs. two moras cannot be made in Daughter 1.

5.3 Sidestepping encapsulation and the problem with *REPEAT(light)

There is a way to make the analysis compatible with MDT: the decision to truncate to one mora vs. two moras happens *in the Mother Node*. Truncation can be effectuated in the Mother Node by ascribing the "BRCT" analysis's constraint ranking to the Reduplicated Word Cophonology (assuming the Mother Node inherits two full copies of the stem).[5] This means that the reduplicant length alternations in Ponapean do not wholly preclude an MDT analysis. However, this move does have a further consequence: **the reduplicant and the base must be subject to the same phonological grammar.** In other words, the Reduplicated Word Cophonology must be able to derive the distribution of reduplicant shapes in a way that is *consistent with the rest of the phonology of that node*.

[5] This requires the use of an alignment-based size restrictor constraint, as employed thus far. (Templatic constraints can't be used, because there is no specified "reduplicant", and something like *STRUC can't be used, because all material has the same status in terms of IO-faithfulness.) As long as ALIGN-ROOT-L$_\mu$ outranks MAX(-IO), it will successfully delete as much material as possible to the left of the material from D2. Note further that this would require morphological information in the phonological computation (something argued to be unnecessary in MDT by Inkelas and Zoll 2005), unless the constituent can be recast as a prosodic one (e.g., "Prosodic Root").

For the present case, it turns out that this will not work either. Recall that reduplicant extension by *REPEAT(light) is a TETU effect: the constraint exerts its influence on reduplication, but not on the rest of the grammar. If we tried to import this into a Mother Node MDT analysis, we would encounter an inexorable problem. (Virtually the same problem was identified in Tawala reduplication by Haugen and Hicks Kennard 2011.)[6]

In order for reduction (which is truly deletion) to occur in the "reduplicant", ALIGN-ROOT-L_μ must dominate MAX-IO (and it must indeed be an IO-faithfulness constraint, because that is the only kind available in MDT/Cophonology Theory). In order for extension (i.e., non-maximal reduction) to take place for light-syllable–initial roots, *REPEAT(light) must in turn dominate ALIGN-ROOT-L_μ. By transitivity, we are left with the ranking *REPEAT(light) $\gg$ MAX-IO. While this properly generates the distribution of reduplicant shapes, it makes the wrong prediction about the base: a root like *rere* should be repaired by deletion. That is, the reduplicated form of *rere* should be something like **rèr-rér* (with final vowel deletion), rather than attested *rer̀-reré*.

MDT can only derive TETU effects by locating that phonology in the relevant Daughter node. Because the reduplicant shape alternations in Ponapean preclude a typical *truncation-in-the-Daughter-node* analysis, the fact that one of the conditioning factors is a TETU effect forecloses on the Mother Node analysis as well. Therefore, Morphological Doubling Theory appears incapable of deriving the distribution of reduplicant shapes in Ponapean.

6. Conclusion

Ponapean exhibits reduplicant shape alternations that can be explained using stress constraints and phonotactic constraints, namely, *CLASH_μ and *REPEAT(light). Importantly, these constraints' domain of application happens to span the base and the reduplicant. This requires that (i) *the surface properties of the base* and (ii) *the reduplicant's position relative to the base* be visible to the stage of the derivation which computes reduplicant shape.

If this analysis were to be adapted to MDT, it would have to be located in the Mother node (including truncation). This requires that the same phonology that applies to the reduplicant also apply to the base. This is demonstrably false with respect to the TETU behavior of *REPEAT(light). Therefore, MDT cannot generate the facts of Ponapean reduplication.

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[6]Thank you to Jason Haugen for bringing to my attention the importance of the TETU effect in this case, and adducing the comparison with Tawala.

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