

Prosodic factors in the adaptation of Hebrew rhotics in loanwords from English

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Abstract

The behaviour of rhotics in (Modern) Hebrew loanwords from English differs from that of all other consonants. Rhotics metathesise, and words containing rhotics show a preference for pseudo-reduplicative structures. Within an Optimality Theoretical framework, I argue that this unique behaviour results from the interaction among various universal well-formedness constraints, whose effect is unattested in native Hebrew grammar. This is evidence of the role of phonological universals in adult grammars.

1. Introduction

This paper focuses on Hebrew rhotics in loanwords from English. The aberrant behaviour of rhotics in adaptation, exhibiting phenomena such as metathesis and reduplication, is explained by appealing to the role of universal well-formedness constraints on syllable and word structure. Crucially, the application of these constraints is not supported by the native Hebrew grammar, and is, I argue, evidence of the role of phonological universals in adult grammars.

1.1 Basic assumptions

Grammatical principles operating in a language logically come from one of two sources: (a) the native grammar, or (b) universal principles (UG).

I assume that the lexicon is divided into strata (Itô & Mester 1999) or has a core-periphery structure (Paradis & LaCharité 1997). Such a structure allows for variable grammars within the lexicon. There are productive principles in the lexicon's periphery (e.g. loanwords, acronyms) which might not apply systematically to the native lexicon (Kenstowicz 2003; Shinohara 2004; Berent et al. 2009; Cohen 2011 *inter alia*). This may be evidence that we can and do access UG when the effects of L1 grammar are weakened. The emergence of

such universal principles in the lexicon's periphery is known as The Emergence of the Unmarked (TETU, McCarthy & Prince 1994).

1.2 Goals

The goal of this paper is twofold. First, I demonstrate that the non-native metathesis and reduplication of Hebrew rhotics in loanwords is systematic, i.e. subject to a grammatical system. Second, via the analysis of prosodic phenomena involving rhotics, I support an approach advocating the universal motivation of the rhotics' behaviour. UG may apply even in what appear to be stable grammatical systems, especially in the lexical periphery of such systems.

1.3 Structure of paper

In §2, an overview of metathesis and reduplication in Hebrew is provided. This is followed in §3 by data displaying the behaviour of rhotics in loanwords. A formal analysis within an Optimality Theoretical framework in the subsequent §4 is followed by concluding remarks in §5.

2. Metathesis and reduplication in the native Hebrew lexicon

The following section is an overview of the native Hebrew grammar, particularly with respect to metathesis and reduplication. I argue that the behaviour of rhotics in loanwords cannot be supported by this native grammar.

2.1 General facts about Hebrew

2.1.1 Rhotics

There is one rhotic in the native Hebrew inventory, [ʁ] (henceforth: ʁ), a uvular approximant with certain frication (Boložky & Kreitman 2007). The precise manner of articulation is usually determined by prosody, with onsets displaying more frication.

2.1.2 Syllable structure

Native Hebrew words have the following syllable structures

σ	INITIAL		MEDIAL		FINAL	
CV	<i>la.kax</i>	'he took'	<i>ka.ta.va</i>	'article'	<i>ka.va</i>	'happened'
CVC	<i>ful.xan</i>	'table'	<i>hit.kav.bel</i>	'snuggled'	<i>fad.xan</i>	'stapler'
V	<i>a.biv</i>	'knight'	<i>no.a.lim</i>	'locking'	<i>ka.vu.a</i>	'permanent'
VC	<i>of.no'im</i>	'motorbikes'	<i>ne.ez.vu</i>	'were left'	<i>bo.ef</i>	'skunk'
CCV	<i>tku.ja</i>	'period'	---		---	
CVCC	---		---		<i>ka.tavt</i>	'you (fem.) wrote'

Table 1 – Syllable structure in native Hebrew words.

Complex margins are noticeably rare in native Hebrew words, with complex onsets appearing only word initially, and complex codas appearing only word finally in 2nd person feminine singular past. All complex edges respect the Sonority Sequencing Generalisation (SSG; Steriade 1982) allowing sonority rises and plateaus towards the vocalic nuclei, but never sonority falls (Boložky 1978; Bat-El 1994).

Loanwords, however, have a richer syllabic inventory (Bat-El 1994; Schwarzwald 2002). Tri-consonantal sequences may appear if they respect the SSG and do not have sonorant clusters (e.g. *stbuk.tu.va* 'structure', *tekt* 'text').

2.2 Reduplication in Hebrew

There is productive *morphologically*-motivated reduplication in the Hebrew lexicon (Bat-El 2006).

First of all, reduplication is invoked in template (*binyan*) satisfaction. All verbs in Hebrew are subject to templatic restrictions imposed by one of the *binyanim*. Novel verbs are almost invariably formed within the *pi'el* template, a disyllabic *binyan* with a XiXeX vocalic pattern (e.g. *tsad* 'a side' → *tsided* 'to side with'; *daf* 'a page' → *difdef* 'to page through' (Bat-El 1994; McCarthy & Prince 1995; Gafos 1998; Ussishkin 2000).

In addition to template satisfaction, reduplication is a means of lexical expansion, the addition of new lexical items which are semantically similar to existing items (e.g. *ifev* 'to confirm' vs. *ifvev* 'to ratify').

Finally, diminutives in nominals may be formed by reduplication (e.g. *dag/dagig* 'fish/small fish'; *xaziv/xazavziv* 'pig/piglet'; *kaxol/kxalxal* 'blue/bluish').

To sum up, reduplication is a derivational process in Hebrew, a strategy of stem formation whose purpose is to form different yet semantically related words. It is (almost invariably) at the word's right edge, and invariably forms prosodic structures already available as unreduplicated forms, unmarked (C)VC syllables, avoiding the creation of clusters (see discussion in §2.1.2 and §4.3 regarding clusters).

2.3 Metathesis in Hebrew

In Hebrew, metathesis does not occur systematically, except for a single instance, strident-initial stems after the *hit-* prefix of the *hitpa'el binyan* (Schwarzwald 2002):

UNDERLYING	SURFACE	CF.
<i>/hit-saʕek/</i> 'he combed'	[<i>histaʕek</i>]	<i>/hit-kasek/</i> 'he crashed' → [<i>hitkasek</i>]
<i>/hit-fapeʕ/</i> 'he improved'	[<i>histaʔepʕ</i>]	<i>/hit-paʕeʕ/</i> 'he compromised' → [<i>hitpaʕeʕ</i>]

Table 2 – Strident metathesis in *hitpa'el*.

The stem-initial strident metathesises with the prefix-final *t*. This process is restricted to stem-initial stridents in *hitpa'el*.

An additional case in which sporadic cases of metathesis are found in Hebrew is during acquisition, where universal principles are known to surface (Berent et al. 2009), often overriding native grammar. In some cases, metathesis is found, specifically to avoid complex codas, preferring complex onsets to them. For example, the adult forms *disk* 'disk' and *tost* 'toast' may be produced as *sdik* and *stot* respectively.

2.4 Summary

Both reduplication and metathesis do occur in Hebrew. However, reduplication is morphologically restricted to lexicon expansion. Metathesis is not only morphologically restricted to the *hitpa'el binyan*, but is also segmentally restricted to stridents. Neither of the two processes is segmentally restricted to or unique to rhotics.

3. Rhotics in Adaptation

3.1 Segmental adaptation

The segmental adaptation of rhotics, remarkably straightforward, is not relevant to the discussion of metathesis and reduplication. Cohen (2010) presents a 1383-word Hebrew loanword corpus, constructed from three different sources: elicitation from native speakers, spontaneous productions and previous publications on Hebrew loanwords. In this corpus, English rhotics are invariably adapted into Hebrew as the native rhotic *ṣ*. Note, many of the words in the corpus do not originate in English, however, they entered Hebrew via English mediation. Therefore, I generally refer to the words as loanwords from English. Word-final rhotics from non-rhotic English dialects with no input surface rhotic also surface as *ṣ* (e.g. British English *ˈaftə* ‘after (military term)’ → Hebrew *ˈaftɛṣ*). The similarity-based phoneme mapping in the adaptation of rhotics into Hebrew has multiple sources in English, both perceptual (Lindau 1985; Ladefoged & Maddieson 1996; Magnuson 2007) and orthographic (Vendelin & Peperkamp 2006; Escudero et al. 2008), which may even provide conflicting evidence (Smith 2005; Cohen 2010:137).

3.2 Prosodic phenomena in adaptation

Prosodic, rather than segmental, phenomena, restricted to rhotics, are at the focal point of this paper. In the realm of consonant adaptation in Hebrew loanwords, the behaviour of the rhotics is unique, as other consonants are ordinarily adapted 1-to-1 to the closest native category, with no prosodic modification.

The only instances in which there is some prosodic modification are: (a) deletion, to avoid complex syllable margins (e.g. *ɪgzɔst* ‘exhaust’ → *egzoz*; *hændbrɛɪks* ‘handbreaks’ → *ambɛks*) and (b) epenthesis, to avoid certain complex codas (e.g. *film* ‘film’ → *filim*).

There are also two additional prosodic phenomena, both of which are unique in adaptation to rhotics: (a) neither is native to Hebrew grammar and (b) both are optional (variation among speakers and lexical items), but when they occur, they occur systematically. In addition to the corpus mentioned in §3.1, most of the examples in this paper were collected from speaker productions, both in conversation and in the media.

3.2.1 Metathesis

ʁ is metathesised from coda into onset position:

NORMATIVE	COLLOQUIAL	GLOSS
<i>kovɲfleks</i>	<i>kʁovɲfleks</i>	'cornflakes'
<i>endovɲfinim</i>	<i>endʁovɲfinim</i>	'endorphins'
<i>fabevɲze</i>	<i>fabʁevɲze</i>	'Fabergé (egg)'
<i>gevɲbeɲ</i>	<i>gʁevɲbeɲ</i>	'Gerber®'
<i>govɲgonzola</i>	<i>gʁovɲgonzola</i>	'gorgonzola'
<i>lunapɲak</i>	<i>lunapʁak</i>	'Lunapark'
<i>maskapɲone</i>	<i>maskʁapone</i>	'mascarpone'
<i>oligavɲx</i>	<i>oligʁavɲx</i>	'oligarch'
<i>pɲefektsijonizem</i>	<i>pʁɲefektsijonizem</i>	'perfectionism'
<i>pɲefovɲmeɲ</i>	<i>pʁɲefovɲmeɲ</i>	'performer'
<i>pɲefumevɲija</i>	<i>pʁɲefumevɲija</i>	'perfumery'
<i>pɲespektiva</i>	<i>pʁɲespektiva</i>	'perspective'
<i>pɲovɲket</i>	<i>pʁovɲket</i>	'portrait'
<i>vepɲetvavɲ</i>	<i>vʁepɲetvavɲ</i>	'repertoire'
<i>supɲevɲfam</i>	<i>supʁevɲfam</i>	'Super Pharm®'

Table 3 – *ʁ*-metathesis in Hebrew loanwords from English.

Note, as mentioned in §3.1, some of the above words do not originate in English (e.g. *govɲgonzola*, *maskapɲone*), however, they entered Hebrew via the English form, rather than directly from the source language (in these cases, Italian). The process is optional in colloquial Hebrew.

3.2.2 Reduplication

ʁ is metathesised from onset into coda position, creating a reduplication-like structure (Zuraw 2002). Henceforth, I will refer to these cases as pseudo-reduplication¹:

NORMATIVE	COLLOQUIAL	GLOSS
<i>intevɲpɲetatsija</i>	<i>intevʁpɲetatsija</i>	'interpretation'
<i>pɲopɲovɲtsija</i>	<i>pɲopʁovɲtsija</i>	'proportion'

Table 4 – Pseudo-reduplication in forms with rhotics.

¹ In a single instance in loanwords, there is even *ʁ*-epenthesis, which creates a pseudo-reduplicated form: *dʁovɲdʁɲont* 'deodorant' → *dovɲdovɲant*. A similar process is found in very few native Hebrew words, such as *ʃfɲefɲet* 'telephone receiver' → *ʃovɲʃevɲet*.

While all the above forms in Tables 3 and 4 optionally undergo the processes mentioned, there are several forms where nothing happens. I do not account for this variation (or lack thereof) in this paper. The following data are some words in which none of the processes under discussion occurs:

NORMATIVE/COLLOQUIAL	UNTESTED	GLOSS
<i>fɔʁmalin</i>	* <i>fɔʁmalin</i>	'formalin'
<i>fɔʁmaika</i>	* <i>fɔʁmaika</i>	'formica'
<i>gɔʁme</i>	* <i>gɔʁme</i>	'gourmet'
<i>pɔʁtselan</i>	* <i>pɔʁtselan</i>	'porcelain'
<i>pɔʁtabelo</i>	* <i>pɔʁtabelo</i>	'portabello (mushroom)'
<i>tɔʁtija</i>	* <i>tɔʁtija</i>	'tortilla'

Table 5 – Non-varying forms.

4. Analysis

4.1 Theoretical background

The underlying segmental representation undergoes modification resulting from constraint interaction (Optimality Theory, OT, Prince & Smolensky 1993/2004). Two types of constraint interact with one another: (a) *faithfulness* constraints requiring input-output correspondence and input string sequences to be preserved, e.g. constraints militating against deletion or metathesis, and (b) *markedness* constraints requiring surface forms to comply with universal preferences, which may force metathesis and pseudo-reduplication.

In OT, each given input has several possible outputs. Each possible output is evaluated by the language's grammar, which defines how *bad* each candidate is (there are no *good* candidates because no candidate is perfect, as all violate some constraint). The least bad candidate in a given set of candidates is the most harmonic candidate, the optimal candidate. The possible outputs are evaluated within a constraint based system in which the constraints are ranked and candidates are eliminated by evaluating them against the highest ranked constraint and then the other constraints in descending order until all but one candidate are eliminated. The remaining candidate is the optimal one and the selected output.

In addition to an OT grammar, I also assume that the lexicon is *stratified* (§1.1). Faithfulness constraints relevant to loanwords (and so indexed) may be ranked differently with respect to markedness constraints than faithfulness constraints pertaining to native words (Itô & Mester 1999).

4.2 Metathesis

Why should metathesis occur at all? The English rhotic has long-range acoustic resonances (Kelly & Local 1986; Hall 2009). These result in rhotics being perceived where they are not actually present, and epenthesised due to this ‘misperception’ (e.g. $f_3.1b1t \rightarrow f_3.1b3.1t$ ‘sherbet’). Because of this resonance, listeners perceive the rhotics but are not necessarily aware of their input string position. Generally speaking, the Hebrew rhotic ʁ is acoustically ‘weak’. Specifically, it is even weaker in coda position, more so than other consonants. Therefore, it ‘favours’ syllable onsets, which are more perceptible than the codas. This being said, rhotics perceived in whatever position preferably surface in the onset position, if possible.

These observations can be translated into a formal OT grammar. The rhotic in Hebrew loanwords from English is assigned a prosodic position which facilitates its optimal perception in Hebrew, driven by perceptibility constraints based on models such as in Steriade’s (2001/2008) P-map. I assume the input to the grammar is the form as produced in English. I propose the constraint *CODA-r:

***CODA-r: Rhotics are avoided in coda position.**

Note, although this constraint may be perceptually motivated, it seems to contradict the general notion that liquids are *good* codas in languages, as codas tend to be as sonorous as possible. Further cross-linguistic evidence for the proposed constraint is presented in §5.

In addition, there are faithfulness constraints militating against deletion or the change in the linear order of the input segments, such as MAX and LINEARITY_{N/LW}:

MAX: All input segments have correspondents in the output (i.e. don’t delete segments).

LINEARITY_{N/LW}: Preserve linear order of input segments in native(N)/loanwords(LW) respectively (i.e. no metathesis).

Recall the metathesised forms in §3.2.1 (e.g. /endɔɹfɪnɪm/ ‘endorphins’ → *endɔɹɔfɪnɪm*). In native words, the faithfulness constraints LINEARITY_N and MAX are not violated. In loanwords, ordinarily, there is no reason to violate these constraints either, as all segments (except ʁ) are possible in codas. However, when the coda is a rhotic, the markedness constraint *CODA-r is potentially

violated. It is possible to avoid the violation of this markedness constraint by violating $\text{LINEARITY}_{\text{LW}}$, metathesising the coda rhotic into onset position. However, this creates a complex syllable onset, violating a different markedness constraint:

***Cx – No complex syllable margins.**

Clearly, *CODA-r outranks *Cx (expressed as: $\text{*CODA-r} > \text{*Cx}$), otherwise rhotics would never be metathesised out of coda position subsequently creating complex onsets. The grammar considers three primary candidates, each violating different constraints²:

/endɔʃfinim/	*CODA-r	MAX	$\text{LINEARITY}_{\text{LW}}$	CX
endɔʃfinim	*!			
endɔfinim		*!		
☞ endɔʃfinim			*	*

Table 6 – Evaluating candidates for /endɔʃfinim/.

The fact that the grammar prefers *endɔʃfinim* is evidence that $\text{LINEARITY}_{\text{LW}}$ and *Cx are the lowest ranked of the four constraints (no evidence of ranking between them – hence the dotted line indicating no crucial ranking). Since the potential violation of *CODA-r is not satisfied by deletion, there is no evidence for any ranking between *CODA-r and MAX. However, both of these constraints are clearly more highly ranked than $\text{LINEARITY}_{\text{LW}}$ and *Cx . Note, both MAX and $\text{LINEARITY}_{\text{N}}$ are highly ranked in Hebrew, but while codas, in general, are disfavoured, the specific constraint *CODA-r is not visible in the native lexicon, as it is dominated by $\text{LINEARITY}_{\text{N}}$. This is where the notion of the Emergence of the Unmarked (TETU, §1.1) comes into play. Although native Hebrew words allow coda rhotics, providing no evidence for their universal markedness due to the high-ranking $\text{LINEARITY}_{\text{N}}$, the unmarked structures without coda rhotics emerge in loanwords, as these are not subject to $\text{LINEARITY}_{\text{N}}$, but rather to the lower ranked $\text{LINEARITY}_{\text{LW}}$.

Since $\text{LINEARITY}_{\text{N}}$ preventing metathesis in native Hebrew nouns outranks *CODA-r , the lexicon is effectively stratified into words which metathesise coda rhotics (loanwords) and those which do not (native).

² Theoretically, there are more than three candidates, but these are the most important.

4.3 Pseudo-reduplication

What is the motivation for non-morphological reduplication? Reduplication results a string occurring twice in a single stem. Lexical representations of such forms are simpler than forms in which all segments are different (i.e. less lexical information) and the production of such forms is simpler, as it requires the repetition of articulatory motor sequences rather than introducing new sequences. This can be translated into an OT grammar. First of all, pseudo-reduplication (not the morphologically motivated type in §2.2) is motivated by constraints such as Bat-El's (2006) COPY, which requires strings to have two occurrences in stems, or Zuraw's (2002) REDUP, requiring word-internal similar substrings. I adopt Zuraw's REDUP.

REDUP – A word must contain some substrings that are coupled.

Here, adjacent strings with identical vowels are assigned a reduplication-like structure via metathesis. Recall the constraints presented in Table 6 in §4.2: *CODA-r, MAX>>LINEARITY_{LOW}, *Cx. The following tableau introduces the REDUP constraint. I do not consider potential candidates which violate MAX, and therefore, ignore MAX (...) in the tableau. The grammar considers three primary candidates, evaluating them with the relevant constraints:

/рворовтсija/	REDUP	*CODA-r	...	LINEARITY _{LOW}	*Cx
рворовтсija	*!	*	...		
☛ рворовтсija			...	*	**
✓ ровровтсija		*!*	...	*	

Table 7 – Evaluating candidates for /рворовтсija/.

The grammar proposed in Table 7 simply does not work! It selects the incorrect *рворовтсija* (indicated by the ☛) rather than the actual winner *ровровтсija* (indicated by ✓). We expect the unattested /рворовтсija/ → *рворовтсija*, which satisfies REDUP and respects *CODA-r>>LINEARITY_{LOW} (i.e. avoids codas by metathesising the rhotic into onset position). We do not expect /рворовтсija/ → *рворовтсija*, as although this satisfies REDUP, it violates LINEARITY_{LOW} as badly as the unattested form, additionally incurring multiple violations of *CODA-r. It appears that multiple violations of the low-ranked markedness constraint barring complex margins are considerably worse than a single violation, and to be avoided, even at the expense of a high-ranked constraint (in our case, *CODA-r).

This is captured by the notion of constraint conjunction (Kirchner 1996; Moreton & Smolensky 2002), particularly that of self-conjunction (Itô & Mester 1998). Self-conjunction encapsulates the idea that multiple violations of a single constraint have a cumulative effect. While a single violation may be low-ranked in the overall scheme of things, multiple violations are more highly ranked. This is similar in effect to the notion of constraint weighting, whereby all constraints have values, rather than relative rankings, and values are cumulative (Pater 2009; Smolensky & Legendre 2006; Prince & Smolensky 1993/2004:236). I will not argue for either model, though adopt self-conjunction in my analysis. The following tableau demonstrates the application of the self-conjoined *C_X-*C_X (note, for simplicity's sake, MAX and LINEARITY_{DW} have been omitted (...) from the table):

/רְבוֹרֹבְטִישְׁיָ/	REDUP	*C _X +*C _X	*CODA- τ	...	*C _X
רְבוֹרֹבְטִישְׁיָ	*!		*	...	
רְבוֹרֹבְטִישְׁיָ		*!		...	**
☞ רְבוֹרֹבְטִישְׁיָ			**	...	

Table 8 – Evaluating candidates for /רְבוֹרֹבְטִישְׁיָ/ with self-conjunction.

The self-conjoined *C_X+*C_X outranks *CODA- τ , thereby selecting the correct output, *רְבוֹרֹבְטִישְׁיָ*. The low-ranked *C_X has a cumulative effect expressed by the self-conjoined constraint. Multiple violations allow the effect of the markedness constraint *C_X to surface.

This is an additional instance of TETU (§1.1). Although Hebrew does allow clusters in native words, it disfavours them, all things being equal. Specifically, clusters are barred in reduplicated elements, as this necessarily results in multiple violations of *C_X. Incidentally, cluster avoidance in Hebrew is not unique to reduplication but appears in other peripheral word formation such as acronyms (Zadok 2002), where clusters are avoided. Specifically with respect to reduplicated forms, crosslinguistically, reduplicants tend to be more unmarked than their bases, avoiding clusters when possible, even when these exist in the base. For example, the Klamath distributive formation, *dje:mi* → *de-dje:m-a* ‘be hungry’ (Steriade 1988:131).

5. Discussion

The unique behaviour of rhotics in Hebrew loanwords from English can be explained within a formal, systematic grammar. Crucially, this grammar differs from the native grammar of Hebrew, i.e. there are parallel grammatical systems (core-periphery, lexical strata). This suggests that the grammar in certain (peripheral) areas of the lexicon (in our case, loanwords) may differ from the grammar in other strata in the lexicon.

Since the grammar under discussion is not supported by Hebrew grammar, its constraints have to be universally motivated, supporting the notion that adults have access to UG (as they couldn't derive the grammar of rhotics from the ambient language). So it appears that *CODA-r, unmotivated by Hebrew grammar, must be part of UG. The question is whether this proposed constraint has any support.

Lindau (1985) states that crosslinguistically, rhotics tend to vocalise and even delete in coda position (post-vocally), implying that coda positions disfavour rhotics. Evidence for this is found in several languages, such as English, Dutch, German, Swedish and numerous other languages, where coda rhotics may be deleted or vocalised (e.g. Itô & Mester 2001 for German coda rhotics).

An additional means of avoiding coda rhotics is the metathesis of rhotics over vowels, which is well supported via articulatory coordination with vocalic nuclei (Hoole et al. 2013). In Rumanian (Savu 2013), *grădina* 'garden' is evidence of coda-nucleus metathesis, avoiding coda rhotics. In addition, in Rumanian loans from Slavic, syllabic rhotics are invariably adapted as complex onsets (e.g. Czech [br̩no] 'Brno' → Rumanian [br̩no]). In Ladino (Judeo-Spanish), there is systematic rC → Cr metathesis in loanwords from other languages (e.g. Spanish *gordo* → Ladino *gođro* 'fat'; Spanish *verde* 'green' → Ladino *veđre*).

In the Sardinian dialect of Sestu Campidanian (Bolognesi 1998), coda rhotics are shifted into onset position when the root is preceded by a determiner (e.g. 'orku 'ogre' vs. s:rok:u 'the ogre')³.

The behaviour of rhotics in Hebrew loanwords from English supports an approach by which adults have access to universal grammatical principles, which surface in the lexical periphery even when these are unsupported by native grammars (TETU). Universal Grammar may apply even in what appear to be stable grammatical systems, albeit in the lexical periphery of such systems.

³ Note, Alber (2001) does not analyse this as metathesis from coda to onset position, as Bolognesi also provides examples of onset rhotics being metathesised into stem initial position.

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