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WHEN STRESS PRESERVATION LEADS TO CLASH

1. BACKGROUND

1.1. Stress clash in English

All works on English stress show that English has some sort of restriction against stress clashes, which is expressed as a general stress principle (Guierre 1979: 317; Trevian 2003: 11; Fournier 2010) as a constraint (*e.g.* *CLASH-HEAD in Pater 2000), as restrictions on foot structure (FTBIN or TROCH, in Pater 1995; 2000, Hammond 1999 or prohibition of unary feet in Burzio 1994) or as the "Rhythm Rule" (Hayes 1981; Kiparsky 1979; Liberman & Prince 1977; Schane 1979).

Here strict parallelism between vowel quality and stress is not assumed → full vowels may be unstressed. This is the position of most pronouncing dictionaries, but see also Burzio (1994, 2007) and Collie (2007: 56 *ff.*)

If full vowels may be unstressed, then stress clashes become much less common.

However, stress clashes still do occur: *acòustícian*, *depàrtméntal*, *elèctrícity* (Kager 1989: 171).

Such exceptional cases have been argued to be evidence of cyclic stress preservation, as it is not attested in monomorphemic words (Collie 2007; Hammond 1999; Kager 1989).

Using the following notation:

/1/ for primary stressed syllables
/2/ for secondary stressed syllables
/0/ for stressless syllables
/(-)/ for optional syllables

We will refer to such cases as having the /021(-)/ pattern.

1.2. Stress Preservation and frequency

Previous studies have shown that preservation effects can be accounted for by relative frequency (Collie, 2007, 2008; Hammond 2003; Kraska-Szlenk 2007).

These phenomena are more likely to occur if the base is more frequent than its derivative.

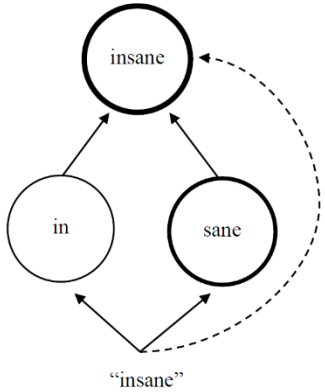
This can be shown by the examples below taken from Bermúdez-Otero (2012), after Kraska-Szlenk (2007: §8.1.2).

(x per 10^6 words in spoken section of COCA)

		base		derivative
a. *cyclic stress*				
cond[é]mn	còmd[è]mn-átion	7.09	>	2.57
imp[ɔ́]rt	ìmp[ɔ̀]rt-átion	5.15	>	0.62
b. *variable stress*				
cond[è]nse	còmd[é ~ ə]ns-átion	0.28	≈	0.22
c. *noncyclic stress*				
cons[ɔ́]rve	còns[ə]rv-átion	1.65	<	9.11
tràmsp[ɔ́]rt	tràmsp[ə]rt-átion	7.23	<	23.54

Collie (2007, 2008) proposes that this effect can be analysed using Hay's (2001) dual-route race model of lexical access. In this model, lexical access in complex words can be achieved through two routes: a direct route and a decomposed route. The more frequent a word is, the higher its resting activation level, and the easier and faster that word can be accessed.

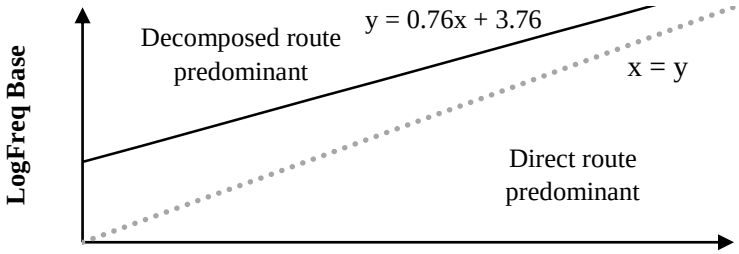
If a base is more frequent than its derivative, then the decomposed route should be the fastest, which should make preservation effects more likely.



Schematized dual-route model from Hay (2001). The solid line represents the decomposed route and the dashed line represents the direct route. Resting activation levels are represented by the thickness of the circles (*BNC* frequencies: *sane* (289), *insane* (360))

Initially, Hay (2001) proposed that the decomposed route should be preferred when the base is more frequent than the derivative (i.e. the x = y parsing line). Hay & Baayen (2002) refined

this proposal with an empirically motivated parsing line, which is represented in the figure below.[1]



Collie's empirical investigation on relative prominence preservation has shown that preservation failure is more likely when the derivative is more frequent than its base (e.g. *antícipate* > *ànticipátion*).

Relative frequency has not yet been tested to try to account for the /021(-)/ pattern.

Hay's model predicts it to be more likely if the base is more frequent than its derivative.

Research questions:

- Can relative frequency account for the /021(-)/ pattern?
- If not, what other parameters can?

2. EMPIRICAL INVESTIGATION

A lot of research on English stress is based on samples and examples whose representativeness is not even discussed, the data sources are seldom mentioned and the figures (efficiency, exception rate) for proposed generalisations are not given as underlined by many (see Myers 1999: 19, Wenszky 2004: 12, Collie 2007: 3, Domahs *et al.* 2014, among others).

Following the tradition founded by French linguist Lionel Guierre (1979), we set out to constitute as exhaustive an inventory as possible to investigate the phenomenon under scrutiny here.

2.1. Data collection and selection

Data needed: derivatives with /1/ on their third syllable and whose bases carry stress on their second syllable.

They are necessarily (so-called) "Class-I" derivatives.

All the entries in Wells (2008) containing a secondary stress and ending in one of the five following "Class-I" suffixes: *-al, -ity, -(at)ion, -ian* and *-ee* were extracted. Only the British transcriptions are considered here.

The existence of a base was checked within Wells (2008) or the OED (rare, obsolete, nonce words were not taken into account).

Potentially biasing constructions were excluded:

- Compounds (e.g. *cross-sectional, lackadaisical*);
- Learned compounds (e.g. *ethnological, synchronicity*);
- Prefixed constructions with a compositional meaning (e.g. *amoral, decontamination, unpredictability*);
- Prefixed constructions whose prefix may have a transparent meaning[2] (e.g. *deflation, decryption*);
- Derivatives whose meaning is unrelated to that of their base (e.g. *universe* > *university*);
- Words derived by substitution (e.g. *proletariat* > *proletarian*);
- Words whose syllable count is variable (e.g. *fluorination* [ˌflɔː-] ~ [ˌfluː‿ə-])

Only those which have a base which is stressed on its second syllable were kept.

The final inventory contains 131 entries (full list in the Appendix).

Token frequencies were collected from the BNC and log-transformed (as $\log_e x$) so they may resemble to the way "humans process frequency information" (Hay & Baayen 2002).

2.2. Final inventory

131 entries, divided into two groups:

Group 1: **may** be stressed /021(-)/ (+ often a /20(-)/ variant)

Group 2: only /201(-)/

[1] They calculated this line with a psycholinguistic model for morphological parsing called Matcheck. That line has slope of 0.76 and an intercept of 3.76.

[2] It has been argued that prefixes with transparent meaning or in antonymic pairs can form separate phonological words and carry stress (Raffelsiefen 1993, 2007). Therefore, words containing prefixes which could be interpreted transparently should be left aside as they might compromise the test on stress preservation.

	Number of words
Group 1	25
Group 2	106
Total	131

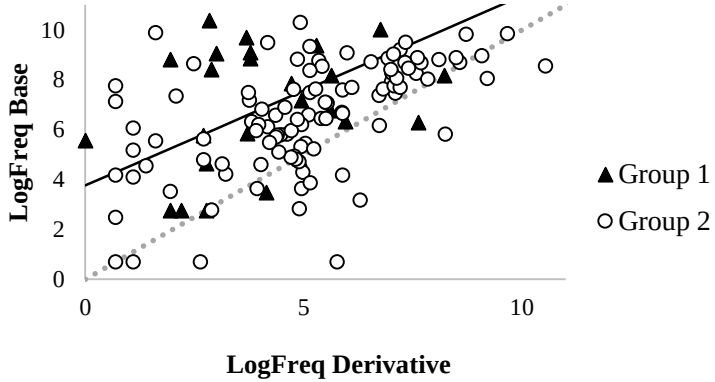
2.3. Results: Relative frequency

2.3.1. Local base only

We tested whether there is a significant difference in relative frequency between the two groups.

Wilcoxon test: W = 1684.5 and p < 0.04

→ Statistically significant, but does not tell us the nature of the difference.



	Median	Proportion of items above Hay & Baayen's (2002) parsing line
Group 1	0,64	48%
Group 2	0,79	19%

The visual distribution of the items, the median of the two groups along and the proportion of items above Hay & Baayen's parsing line indicates that the more the base is frequent compared to its derivative, the more likely it is for the derivative to be in Group 1.

[3] Here, we have a total of 17 derivatives with remote bases. In Group 1, 1/11 remote bases is less frequent than the local base (but both are very frequent: *directorial* (40) < *director* (16199) < *direct* (15679)). In Group 2, 2/6 remote bases are less frequent than the local base.

2.3.2. What influence of the remote base?

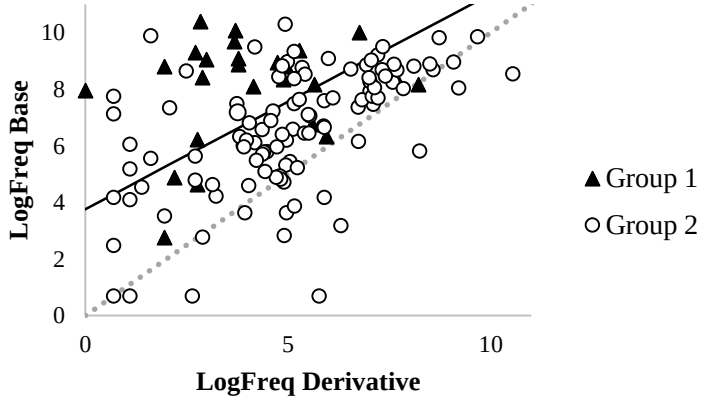
More items in Group 1 have a more deeply embedded base.

	Number of derivatives which have a remote base	Distribution of all derivatives with a remote base
Group 1	11/25 (44%)	65%
Group 2	6/106 (6%)	35%

Remote bases tend to be more frequent than local bases[3]:

Derivative	BNC Derivative	Local Base	BNC Local Base	Remote Base	BNC Remote Base
collectivity	113	collective	2593	collect	7760
connectivity	134	connective	128	connect	4274
diffusivity	16	diffusive	16	diffuse	506

If we take only the most frequent base, relative frequency becomes a stronger predictor of the /021(-)/ pattern (W = 1994, p < 0.0005).



	Median	Proportion of items above Hay & Baayen's parsing line
Group 1	0,51	72%
Group 2	0,78	20%

The results show relative frequency to be a significant predictor of exceptional stress preservation in this environment.

But:

- Statistical significance is not causality
- Even if this is the cause, the predictability of such stress behavior remains probabilistic

Let us now consider the theoretical consequences of these results.

2.3.3. Discussion

The fact that there is a significant effect of relative frequency comforts theories which make the hypothesis that the outputs of phonological computation are stored, like Stratal OT Bermúdez-Otero (2011, 2012).

In this model, direct lexical access is seen as morphosyntactic blocking whereas preservation effects are seen as a result of (fake) cyclicity.

In other words, what the frequency effects would predict is the presence or absence of the base in the input of the phonological computation of the derivative.

Collie (2007, 2008) used that model to predict stress preservation failure in derivatives with three pre-tonic syllables. We then get:

Input: /o(rígi)nal-ity/	STRESSIDENT	ALIGN-L
☞ a. o(rìgi)(náli)ty		*
b. (òri)gi(náli)ty	*!	

Input: /miscegen-ation/	STRESSIDENT	ALIGN-L
a. mis(cège)(nátion)		*!
☞ b. (mìsce)ge(nátion)		

However the broader hierarchy she gives is:

PARSE-σ >>*CLASH-HEAD >> STRESSIDENT >> ALIGN-L

For a derivative with a base stored with stress (fake cyclicity), we then get:

Input: /a(dóp)t/	PARSE-σ	*CLASH-HEAD	STRESSIDENT	ALIGN-L
💣 a. (àdop)(tée)			*	
b. a(dòp)(tée)	*!	*		*

An analysis simply based on absence vs. presence of a stored base in the input cannot predict the /021(-)/ pattern

→ STRESSIDENT would also need to outrank both PARSE-σ and *CLASH-HEAD.

Then, are there other factors which may cause this stress behaviour?

2.4. Results: Suffix specificities

	-ity	*-ian*	*-al*	*-ee*	***-(at)ion***	Total
Group 1	10	1	4	9	**1**	25
Group 2	7	1	9	9	**80**	106
Total	17	2	13	18	**81**	131

Is it because *-ation* is autostressed?

- So is *-ee*, and yet it does accept /021(-)/.

-(at)ion tends to attach to less frequent bases than other suffixes in this inventory,

- Relative frequency could be, once again, an explanation.

2.5. Results: Structure of the second syllable

Heavy syllables may be divided into VV and VC. This is justified by the difference between the very strict permanence of consonants and the fundamental variability of vowels (Guierre 1979).

→ We should distinguish closed syllables from open syllables in the analysis.

If the syllable is closed, it has been shown that the place of articulation of the coda consonant could affect vowel reduction (Burzio 1994, 2007; Dahak 2011).

→ Could it affect stress preservation?

		Closed syllable				Open syllable
		Non-coronal obstruents	Liquids	Nasals	/s/	
-(at)ion	Group 1	0	0	0	1	0
	Group 2	6	15	8	4	48
Other suffixes	Group 1	13	2	2	2	5
	Group 2	1	3	3	4	14

- Non-coronal obstruents in the coda seem to favour preservation.
- Open syllables seem to disfavour it.

3. CONCLUSION

We have shown that several parameters can be (partly) correlated with the occurrence of the /021(-)/ pattern, although none of them offers an entirely satisfactory account.

Relative frequency significantly predicts exceptional stress preservation, but we have shown that the theoretical frameworks that have been used to model frequency so far may need to be revised.

Although we found a suffix with a specific behavior, *-(at)ion*, we found this could actually be a frequency effect.

Finally, we found a potential influence of the structure of the second syllable, which is still to be accounted for theoretically.

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Appendix

Group 1

Derivative	LPD	LPD Var	BNC Derivative	Local Base	BNC Base 1	Remote Base	**BNC Base 2**
addressee	201	021	199	address	11596		
adoptee	021		20	adopt	8426		
appointee	021	201	44	appoint	7169		
attendee	021	201	44	attend	8845		
collectivity	20100	02100	113	collective	2593	collect?	**7760**
connectivity	20100	02100	134	connective	128	connect	**4274**
debauchee	201	021	7	debauch	16		
departmental	2010	0210	867	department	22009	depart?	
detainee	201	021	273	detain	858		
diffusivity	20100	02100	16	diffusive	16	diffuse	**506**
directorial	20100	02100	40	director	16199	direct	**15679**
elasticity	20100	02100	385	elastic	568		
electoral	0100	0210	2047	elector	546	elect	**4999**
electrician	02100	20100	283	electric	3574		
electricity	02100	20100	3738	electric	3574		
ellipsoidal	2010	0210	9	ellipsoid	16	ellipse	**130**
encrustation	20100	02100	16	encrust	102		
escapee	021	201	18	escape	4545		
perceptivity	20100	02100	2	perceptive	264	percept	**2880**
receptivity	20100	02100	41	receptive	340	receive	**24054**
reflectivity	20100	02100	15	reflective	314	reflect	**11027**
resistivity	20100	02100	63	resistive	32	resist	**3341**
returnee	021		17	return	32412		
selectee	021		7	select	6758		
selectivity	02100	20100	142	selective	1293	select	**6758**

Group 2

Derivative	LPD	LPD Var	BNC Derivative	Local Base	BNC Base 1	Remote Base	BNC Base 2
abjuration	20100		7	abjure	34		
acceptation	20100		5	accept	19623		
acclamation	20100		50	acclaim	387		
accusation	20100		1094	accuse	4496		
acquisition	20100		3293	acquire	6704		
adaptation	20100		1116	adapt	2774		
admiration	20100		922	admire	2045		
adoration	20100		142	adore	492		
affectation	20100		65	affect	13278		
affirmation	20100		248	affirm	633		
apparition	20100		138	appear	29503		
application	20100		15871	apply	18993		
assignation	20100		42	assign	1785		
assignee	201		172	assign	1785		
attestation	20100		15	attest	279		
augmentation	20100		53	augment	494		
authenticity	20100		356	authentic	809		
cementation	20100		57	cement	910		
coercivity	20100		3	coercive	178	coerce	155
combination	20100		5285	combine	5927		
commendation	20100		129	commend	608		
competition	20100		9942	compete	3119		
componential	20100		12	component	5641		
condemnation	20100		447	condemn	2201		
condonation	20100		5	condone	258		
conductivity	20100		146	conductive	73	conduct	7914
conferee	201		2	confer	1248		
confirmation	20100		1159	confirm	8376		
conformation	20100		243	conform	1214		
confrontation	20100		1183	confront	2324		
confutation	20100		3	confute	2		
congelation	20100		2	congeal	65		
connotation	20100		363	connote	65		
consanguinity	20100		14	consanguine	2		
consignee	201		79	consign	301		
declamation	20100		25	declaim	68		
declaration	20100		2180	declare	5850		
deportee	201		68	deport	242		
deputation	20100		134	depute	112		
derivation	20100		226	derive	5091		
devotee	201		195	devote	2067		
dictatorial	20100		102	dictator	335	dictate	1385
dilatation	20100		121	dilate	139		
dispensation	20100		167	dispense	724		
disposition	20100		838	dispose	1580		
dissertation	20100		319	dissert	2		
domesticity	20100		129	domestic	6769		
eccentricity	20100		222	eccentric	629		
embarkation	20100		43	embark	1319		
emendation	20100		18	emend	16		
employee	010	201	8804	employ	7807		
endorsee	201		8	endorse	1549		
equatorial	20100		140	equator	205		
exaltation	20100		56	exalt	99		
excitation	20100		361	excite	773		
exclusivity	20100		118	exclusive	2034	exclude	4603
exhortation	20100		187	exhort	187		
existential	20100		210	existence	6446	exist	11084
expiration	20100		78	expire	716		
explanation	20100		6149	explain	18411		
exploration	20100		1636	explore	4737		
exponential	20100		112	exponent	388		
horizontal	2010		1215	horizon	1747		
imposition	20100		694	impose	6101		
inanition	20100		3	inane	60		
infestation	20100		124	infest	124		
information	20100		37948	inform	5148		
inspiration	20100		1359	inspire	2185		
intestinal	0100	2010	841	intestine	473		
intuition	20100		544	intuit	24		
invocation	20100		97	invoke	988		
lamentation	20100		49	lament	409		
magisterial	20100		51	magister	38		
molestation	20100		23	molest	102		
obligee	201		2	oblige	2329		
observation	20100		4895	observe	7239		
oratorical	20100		15	orator	120	orate	2
permutation	20100		142	permute	38		
perspiration	20100		173	perspire	48		
perturbation	20100		111	perturb	133		
preservation	20100		1117	preserve	3885		
proclamation	20100		254	proclaim	1169		
procuration	20100		3	procure	428		
profanation	20100		4	profane	94		
proposition	20100		2018	propose	7203		
provocation	20100		361	provoke	1971		
recitation	20100		65	recite	452		
referee	201		1531	refer	13421		
reformation	20100		400	reform	8809		
refutation	20100		88	refute	329		
relaxation	20100		1250	relax	3167		
reparation	20100		172	repair	4348		
repetition	20100		1024	repeat	7003		
reputation	20100		3800	repute	336		
reservation	20100		1509	reserve	5942		
resignation	20100		2547	resign	3046		
respiration	20100		135	respire	17		
restoration	20100		1959	restore	3839		
revelation	20100		1355	reveal	9952		
revocation	20100		81	revoke	324		
salutation	20100		45	salute	557		
statistician	20100		155	statistic	232		
subornation	20100		2	suborn	12		
supposition	20100		172	suppose	11366		
trephination	20100		2	trephine	2		
usurpation	20100		84	usurp	163		