

Degrees of (Un)acceptability in Syllable Contact*

Katharina S. Schuhmann

Katharina.Schuhmann@alumni.stonybrook.edu

This paper presents empirical evidence that phonological grammar determines different degrees of acceptability and unacceptability with respect to the emergence of syllable contact restrictions. Unlike all other areas of German phonology, i-truncations do not allow syllable contact sequences of rising sonority (Ito & Mester 1997). Such syllable contact restrictions can be accounted for by the emergence of a universal markedness scale that ranks all potential syllable contact cases in a hierarchy of strata from least marked to most marked with language-specific cut-off points (Gouskova 2004).

A grammaticality judgment task with nonce i-truncations was conducted to test the hypothesis that the markedness scale for syllable contact surfaces as different degrees of unacceptability and acceptability. The results of this study support the hypothesis that underlying markedness levels of the syllable contact scale are reflected in differential acceptability judgments. As expected, the stimuli in the grammatical strata have better acceptability scores than the stimuli in the ungrammatical strata. Crucially, the results for the five ungrammatical strata show a steady five-step trend of increasing rejection that epitomizes the five levels of increasing syllable contact markedness in the stimuli. The acceptability judgments for stimuli in the five grammatical strata show a four-step trend of decreasing acceptance that epitomizes four of the five levels of increasing syllable contact markedness in the stimuli.

These results are particularly intriguing since these acceptability judgments show subtle markedness effects that cannot be explained as frequency effects, or as patterns that German speakers could have learned from the German lexicon or phonology since syllable-contact restrictions are specific to i-truncations in German. Overall, these results provide novel evidence that German speakers have inherent knowledge about phonological markedness at the level of syllable contact.

1 Introduction

German i-truncations are based on a morphological process by which multisyllabic nouns are truncated and receive an /i/ word-finally. German i-truncations are unmarked in many ways. At the prosodic level, i-truncations are disyllabic, stressed on the first syllable, and correspond to the beginning of the base form. An example for a typical i-truncation is the hypocoristic form /ká.ti/ for the personal name /kà.ta.rí.na/ ('Katharina'). Other nickname formations in German, such as clippings, will not be discussed here.¹

* I am particularly thankful to Ellen I. Broselow, Christina Y. Bethin, and Robert D. Hoberman for helpful feedback on earlier versions of this paper. All errors are of course entirely my own.

¹ In clippings, one or multiple syllables of a word are deleted, but the remaining syllables and sounds are not altered, and no additional sounds or morphemes are added (unlike in i-truncations). For example, the clipping for the name /kà.ta.rí.na/ is /ká.ta/, while the i-truncation is /ká.ti/. Base forms with an /i/ nucleus in the second syllable, such as "Unīversitāt" (*university*), can be shortened to "Uni", a form that could be derived by either of these two morphological processes (clipping or i-truncation).

When the base form contains a word-medial consonant sequence in the position where the form should be truncated, the precise length of the i-truncation is determined by sonority, allowing only i-truncations with consonant sequences of falling sonority. For example, a consonant sequence of falling sonority such as /rb/ in ‘Gorbi’ for ‘Gor.ba.tschof’ is grammatical, while a consonant sequence with rising sonority such as /br/ in *‘Gabri’ for ‘Gabriele’ is ungrammatical in German i-truncations (Ito & Mester 1997).

The examples below illustrate how various types of word-medial consonant sequences in the base forms surface in derived i-truncations. The relevant consonants are shown in bold. I-truncations that are based on words with word-medial consonant sequences with falling sonority (*RC sequences*) retain both consonants, as shown in (1).

(1) RC sequences: Consonant sequences with falling sonority

- | | | | | |
|----|----------------------------|---|--------------------|-------------------------------------|
| a. | [g or .bə.ʃɔf] | > | [g or .bi] | “Gorbatschow”, <i>proper noun</i> |
| b. | [val.d ə .mɐ] | > | [val.d i] | “Waldemar”, <i>proper noun</i> |
| c. | [klin s .man] | > | [klin .si] | “Klinsmann”, <i>proper noun</i> |
| d. | [ʔal.k o .ho.lɪ.kə] | > | [ʔal.k i] | “Alkoholiker”, <i>alcoholic (n)</i> |

I-truncations that are based on words with word-medial consonant sequences with rising sonority (*CR sequences*) retain only the first consonant, as shown in (2).

(2) CR sequences: Consonant sequences with rising sonority

- | | | | | |
|----|--------------------------------------|---|---|--|
| a. | [ga. bri .e.lə] | > | [ga. bi] (*[ga. bri], *[gab. ri]) | “Gabriele”, <i>proper noun</i> |
| b. | [ɔst ^ɾ .d ɔ l.ʃɐ] | > | [ɔs. si] ² | “Ostdeutscher”,
<i>term for people from East Germany</i> |
| c. | [vest ^ɾ .d ɔ l.ʃɐ] | > | [ves. si] | “Westdeutscher”,
<i>term for people from West Germany</i> |

In i-truncations that are based on words with word-medial NC-consonant sequences (where the first consonant in the cluster is a nasal, and the second one is any consonant), both consonants are retained only if they are homorganic (Féry 1997), as shown in (3).

(3) NC sequences: Consonant sequences in which the first consonant is a nasal (cf. Féry 1997)

- | | | | | |
|----|----------------------|---|---|---------------------------------|
| a. | [klin s .man] | > | [klin .si] | “Klinsmann”, <i>proper noun</i> |
| b. | [man. fred] | > | [ma. ni], [man. ni] (*[man. fri], *[man. fi]) | “Manfred”, <i>proper noun</i> |
| c. | [ʔ ɪ m.kə] | > | [ʔ ɪ m. mi] (??[ʔ ɪ m.ki], *[ʔ ɪ .mki]) | “Imker”, <i>bee master</i> |

² In this paper, transcriptions like [-s.s] represent ambisyllabic but short consonants.

Stratum number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	w.t>	w.s>	w.d>	w.z>	w.n>	w.l>	w.r>	w.w>	r.w>	l.w>	n.w>	z.w>	d.w>	s.w>	t.w
		r.t	r.s	r.d	r.z	r.n	r.l	r.r	l.r	n.r	z.r	d.r	s.r	t.r	
			l.t	l.s	l.d	l.z	l.n	l.l	n.l	z.l	d.l	s.l	t.l		
				n.t	n.s	n.d	n.z	n.n	z.n	d.n	s.n	t.n			
					z.t	z.s	z.d	z.z	d.z	s.z	t.z				
						d.t	d.s	d.d	s.d	t.d					
Sonority Distance (DIST)							s.t	s.s	t.s						
								t.t							
	-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7

Fig. 1. The Syllable Contact Hierarchy (adapted from Gouskova 2004:10).

The SCH is argued to be part of the constraint set of every language. Further, the relative ranking of the strata reflects markedness. The consonant sequences with the highest degree of sonority rise (stratum 15, DIST +7, i.e. a sonority distance of 7, according to a measurement matrix used to calculate the sonority distance between consonants in individual sequences) are most marked, while the consonant sequences with the highest degree of sonority drop (DIST -7) are least marked.

The SCH is argued to be universal and innate. Cross-linguistic differences in syllable contact restrictions can be accounted for with language-specific cut-off points along the hierarchy. For example, Icelandic, Faroese, Sidamo, and Kirgiz allow a certain degree of sonority rise or fall in their coda-onset sequences, while a more extreme degree of sonority difference (rise or fall) is not allowed (Gouskova 2004). Thus, the SCH can explain typological variation in how much the sonority levels of syllable contact cases may rise or fall: all languages have the SCH as part of their constraint ranking, but the cut-off point, i.e. the maximal drop/rise in the sonority level of coda-onset sequences, differs between languages.

In this paper, it is proposed that different syllable contact sequences are not merely acceptable or unacceptable, but that more marked syllable contact sequences are more unacceptable and, conversely, that more unmarked syllable contact sequences are more acceptable. Concretely, it is predicted that the relative position on the syllable contact scale of one ungrammatical syllable contact sequence (e.g., “sn” in stratum #11) with respect to another ungrammatical syllable contact sequence (e.g., “nl” in stratum #9) would be reflected in acceptability judgments of ungrammatical hypocoristics. Similarly, it is predicted that the relative position on the syllable contact scale of one grammatical syllable contact sequence (e.g., “ns” in stratum # 5) with respect to another grammatical syllable contact sequence (e.g., “ln” in stratum # 7) would be reflected in acceptability judgments of grammatical hypocoristics.

Recent work in phonotactics (Coetzee 2004, 2006, 2008; Moreton 2002; Berent et al. 2007, 2008; Hayes & Wilson 2008) suggests that phonological wellformedness judgments are gradient. Coetzee (2004, 2006, 2008) has provided evidence that native speakers show subtle differences in their acceptance of ‘non-optimal’ candidates with illegal phonotactic sequences. Coetzee (2008) refers to this phenomenon as ‘different degrees of ungrammaticality’ and accounts for this type of phenomenon with a formal

Optimality-Theory model of constraint ranking.³ The spirit of Coetzee's work on 'degrees of ungrammaticality' is adapted in this paper, although the findings here are not based on constraint rankings, but rather on more general effects of universal markedness on acceptability judgments by native speakers. Differences in grammaticality judgments that correlate with differences in markedness levels are henceforth referred to as 'degrees of acceptability and unacceptability'. The working hypothesis and the predictions for the conducted experiment are summarized in (5) and (6), respectively:

(5) Hypothesis (H1)

Grammar defines degrees of (un)acceptability at the level of syllable contact.

(6) Predictions (based on H1)

- a. Degrees of unacceptability: Ungrammatical i-truncation forms with a highly marked syllable contact sequence (i.e., a syllable contact sequence corresponding to a stratum at the far right end of the syllable contact hierarchy) will be rated as worse than ungrammatical i-truncation forms with a less marked syllable contact sequence (i.e., a syllable contact sequence corresponding to a stratum at the left side of the ungrammatical strata of the syllable contact hierarchy), everything else being equal.
- b. Degrees of acceptability: Grammatical i-truncation forms with a highly unmarked syllable contact sequence (i.e., a syllable contact sequence corresponding to a stratum at the far left end of the syllable contact hierarchy) will be rated as better than grammatical i-truncation forms with a more marked syllable contact sequence (i.e., a syllable contact sequence corresponding to a stratum at the right side of the grammatical strata of the syllable contact hierarchy), everything else being equal.

A grammaticality judgment task was designed to test whether native speakers of German show differences in the acceptability of various ungrammatical consonant-sequences, as well as differences in the acceptability of various grammatical consonant sequences in i-truncations, reflecting universal markedness levels. It was predicted that native German speakers would rate ungrammatical forms with a greater degree of sonority rise as worse than ungrammatical forms with a smaller degree of sonority rise. Conversely, it was predicted that native German speakers would rate grammatical forms with a greater degree of sonority fall as better than grammatical forms with a smaller degree of sonority fall.

2 Experiment

The grammaticality judgment task was conducted as a web-survey. Participants rated grammatical as well as ungrammatical nicknames for nonce-names (nonce-words that were introduced as proper nouns) on a scale from 1 to 10. All instructions and all stimuli

³ The formal implementation of this insight is a 'rank-ordering model of EVAL' (ROE) in which EVAL not only chooses the optimal candidate among a set of candidates, but also creates a harmonic rank-ordering for all candidates (Coetzee 2004, 2006). The ROE predicts that lower-ranked constraints of the SCH, which do not play a role in the selection of a winning candidate, should still have an effect on the relative well-formedness of non-optimal candidates.

were provided in writing. The main research question was whether stimuli within the ungrammatical group would show different degrees of unacceptability, and whether stimuli within the grammatical group would show different degrees of acceptability. Concretely, a trend of decreasing acceptability (or increasing rejection) was predicted as a function of increasing markedness of the stimuli.

2.1 Method

2.1.1 Participants

Thirty-six adult native speakers of German (self-identified) participated in the web-survey. Approximately half the participants participated anonymously, while the other half revealed their name and contact information to be entered into a drawing for a cash prize (25 EUR). In order to gain information about the participants' dialect, one survey question asked participants to indicate how they produce onset /r/'s in their dialect of German. Two participants' data were not included in the analysis because they only used scores between 1 and 3 (on a scale from 1 to 10) for all of the questions. The analysis of the data of the remaining 34 participants is described below.

2.1.2 Stimuli

Each full nonce-name ended in one of six suffixes (-*atje*, -*ada*, -*omis*, -*ander*, -*enke*, -*edor*), yielding made-up personal names like *Nolfander*. The suffixes were distributed evenly among all strata. The bases of the full nonce-names were of the prosodic shape CVCC-, i.e. a simple onset in word-initial position, followed by a vowel, which was followed by a consonant cluster. All full nonce-names were trisyllabic and were assumed to receive stress on the penultimate syllable. All i-truncations were disyllabic and were assumed to receive stress on the initial syllable. Crucially, the word-medial CC sequence in each full nonce-name was retained in the corresponding i-truncation, independent of whether the CC sequence had a rising or falling sonority profile. The complete list of the 48 stimuli (full nonce-names and i-truncations) is available in Appendix I A.

The full nonce-name stimuli were further created so that they did not contain any instances of /i/. The high front vowel was avoided in the second syllable so that the i-truncation-stimuli could not be analyzed as clippings (cf. footnote 1, p. 1). Furthermore, /i/ was not used in the first syllable in order to avoid potential OCP(i)-type effects that might lead participants to rate i-truncations with two /i/'s as worse than other vowel combinations in i-truncations.

Gouskova (2004) groups the most frequent coda-onset CC sequences into fifteen strata (cf. Fig. 1, p. 4). Each stratum is defined in terms of the sonority distance between the two consonants of each of the CC sequences. Not all individual strata could be included in the experiment due to phoneme inventory restrictions in German. The first stratum (stratum #1, Dist -7), a glide followed by a voiceless stop ("w.t"), was excluded from the design of this experiment because /j/, the only glide in German, is not allowed in coda position (*[j] CODA). The last stratum (stratum #15, Dist +7), a voiceless stop followed by a glide ("t.w"), was excluded because German phonology generally does not allow a sequence in which the glide [j] is followed by a high front vowel (*[ji]). This exclusion was necessary for this experiment because all invented nicknames are i-truncations and any second consonant of a CC sequence in the nickname is automatically

followed by an /i/. These two strata are designated as impossible ('imp') below.⁴ Finally, the middle stratum (stratum #8, DIST 0) was treated as a special case, because this stratum can refer either to ambisyllabic consonants, or to CC sequences of two consonants that agree in manner and voicing. The experiment included four nonce-names of each type, a) four nonce-names with an ambisyllabic consonant, indicated by two identical consonants in the orthography ("ss", "dd", "tt", and "ll"), and b) four nonce-names with a CC sequence in which the two non-identical consonants agreed in manner and voicing. Of the latter type, two forms had a stop-stop sequence ("kt" and "tk"), the other two had a fricative-fricative sequence ("sf" and "fs").

The thirteen strata tested in this experiment are shown in Figure 2; the sequences in italics were not tested.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>w.t</i>	<i>w.s</i>	<i>w.d</i>	<i>w.z</i>	<i>w.n</i>	<i>w.l</i>	<i>w.r</i>	<i>w.w</i>	<i>r.w</i>	<i>l.w</i>	<i>n.w</i>	<i>z.w</i>	<i>d.w</i>	<i>s.w</i>	<i>t.w</i>
	<i>r.t</i>	<i>r.s</i>	<i>r.d</i>	<i>r.z</i>	<i>r.n</i>	<i>r.l</i>	<i>(r.r)</i>	<i>l.r</i>	<i>n.r</i>	<i>z.r</i>	<i>d.r</i>	<i>s.r</i>	<i>t.r</i>	
		<i>l.t</i>	<i>l.s</i>	<i>l.d</i>	<i>l.z</i>	<i>l.n</i>	<i>l.l</i>	<i>n.l</i>	<i>z.l</i>	<i>d.l</i>	<i>s.l</i>	<i>t.l</i>		
			<i>n.t</i>	<i>n.s</i>	<i>n.d</i>	<i>(n.z)</i>	<i>(n.n)</i>	<i>z.n</i>	<i>d.n</i>	<i>s.n</i>	<i>t.n</i>			
				<i>z.t</i>	<i>z.s</i>	<i>z.d</i>	<i>(z.z)</i>	<i>d.z</i>	<i>s.z</i>	<i>t.z</i>				
					<i>d.t</i>	<i>d.s</i>	<i>d.d</i>	<i>s.d</i>	<i>t.d</i>					
						<i>s.t</i>	<i>s.s</i>	<i>t.s</i>						
							<i>t.t</i>							
-7	-6	-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	+6	+7

Fig. 2. Tested CC sequences of the SCH: Consonant sequences in italics could not be tested due to phoneme inventory restrictions in German. CC sequences in parentheses indicate that these sequences could theoretically be tested, but were not included in the list of stimuli.

The experiment included exactly four words per stratum, exemplifying as many of the consonant sequences with a particular sonority distances as possible, given the German phoneme inventory and phonology. Within each stratum, two of the four words were designed to yield a minimal pair with a stimulus in another stratum; both members of the minimal pair had either a consonant cluster of rising sonority or of falling sonority. The minimal pairs were constructed so that the difference in sonority distance between the two forms was different in each pair. For example, the minimal pair {'Pelri' (stratum #9) – 'Pekri' (stratum #14)} differs only in one sound, but these two forms are on opposite ends of the spectrum of possible C.C sequences with rising sonority in German. When placed on the SCH, these two forms are five strata apart from each other. On the other hand, both forms of a minimal pair like {'Fusni' (stratum #11) – 'Futⁿi' (stratum #12)} have a C.C sequence with a more similar sonority distance because the CC sequences are from neighboring strata.

⁴ Moreover, the phoneme 'h' is not part of the SCH (Gouskova 2004). German i-truncations also do not allow the second syllable to be of the form [hi] (*[hi]), e.g. 'Johanna' > *Johi. Thus, none of the stimuli contained clusters with the phoneme /h/ in word-medial position. Furthermore, voiced obstruents in coda position are fully or partially devoiced in German. No stimuli with voiced obstruents in coda position were included. This led to the exclusion of the type "d.t" (within stratum #6, DIST -2) or "d.s" (within stratum #7, DIST -1), for example.

These minimal pairs were constructed to make it possible to compare individual forms that differ only in one sound and thus in their position on the sonority scale, while all other variables are kept constant. Furthermore, half of the minimal pairs were randomized so that the two forms did not occur within close proximity to each other. The other half of the minimal pairs were listed ‘one after the other’, whereby one form of the minimal pair was directly followed by the other form of the minimal pair (the relative order of the forms of the minimal pair was pseudo-randomized as well). This distribution of the minimal pair forms was chosen to test whether speakers are more sensitive to subtle differences between two possible or two impossible forms when two similar forms occur within a short time interval. (This prediction was not confirmed by the results; the description of the results below will therefore not make reference to this design feature.) All other nonce-word forms occurred in random order in the survey. The list of stimuli is given in Appendix I B and reflects the order in which they occurred in the web-survey.

2.1.3 Design and Procedure

The participants saw 56 made-up German nonce-names as well as one i-truncation (‘nickname’) for each nonce-name. The task was to indicate on a scale from 1-10 how good or bad the given i-truncation (‘nickname’) sounded to the participants, 1 being ‘very good’ and 10 being ‘very bad’. For example, participants were given the nonce-name “NOLFANDER” and the nickname “NOLFI” and were asked to rate, on a scale from 1 to 10, how good or bad the nickname sounded to them for the provided made-up name. A translation-equivalent of this survey question is shown in (7). All the survey questions were identical except for the stimuli. Please refer to Appendix II for a snapshot of a sample page of the web survey (in German).

(7) Example Survey Question (*translated*)

How good or bad does the following nickname for the provided made-up name sound to you?

NOLFI for NOLFANDER

Please indicate your answer using the following scale, whereby “1” represents “very good” and “10” represents “very bad”.

1 2 3 4 5 6 7 8 9 10

very good ----- good ----- bad ----- very bad

(Optional additional comments:)

The survey included three additional ‘security’ questions to prevent participants from selecting answers without reading the questions. In these security questions, participants were instructed to select a specific number on the scale (10, 1, and 9). Finally, the

participants were asked to describe the characteristics of /r/ in their individual dialects of German. Thus, the total number of questions was sixty, all of which required an answer. The survey took approximately 15-20 minutes to complete. The website included an introduction with a few examples (Gorbi and *Gabri) to demonstrate to the participants that some i-truncations sound better than others, although the full names were reduced to the same number of letters in both example nickname forms.

The general experimental design was initially tested in a pilot study. This pilot study compared two designs to determine which one was most suitable for detecting subtle differences in acceptability judgments of non-optimal (and optimal) i-truncation forms. A comparison of the two designs in the pilot study revealed that, overall, and in particular for stimuli with word-medial rising sonority consonant clusters, participants rated two forms differently on the 10-point scale, but reported that both forms were equally good/bad in the design with direct comparisons. Therefore, the current experiment made use of the 10-point scale design. The pilot data also provided initial evidence for gradient markedness effects, because increasing markedness in syllable contact was correlated with an increasing degree of rejection.⁵

3 Results

To recapitulate, this study was designed to test the hypotheses that native speakers rate syllable contact sequences not simply as acceptable or unacceptable, but that they evaluate individual syllable contact sequences as relatively acceptable or relatively unacceptable based on their intrinsic knowledge about how marked each sequence is. The general predictions were that stimuli with more marked syllable contact sequences should be rejected more strongly than stimuli with less marked or more unmarked syllable contact sequences. The averages reported below represent averages of the raw data pooled across all participants. Depending on the question of interest, the averaged results for individual stimuli, individual strata (based on their markedness level), or the entire grammatical or ungrammatical group are discussed in the following sections.

A formal analysis of the data of individual participants was not done because the data of individual speakers do not always reflect the overall gradient trend that the averages reveal, nor is it necessary that they do. Hayes (1998) surveys native English speakers on

⁵ The pilot study included 26 stimuli in each design. Five participants completed both designs. The design that fared better was the design chosen in the experiment reported here, i.e. the design in which the participants rated individual stimuli on a scale from 1 to 10, 1 being 'very good' and 10 being 'very bad'. In the other design, two stimuli were presented at once (two nicknames with corresponding full nonce-names) and the participants were asked to judge whether both i-truncations are equally bad, or whether one of the two forms was a 'lesser evil' than the other. In the critical condition of this second experimental design, participants were given two nonce-names with a nickname each. Both of the provided i-truncations retained the CC sequences of their corresponding base form, which were, however, of rising sonority. They should therefore both be non-optimal, in accordance with the general finding that i-truncations only retain CC sequences of falling sonority. The participants were asked whether the given i-truncations for the made-up names were equally bad, or whether they thought that although both i-truncations are 'bad' forms, one of them was worse than the other, i.e. that one was "the lesser evil" of the two non-optimal i-truncations. (In the control conditions, participants were asked to rate the relative well-formedness of an i-truncation with a possible CC sequence, as well as an i-truncation with an impossible CC sequence in word-medial position. In this case, participants were expected to always indicate that the i-truncation with a consonant sequence of falling sonority was better than the i-truncation with a consonant sequence of the rising sonority.)

the acceptability of different words with ‘light’ [l] vs. ‘velarized’ [ɫ], and argues that the data show gradient well-formedness, even though the data of individual participants do not seem to show the same gradient well-formedness pattern as the overall average. He argues that the variation in individual responses must be due to negligible effects that recede when the group averages are analyzed, which is the approach taken here.

3.1 Grammatical vs. ungrammatical strata

Before the data can be analyzed for degrees of acceptability and unacceptability, it is important to check whether the grammatical group, the i-truncations with a heterosyllabic consonant sequence of falling sonority (strata #2 through #7), was overall rated as better than the ungrammatical group, the i-truncations with consonant sequences of rising sonority (strata #9 through #14). Figure 3 shows that this expectation is met.

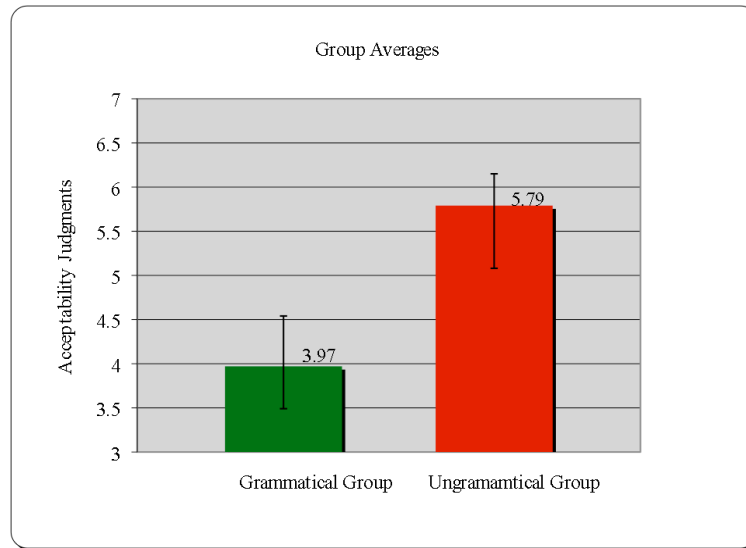


Fig. 3. This graph shows group averages for the grammatical (3.97) and the ungrammatical (5.79) group, based on the raw data. The standard deviation for the grammatical group is (+0.57, -0.48), the standard deviation for the ungrammatical is (+.36, -0.71).

As predicted, all the strata in the grammatical group have better scores (lower numeric values) than the strata in the ungrammatical group. The range of averages for the grammatical group spans from 3.49 to 4.53, and does not overlap with the range of averages for the ungrammatical group, which spans from 5.08 to 6.15. This difference between the groups is statistically significant ($t(10) = 7.68, p < .0001$).

3.2 Emergent markedness effects

A closer look at the individual strata revealed that two types of phenomena shaped the results. The acceptability judgments show the influence of emergence of the unmarked (TETU) effects (McCarthy & Prince 1994), as discussed below. Once these TETU effects are factored out of the results (henceforth “adjusted results”), the expected markedness effects of the Syllable Contact Hierarchy become apparent in the acceptability judgments.

For any given stratum, the averages are calculated by pooling across subjects and the relevant stimuli. These adjusted results are given in Table 1.

Table 1: Adjusted averages for each stratum of the Syllable Contact Hierarchy.

Grammatical Group							Ungrammatical Group							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
<i>imp.</i>	(n/a: [rC])	(n/a: [r/IC])	2.69	2.98	3.14	3.06	OCP	5.29	5.43	5.78	5.97	6.28	(n/a: syllab.)	<i>imp.</i>
Ø: 2.97							Ø: 5.75							

The adjusted average scores shown in Table 1 provide evidence for the hypothesis: Except for stratum #7, the scores of the individual strata increase steadily (showing increasing rejection) along the lines of the SC hierarchy. Although the differences between the average scores of the individual strata are very small, they do show a relationship between acceptability ratings and markedness as defined by the Syllable Contact Hierarchy. This correlation suggests that native speakers rate the nicknames based on how marked or unmarked each syllable contact sequence is. A graph displaying the adjusted average of each stratum is provided in Figure 4.

As Figure 4 shows, the adjusted results for the ungrammatical strata (#9 through #13) show a trend with five different degrees of unacceptability that reflect exactly the increasing markedness levels of the respective syllable contact cases. The adjusted results for the grammatical strata (#4 through #7) also show a trend, although stratum #7 shows an average that falls outside the direction of the overall trend.

In hindsight, several stimuli in multiple different strata had to be eliminated from the data analysis because of the following two factors related to orthography. First, any stimulus with a word-medial /rC/ sequence had to be disregarded. Standard German, as well as many dialects of German, are non-rhotic. In non-rhotic dialects, an underlying coda /r/ is not realized as a consonant, but rather as a schwa-like vowel sound. Stimuli with an /r/ in coda position should not be used as stimuli in studies about syllable contact, because these words do not necessarily contain a consonant sequence in the output. The stimuli that could not be analyzed because they contained a coda /r/ are all the stimuli in stratum #2 (*Purki, Ferpi, Larti, Garti*), one stimulus in stratum #3 (*Bersi*), one in stratum #4 (*Terdi*), one in stratum #5 (*Murwi*), one in stratum #6 (*Serni*), and two in stratum #7 (*Purli, Ferli*). It is clear that none of these stimuli are relevant in the current study on syllable contact.

Across the board, stimuli with spelled “w” as the second consonant also showed unexpected behavior. These stimuli were designed and included to elicit behavior to stimuli with a voiced C as the second C of the CC sequence. The relevant stimuli are one stimulus in stratum #5 (*Murwi* – but the data for this stimulus are already eliminated from the overall analysis because the stimulus also has an /r/ in coda position), two in stratum 6 (*Jalwi, Golwi*), one in stratum 10 (*Geswi*), and one in stratum 11 (*Dakwi*). The stimuli with coda ‘w’ are excluded because it does not appear correct to assume that native speakers think that a spelled ‘w’ corresponds to the voiced labiodental fricative [v], or at

least not in the context used in this study.⁶ One of the participants in the pilot study pronounced stimuli with a spelled “w” in word-medial position as [f], even when asked whether she intended to say [f] or [v]. It is therefore argued that a coda “w” in spelling does not unequivocally lead readers to assume a voiced, labiodental fricative, although this was assumed when the stimuli were created. The question of how to interpret a spelled “w” also seems to be influenced by the fact that the letter “w” most often represents the sound [v] in word-*initial* position (e.g., in ‘wh’-words such as “wie” [vi], “wo” [vo], “warum” [varʊm]), but only seldom in word-*medial* position (e.g., in ‘Möwe’ (*seagull*)). To summarize, it was necessary to exclude all stimuli containing a spelled “w” in onset position.

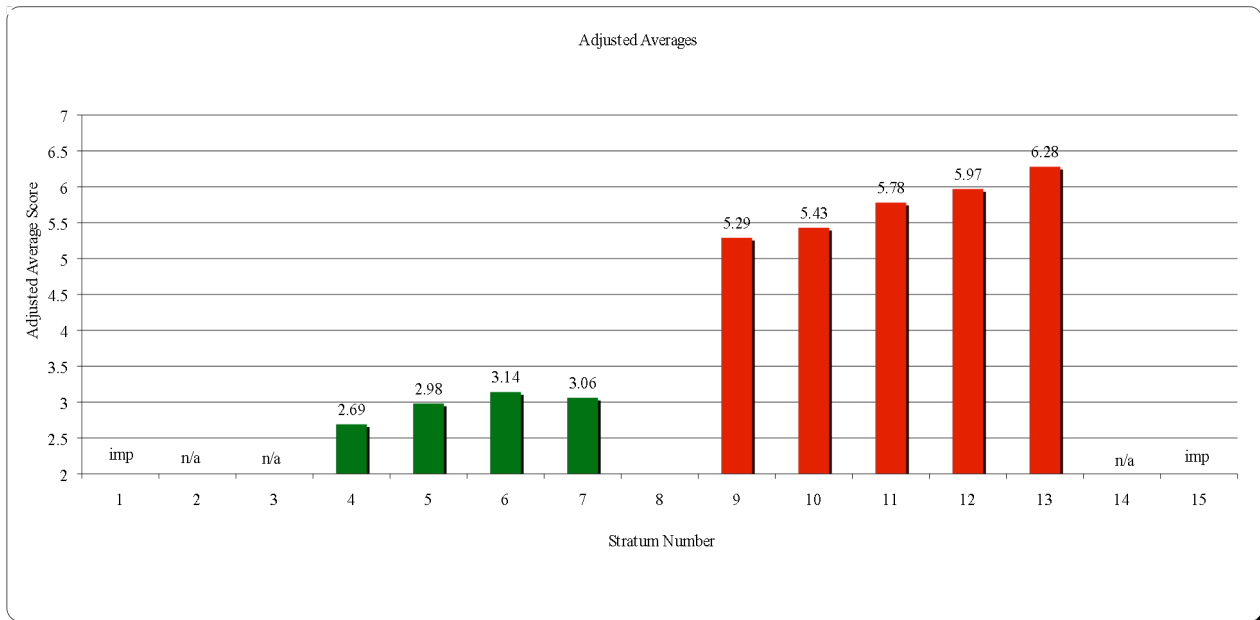


Fig. 4. Bar graph of the adjusted averages for each stratum of the Syllable Contact Hierarchy. Strata #1 and #15 are impossible (‘imp’) in German due to phoneme inventory and phonotactic restrictions (see above, p. 7). The data for stratum #2 had to be excluded because all stimuli contained an /r/ in coda position (see above, p. 11). Similarly, the data for stratum #3 had to be excluded because all stimuli contained an /r/ or an /l/ in coda position (see above, p. 11 & § 3.3.2). The crucial consonant sequences in all stimuli in stratum #14 seem to have been analyzed as complex onsets, rather than as coda-onset sequences (see below) and were thus excluded. The distinctive behavior of the stimuli in stratum #8 is described below (§ 3.3.1.1).

The level of significance for these results was tested by a Spearman Rank-order coefficient (r_s). The rank order of the adjusted results yields an r_s of 0.95 for the nine strata (#4-7, 9-13), which is statistically significant at the $< .05$ level. For this calculation, the nine strata that are based on the Syllable Contact Hierarchy (SCH) are used as X

⁶ In general, German orthography is thought to represent the sound [v] with the letter “w”, as in ‘wann’ (*when*), ‘Wagen’ (*wagon/car/cart*), ‘Möwe’ (*seagull*). However, in loanwords, [v] is often represented with the letter “v”, as in ‘Universität’ (*university*), ‘Virus’ (*virus*), ‘privat’ (*private*) (based on the following website: <http://www.canoo.net/services/GermanSpelling/Amtlich/LautBuchst/pgf32.html?MenuId=OfficialSpelling1016>).

values. The adjusted averages for these strata were ranked in order and used as Y values. The rank order of the adjusted results is shown in Table 2.

Table 2: Determination of rank order of the results of the grammaticality judgment task.

Rank Order	Ranks for	
	X: Stratum Number	Y: Adjusted Average
1	4	2.69
2	5	2.98
3	7	3.06
4	6	3.14
5	9	5.29
6	10	5.43
7	11	5.78
8	12	5.97
9	13	6.28

Although some justified adjustments were made to the data, the overall acceptance of grammatical stimuli and rejection of ungrammatical stimuli is still preserved, as shown in Figure 5. This difference between the grammatical and the ungrammatical group is still statistically significant ($t(7) = 12.59, p < .0001$).

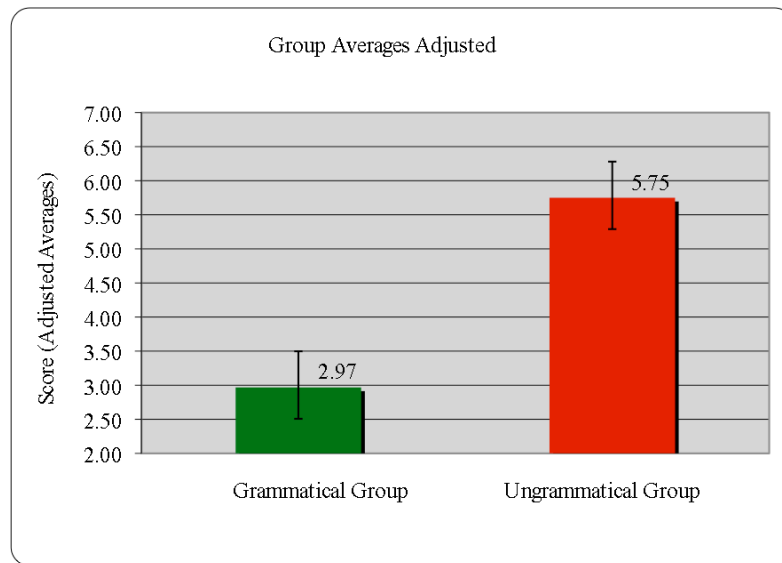


Fig. 5. This bar graph shows the adjusted averages pooled over all strata in the grammatical group and the ungrammatical group, respectively. The pooled, adjusted average for the grammatical group is 2.97; The pooled, adjusted average for the ungrammatical group is 5.75.

3.3 Other TETU effects

The results of the web-survey do not only provide evidence for degrees of acceptability and degrees of unacceptability in syllable contact, but they also provide

evidence for several other emergence of the unmarked (TETU) effects. These emergent effects are presented in the following sections.

3.3.1 OCP Effects

3.3.1.1 OCP (Manner)

Half of the stimuli in stratum #8 contain CC sequences with two non-identical obstruents, while the other half contain CC sequences with ambisyllabic consonants. The group of stimuli with non-identical obstruent CC sequences (*Sakti*, *Tefsi*, *Butki*, *Lusfi*) shows strong OCP effects. Importantly, none of these non-identical obstruent CC sequences can be analyzed as complex onsets in German, thus eliminating other potential influences as described below for other stimuli (cf. §3.4). Overall, the group average for non-identical obstruent CC sequences shows a high average score (6.12), while the group average for ambisyllabic consonants (spelled as ‘Tassi’ or ‘Seggi’, for example) shows a low average score (2.13). This pattern suggests that i-truncations do not allow CC sequences (in word-medial position) that contain two obstruents that agree in manner, i.e. heterosyllabic C.C sequences that contain two stops (*Sakti*, *Butki*) or two fricatives (*Tefsi*, *Lusfi*). These findings are plotted in Figure 6.

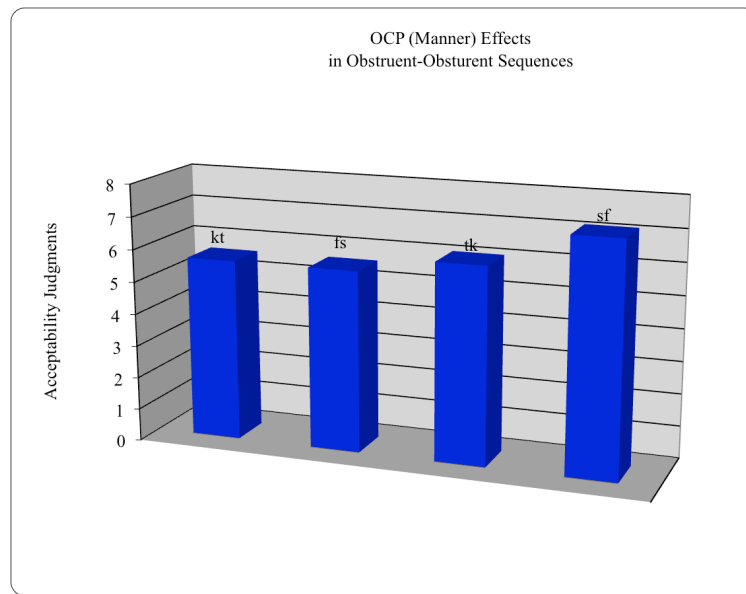


Fig. 6. Bar graph of the results for stimuli with non-identical obstruent-obstruent sequences (Stratum 8), *Sakti*, *Tefsi*, *Butki*, *Lusfi*, which show the highest scores overall in this study (on average 6.118 for all four stimuli), indicating very low acceptability ratings. These high ratings are accounted for by OCP (manner) restrictions.

The following finding provides further support for this OCP analysis. One of the stimuli in stratum 10, *Sukbi*, also contains a C.C sequence with two stops. As expected under the OCP (obstruent) analysis developed in this paragraph, the average score for this word (7.53) is much higher than for the other stimuli in this group (which range from 5.29 to 6.21). The proposed constraint is OCP (manner), which is defined in (8):

- (8) OCP (manner): A C.C sequence must not contain two obstruents that agree in manner. (In other words: *stop-stop and *fric-fric).

In other words, this OCP constraint is violated by heterosyllabic stop-stop or fricative-fricative sequences. Crucially, the proposed constraint is not violated by stop-fricative or fricative-stop sequences. The name “OCP (manner)” functions merely as an abbreviation for the definition provided above.

3.3.1.2 OCP (coronal)

Another instance of an emergence of the unmarkedness (TETU) OCP effect becomes evident from the data in strata #4, #7, and #9. In stratum #4, the two stimuli *Jolsi* and *Nolfi* both contain C.C sequences with two continuants, /ls/ and /lf/, respectively. The stimulus with the entirely coronal sequence /ls/ (*Jolsi*) is rated as worse (4.97) than the stimulus with the non-homorganic /lf/ sequence (*Nolfi*) (2.29). In stratum #7, the score for the stimulus with two coronals, *Valni* with the /ln/ sequence⁷, is considerably higher (5.71) than the average scores for the other stimuli in this stratum, which contain /ft/ and /rl/⁸ sequences ({3.06, 4.42, 4.46} for *Dafti*, *Ferli*, and *Purli*, respectively). In stratum #9, the stimulus *Pelri* with two coronals, an /lr/ sequence, received worse acceptability judgments (6.01) than the other stimuli in this stratum, which contained /ts/, /nl/, and /fd/ sequences ({3.68, 5.21, 5.38} for *Datsi*, *Vanli*, *Mafdi*, respectively).

In all of these cases, the stimuli with the higher rejection scores contain word-medial C.C sequences with two coronal consonants, of which the first C is an /l/. This consistent pattern across three strata suggests the emergence of a (gradient) OCP constraint that affects CC sequences with two coronal continuants.

Interestingly, when an average score for the stimulus *Pelri* from stratum #9 is computed based on only the judgments of those participants that indicated (clearly) (in the last question of the survey) that they had a trilled [r], the average score for *Pelri* is even higher (6.12). This increase in the score suggests a stronger OCP effect when the C's are clearly two coronal continuants, namely /l/ and /r/. All of these findings provide evidence for an OCP constraint that restricts CC sequences with two coronal continuants, abbreviated as OCP (coronal). The definition of OCP (coronal) is provided in (9).

- (9) OCP (coronal): A CC sequence must not contain two coronals that are both continuants.

The OCP (coronal) constraint needs to be further specified to only apply to sequences in which the first C is /l/ (which is the case in all of the examples analyzed above). This specification is important, because an OCP effect does not hold for stimuli with CC sequences with two continuant coronals in which the first C is not an /l/. For example, the stimulus *Vanli* of stratum #9 does not show a much more degraded rating as compared to the other stimuli. The stimulus *Pelri* from the same stratum and with a word-medial lC

⁷ It is assumed that the term ‘continuant’ encompasses nasals (nasal continuants) as well.

⁸ The stimuli with the /rl/ sequence should, however, not be taken into consideration, since coda /r/'s are not usually pronounced in a consonantal way in German (see discussion about “r” above).

sequence, however, does show a degraded rating. Again, the name “OCP (coronal)” is only intended as an abbreviation for the definition provided above.

While the requirement that the first C of this C.C sequence be an /l/ may appear to be somewhat arbitrary, it seems to be the best description for the constraint which is operating in these diverse forms, but not in other, similar forms. The requirement that the first C be an /l/ will also play a role in two other constraints developed below, namely the *LatC(-voice) and the Lat CODA-COND constraints. Apparently, all three constraints are involved in some form of similarity or dissimilarity requirement between a lateral and the following consonant. Further research is necessary to determine whether these phenomena can possibly be subsumed under one single constraint.

3.3.2 Requirements on lateral-obstruent sequences

One of the two outliers of the otherwise steady trend of the SCH is stratum #3. The higher averages for the stimuli in this stratum can be explained by two markedness constraints that both apply to lateral-stop sequences. These markedness constraints are violated when the stop is too dissimilar from the lateral, in the broadest sense. More specifically, the stimulus ‘Jalti’ with a homorganic LT sequence has a relatively low average (3.32) compared to the other two stimuli from stratum #3, which have non-homorganic LT sequences, ‘Golpi’ (3.68) and ‘Telpi’ (3.94). This pattern suggests that homorganic LT sequences are preferred. It is argued that the higher averages for ‘Golpi’ and ‘Telpi’ are due to minor or gradient violations of a constraint that requires a lateral and a following stop to be homorganic. This requirement for lateral-stop homogeneity is conceptualized as an extension of the well-known requirement for homorganic nasal-stop sequences, the CODA-COND markedness constraint, defined in (10).

- (10) CODA-COND: A nasal coda and a following stop must be homorganic.

It is argued here that the lower acceptability ratings for non-homorganic LT sequences are due to a special markedness constraint parallel to CODA-COND. The proposed constraint is provided in (11).

- (11) LAT CODA-COND: A lateral coda and a following stop must be homorganic.

The available data from this study also tested one stimulus with a nasal coda followed by a stop, *Banti* in stratum #4. However, to test the predictions of the CODA-COND as a TETU phenomenon in i-truncations, the score for *Banti* must be compared to NT (nasal-stop) sequences that are not homorganic. Under the assumption that both CODA-COND and LAT CODA-COND are active in German i-truncation processes, the prediction is that the non-homorganic NT sequences should be rated as less acceptable than homorganic NT sequence like in *Banti*. Further research is needed to test this hypothesis. It should be noted again that I am proposing that LAT CODA-COND is a gradient constraint that became apparent in this grammaticality judgment task. While this constraint does not rule out violating sequences as ungrammatical, it leads to slightly lower acceptability scores.

Under the hypothesis that CODA-COND is also active as a gradient constraint in i-truncation processes, the constraint is not predicted to rule out non-homorganic NT sequences, but to assign lower acceptability scores to them as compared to homorganic NT sequences, everything else being equal.

The LAT CODA-COND constraint formalizes why non-homorganic LT sequences have lower acceptability ratings than homorganic ones. However, the stimulus with the homorganic LT sequence, ‘Jolti’, is still rated higher than predicted by the syllable contact hierarchy. The previous markedness constraint (LAT CODA-COND) entails the abstract requirement that the lateral and the following stop be relatively similar to each other.

Another similarity requirement might also be involved in the relatively low acceptability score of ‘Jalti’. The two C’s in this LT sequence are similar in terms of place of articulation but not in terms of voicing. This observation suggests that another gradient markedness constraint is involved in the evaluation of i-truncations, which is violated by LT sequences that do not agree in voicing. As in the previous case, this pattern for LT sequences is similar to one of the constraints applicable to NC sequences in German i-truncations, the markedness constraint *NC_(-voice), defined in (12).

- (12) *NC_(-voice): No nasal plus voiceless obstruent sequences.

The hypothesis is that ‘Jalti’ has a (slightly) degraded acceptability score because its word-medial CC sequence violates the gradient constraint *LatC_(-voice), defined in parallel to *NC_(-voice), as shown in (13).

- (13) *LC_(-voice): No lateral plus voiceless obstruent sequences

Further evidence for this analysis is provided by a comparison of a near-minimal pair in the study. The average for the stimulus *Jalti* (in stratum #3), **3.32**, is higher than the average for the stimulus *Joldi* (in stratum #5), **2.97**. Both of these stimuli have a CC sequence in which a lateral is followed by a homorganic stop. However, in *Jalti*, the /l/ is followed by a voiceless stop, violating *LatC_(-voice), while the stimulus with the better rating, *Joldi*, does not violate this proposed constraint because the lateral is not followed by a voiceless stop (obstruent). These comparisons thus provide some corroborating evidence for a TETU phenomenon, in which the constraint *LatC_(-voice), which is not active in the general phonology of the German language, affects the acceptability judgments of i-truncations.

The various described requirements on lateral-obstruent (LC) sequences seem to aim for LC sequences that are neither too similar (this is the effect of the proposed constraint “OCP (coronal)”), nor too dissimilar (this is the effect of both LAT CODA-COND, and of *LT_(-voice)). These three constraints on LC sequences seem to conspire to yield LC sequences with a ‘balanced’ level of similarity between the two consonants. The similarity and dissimilarity requirements are based on the features manner, place, and voicing. So far, the available data suggest that LC sequences can be divided into the following two main groups: a) LC sequences in which a lateral is followed by an oral stop: here, similarity is required, both in terms of place of articulation and in terms of

voicing; and b) LC sequences in which a lateral is followed by anything except an oral stop: here, dissimilarity (OCP) is required, again both in terms of place of articulation and in terms of voicing. This analysis is summarized in Table 3, whereby “given” refers to the manner of articulation of the consonant (an oral stop in group *a*, and not an oral stop in group *b*). Further, ‘goal’ refers to the (dis)similarity requirements assigned to the place of articulation and to the voicing feature of the same consonant.

Table 3: The emergence of similarity and dissimilarity requirements on LC sequences in i-truncations

		Type of LC Sequence	
		C = oral stop	C ≠ oral stop
Given	Manner of C’s	L & C: rather different	L & C: rather similar
	Place of C’s	L & C: same	L & C: different
Goal	Voicing of C’s	L & C: same	L & C: different (predicted based on existing patterns)

Both of the constraints proposed above extend typical constraints for nasal-obstruent sequences to lateral-obstruent sequences. This analysis suggests that laterals and nasals must be similar. Corroborating evidence for the hypothesis that laterals and (coronal) nasals are similar comes from cross-linguistic data that show that /l/ and /n/ are in fact alike. First, syllable-contact cases involving an [l] and an [n] in Korean (in either order) lead to assimilated sequences, either [-n.n-] or [-l.l-]. This can be analyzed as an OCP constraint, which evades two adjacent consonants that are too similar to each other by assimilating them. Second, Pater (2010) makes reference to Yine syncope (based on Kisseberth 1970 and Malteson 1965) in which [ru] is an allomorph of [lu]. The examples suggest that the allomorph [ru] is chosen to avoid an [n] and an [l] in adjacent syllables: underlying [kakonu+lu] cannot surface as *[kakonulu] with the allomorph [lu], but must surface with the allomorph [ru]: [kakonru]. This data suggest an OCP effect involving [n] and [l]. Further research is necessary to confirm that the conditioning principle for allomorphy selection is indeed based on the presence of the nasal [n], but the available data strongly suggest this conclusion. These cases provide cross-linguistics evidence that laterals and (coronal) nasals are treated as similar sounds by the phonological grammar, and justify the extension of constraints that are typically used for nasal-obstruent sequences to lateral-obstruent sequences. Further research would be useful to look for similar cases of parallelism between laterals and nasals in other languages.

Interestingly, both NC and LC sequences were already known to have specific requirements in the formation of German i-truncations before the experiment (cf. §1). First, NC sequences in (3) were shown to require homorganicity (Féry 1997). Second, LC sequences in (4) were shown to behave inconsistently, sometimes permitting a word-medial consonant sequence and sometimes reducing the cluster to the first consonant. The above-stated analysis about lateral-obstruent sequences can now explain why the name *Volker* with the /lk/ sequence cannot be truncated to **Volki* (cf. (4c) above). The analysis developed based on the results in the nonce-word experiment suggests that lateral-(oral) stop sequences must agree in place of articulation and in voicing. Both requirements are not fulfilled by the impossible i-truncation **Volki*, since /k/ is not a coronal and is not voiced. Furthermore, the name *Wolfgang* can be truncated to *Wolfi*,

maintaining the /lf/ sequence (cf. (4a) above). Again, this can be accounted for by the analysis proposed above: the LC sequence in *Wolfgang* contains a lateral followed by an obstruent which is not an oral stop (group *b* in the table above). Hence, the requirement on this LC sequence is that its consonants do not agree in place of articulation or in voicing. Both of these requirements are fulfilled since /f/ is neither a coronal, nor voiced. The analysis of LC sequences has helped provide some insight into why *Wolfgang* can be truncated to *Wolfi*, although *Volker* cannot be truncated to **Volki*.

3.4 Heterosyllabic vs. tautosyllabic syllabification of consonant sequences

Although German phonology in general allows complex margins, and although i-truncations allow complex onsets in the first syllable, complex onsets are not allowed in the second syllable in i-truncations. The prediction was that German speakers would analyze word-medial CC sequences in i-truncations uniformly as coda-onset sequences rather than as complex onsets. This prediction is based on the general observation that i-truncations in German cannot have complex margins word-medially (no complex onsets in the second syllable, i.e. before the morpheme ‘-i’). For example, Standard German allows both /st/ and / and /ft/ sequences in syllable codas, but only /ft/ in syllable onsets. The i-truncation for “Knastinsasse” (prison inmate) is “Knasti” which cannot be pronounced with a /ft/ sequence: *[knafti], but only with a /st/ sequence: [knasti]. Since an /st/ sequence in syllable onset position must be pronounced as /ft/, this example (and others) provide clear evidence that word-medial CC sequences in i-truncations are not syllabified as complex onsets, but as coda-onset sequences. This single C-onset restriction in German i-truncations, which is not part of the general property of German, is another case of the emergence of the unmarked (TETU) (McCarthy & Prince 1994). Based on the finding that i-truncations do not allow complex onsets in medial position, it was predicted that a CC sequences in word-medial position would be analyzed as heterosyllabic sequences, both for the grammatical and ungrammatical strata, so as to not violate the single C-onset requirement specific to i-truncations.

The stimuli in the strata of the ungrammatical group (#9 through #14) all contain word-medial CC sequences with rising sonority. A closer look at the data in strata #12, #13, and #14 shows that those stimuli with CC sequences that can surface as complex onsets in word-medial position in German phonology (except in i-truncations) behave differently than those stimuli with CC sequences that cannot surface as complex onsets in German. In most cases, CC sequences that can occur as complex onsets in German in general have a lower average score than other stimuli in the same stratum. The stimuli in stratum #13 exemplify this: while ‘Butli’ and ‘Gesri’ have averages of 6.32 and 6.24 respectively, the averages of the two other forms, ‘Dafri’ (4.79) and ‘Tepli’ (5.68) are considerably lower. Importantly, the stimuli with the higher ratings have CC sequences that can never occur as a complex onset in German **/tl-/*, **/sr-/*. Conversely, all the stimuli in stratum #14 (*Datri*, *Pekri*, *Nopri*, *Gatri*), two stimuli in stratum #13 (*Dafri*, *Tepli*), and three in stratum #12 (*Pofli*, *Sapni*, *Nofli*) have a word-medial CC sequence that can occur either as a complex onset or as a coda C followed by an onset C in ‘standard’ German phonology. It is therefore argued that these stimuli with rising CC sequences that occur as complex onsets elsewhere in the language received lower numerical scores (showing greater acceptability) because participants analyzed them as complex onsets. Alternatively, it is plausible that different participants or even individual

participants varied between analyzing them as complex onsets and as coda-onset sequences.

Similarly, the stimulus ‘Datsi’ in stratum #9 is argued not to be a case of a coda-onset sequence. I am proposing that the stimulus is not analyzed as a coda-onset sequence ([dat.si]), unlike expected, nor as a complex onset ([da.tsi]), but rather as a simple onset with a complex segment, the affricate /t^s/: [da.t^si]. This analysis is supported by i-truncations such as ‘Franzi’ ([fran. t^si]) for the name ‘Franziska’. This i-truncation has a word-medial coda-onset sequence where the onset contains the complex segment [t^s]. The analysis of the affricate [t^s] as a complex phoneme in German is also presented in Wiese (1996:14, 261f).

These individual stimuli all have in common that their word-medial CC sequences were predicted to be analyzed as coda-onset sequences, when, at the same time, the remainder of the grammar (i.e. any syllable except for the word-final syllable in i-truncations) allows the same sequence of sounds to be analyzed and syllabified as complex onsets. The data from the online survey show that the stimuli with CC sequences that occur as complex onsets in other parts of the grammar usually have lower scores than the expected scores of their stratum level. It is therefore argued that the participants in this study assumed that these CC sequences do indeed constitute complex onsets, although this violates the constraint prohibiting complex onsets in word-medial position in i-truncations. (See the preliminary constraint NoComplMargin_{S(i-trunc)} in my OO-analysis of German i-truncations (Schuhmann, 2007, 2010).)

Speakers apparently prefer to violate the markedness constraint on complex margins rather than to violate constraints of the Syllable Contact hierarchy, at least for those CC sequences that are allowed as complex onsets in the overall German phonology. While the single C-onset restriction in these nonce-name i-truncations seems to be weaker than in regular i-truncations, the syllable contact restrictions do not seem to be weaker in these nonce-name i-truncations than in regular i-truncations. Under this analysis, the participants arguably did not analyze the critical consonant sequences as heterosyllabic. This coherent group of stimuli was therefore excluded from the overall analysis of the syllable contact data, because tautosyllabic sequences do not fall under the predictions of syllable contact requirements.

4 Discussion

This study was conducted to test the hypothesis that decreasing unmarkedness and increasing markedness in syllable contact sequences is mirrored by different degrees of acceptability and unacceptability in a grammaticality judgment task with nonce-names and their corresponding i-truncation nicknames. The adjusted averages of the individual strata show a clear upward trend between strata #4 and #16 (excluding stratum #8), with the exception of stratum number #7. In other words, the results of the adjusted averages for the five strata in the ungrammatical group show a steady upwards trend: strata with more marked ungrammatical syllable contact sequences are rated as worse than strata with less marked but still ungrammatical syllable contact sequences. The results of the adjusted averages for the four strata in the grammatical group also show a trend, although the pattern is not as robust: the results for stratum #7 do not show the predicted pattern of the trend, and it is not clear what might have caused this, except for the fact that the average of this stratum is based on the data of a single stimulus. Although the differences

between adjacent strata are very small, it is argued that the trend is nonetheless apparent. These findings support the hypothesis that the level of markedness in syllable contact is the driving force in the formation of i-truncations and is further reflected in different degrees of acceptability and unacceptability.

The results of this study provide clear evidence for emergent markedness effects for syllable contact restrictions in German i-truncation nicknames. This finding is particularly intriguing in light of recent discussions about learnability questions of formal models of phonological grammar and proposed constraints. German phonology does not usually restrict the type of syllable contacts allowed, except in i-truncations. The acceptability judgments of German speakers yielded different degrees of unacceptable i-truncation nicknames, as well as different degrees of acceptable i-truncation nicknames. These acceptability ratings reflect the stimuli's level of markedness (in syllable contact), which normally does not play a role in general German phonology. The results therefore provide evidence for the inherent status of syllable contact markedness. In other words, the responses of the participants in this survey reveal markedness effects that speakers could not have learned or inferred from their German lexicon, or the general phonological input in their environment. Rather, the responses of the participants in this survey provide evidence that German speakers have access to universal markedness specifications, which influence their decision about how (un)acceptable individual i-truncation nicknames are. This finding is in line with recent research supporting the conclusion that speakers are inherently aware of the markedness levels of different structures (e.g. Berent et al. 2007, Davidson 2000). Despite ubiquitous frequency effects and the results of statistical learning etc., there is also ample evidence that speakers have "universal grammatical preferences" (Berent et al. 2007:598). The results of the reported nonce-word experiment investigating the effects of the Syllable Contact Hierarchy provide corroborating support for this conclusion.

5 No Frequency Effects

Recent research has revealed evidence for the influence of various types of frequency effects on phonological properties or word-likeness ratings (e.g., Frisch 1996, Bailey & Hahn 2001, Zuraw 2009). In light of the increasing number of reported cases of frequency effects, it seems worthwhile to try to establish, if possible, whether frequency effects could also account for the results of the nonce-word experiment reported above. In order to test whether the gradient wellformedness judgments could be explained as frequency effects, we calculated the frequency of the tested syllable contact sequences. If the gradient wellformedness judgments of the experiment could be explained as effects of frequency, sequences of higher frequency should be more acceptable, and conversely, sequences of lower frequency should be less acceptable. This means that smaller numbers on the acceptability scale – which indicate higher acceptance ratings – should correlate with higher frequencies of the relevant sequences. We calculated the (type) frequencies of the tested syllable contact sequences using the German CELEX database. The frequency results are shown in Figure 7.

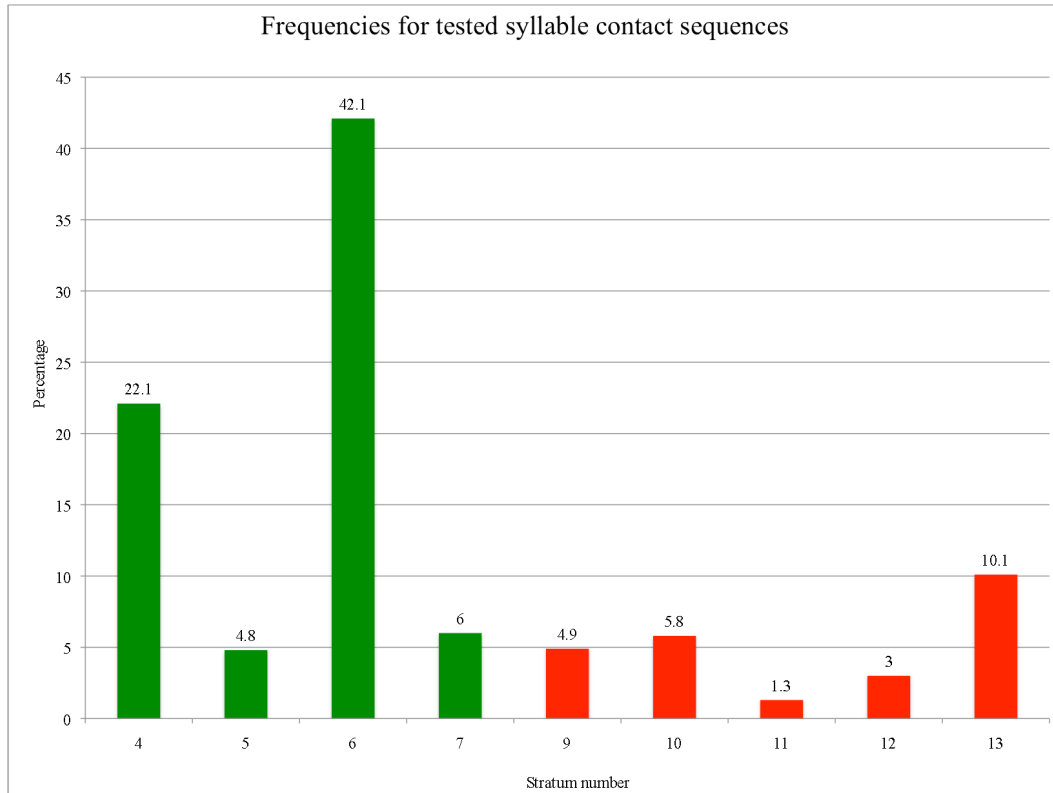


Fig. 7. Bar graph of the frequency calculations for the tested syllable contact sequences using the German CELEX database. The four green bars on the left-hand side represent the grammatical group of strata, whereas the five red bars on the right-hand side represent the ungrammatical group of strata.

The results of the frequency calculations for the tested syllable contact sequences as shown in Figure 7 clearly do not correlate with the scalar grammaticality judgments revealed in the experiment described above ($r_s = -0.49$, *n.s.*). If there was in fact a correlation between the frequency results and the grammaticality judgments, we would expect the frequency results in Figure 7 to steadily decline from higher to lower frequencies. The non-existent correlation between frequency effects and the gradient grammaticality judgments suggests that the scalar wellformedness judgments of syllable contact sequences in German i-truncations are not based on frequency effects.

6 Conclusion

This study on German i-truncation forms reveals multiple TETU (The Emergence of The Unmarked) effects (McCarthy & Prince 1994). Besides the emergent syllable-contact restrictions, which are at the heart of this investigation, the nonce-word experiment also provided data about lateral-obstruent restrictions (analyzed as similarity and dissimilarity (OCP) requirements), OCP restrictions on two consonants that agree in manner, as well as different syllabification strategies for word-medial CC sequences.

The reported grammaticality judgment task was conducted to test the hypothesis that grammar does not only define which syllable contact forms are acceptable and which are unacceptable, but that grammar also defines different degrees of acceptability and unacceptability. Indeed, the results of the nonce-word experiment revealed different

degrees of (un)acceptability of German i-truncation nicknames, which can be accounted for by the degree of (un)markedness displayed at the level of syllable contact. The results are particularly intriguing since the markedness of consonant sequences in syllable contact positions does not otherwise appear to play a role in the phonology of German. The fact that the acceptability judgments reveal subtle markedness effects of syllable contact sequences, which could not have been inferred from the German phonological grammar, from the lexicon, or from frequency effects, strongly suggests that German speakers have inherent knowledge about markedness relationships.

Appendix I.A: List of stimuli (used in the web-based survey)

Strata of stimuli	Stimuli (nickname)	Full stimuli (name)
2	Purki	Purkatje
7	Purli	Purlatje
2	Ferpi	Ferpada
7	Ferli	Ferlada
3	Jalti	Jaltomis
6	Jalwi	Jalwomis
3	Golpi	Golpander
6	Golwi	Golwander
4	Jolsi	Jolsenke
5	Joldi	Joldenke
4	Banti	Bantedor
5	Bansi	Bansedor
2	Larti	Lartedor
3	Bersi	Bersatje
4	Terdi	Terdomis
5	Murwi	Murwada
6	Jundi	Jundenke
7	Dafti	Daftander
14	Gatri	Gatromis
2	Garti	Gartomis
3	Telpi	Telpada
13	Tepli	Teplada
4	Nolfi	Nolfander
12	Nofli	Noflander
11	Kesni	Kesnatje
5	Kensi	Kensatje
10	"Senri"	"Senredor"
6	Serni	Sernedor
7	Valni	Valnenke
9	Vanli	Vanlenke
9	Datsi	Datsander
14	Datri	Datrander
9	Pelri	Pelrada
14	Pekri	Pekrada
10	Danri	Danrenke
13	Dafri	Dafrenke
10	Geswi	Geswatje
13	Gesri	Gesratje
11	Pofni	Pofnedor
12	Pofli	Pofledor
11	Fusni	Fusnomis

12	Futni	Futnomis
9	Mafdi	Mafdomis
10	Sukbi	Sukbada
11	Dakwi	Dakwander
12	Sapni	Sapnatje
13	Butli	Butledor
14	Nopri	Noprenke
8	Tassi	Tassedor
8	Seggi	Seggomis
8	Letti	Lettatje
8	Palli	Pallenke
8	Sakti	Saktedor
8	Tefsi	Tefsomis
8	Butki	Butkatje
8	Lusfi	Lusfenke

Appendix I.B: List of stimuli (in the order used for the experiment)

Order	Strata of stimuli	Stimuli (nickname)	Full stimuli (name)
1	4	<i>Nolfi</i>	<i>Nolfander</i>
2	12	<i>Nofli</i>	<i>Noflander</i>
3	7	Dafti	Daftander
4	3	Jalti	Jaltomis
5	12	Sapni	Sapnatje
6	5	Bansi	Bansedor
7	4	Banti	Bantedor
8	9	Datsi	Datsander
9	11	Fusni	Fusnomis
10	12	Futni	Futnomis
11	5	Joldi	Joldenke
12	<i>'security question' (10)</i>		
13	14	Nopri	Noprenke
14	11	Pofni	Pofnedor
15	8	Tassi	Tassedor
16	3	Bersi	Bersatje
17	2	Ferpi	Ferpada
18	7	Ferli	Ferlada
19	10	Sukbi	Sukbada
20	10	"Senri"	"Senredor"
21	6	Serni	Sernedor
22	12	Pofli	Pofledor
23	8	Sakti	Saktedor
24	10	Danri	Danrenke
25	8	Palli	Pallenke

26	14	Pekri	Pekrada
27	9	Pelri	Pelrada
28	<i>'security question' (1)</i>		
29	2	Larti	Lartedor
30	6	Golwi	Golwander
31	3	Golpi	Golpander
32	11	Dakwi	Dakwander
33	13	Butli	Butledor
34	8	Tefsi	Tefsomis
35	4	Jolsi	Jolsenke
36	6	Jalwi	Jalwomis
37	7	Purli	Purlatje
38	10	Geswi	Geswatje
39	13	Gesri	Gesratje
40	14	Datri	Datrandor
41	14	Gatri	<i>Gatromis</i>
42	2	Garti	<i>Gartomis</i>
43	3	Telpi	Telpada
44	8	Butki	Butkatje
45	13	Dafri	Dafrenke
46	11	Kesni	Kesnatje
47	8	Letti	Lettatje
48	2	Purki	Purkatje
49	13	Tepli	Teplada
50	<i>'security question' (9)</i>		
51	6	Jundi	Jundenke
52	9	Vanli	Vanlenke
53	8	Lusfi	Lusfenke
54	5	Kensi	Kensatje
55	8	Seggi	Seggomis
56	4	Terdi	Terdomis
57	9	Mafdi	Mafdomis
58	5	Murwi	Murwada
59	7	Valni	Valnenke
60	<i>question about "r"</i>		

Appendix II.A: Snapshot of Website <<http://deutschexperiment.googlepages.com/home>>

DeutschExperiment - Herzlich Willkommen!

<http://deutschexperiment.googlepages.com/home> Google

Herzlich Willkommen!

Das ist die Webseite für unser Experiment mit Deutschen Spitznamen

*****Hier kannst Du 25 Euro gewinnen!*****

Was Du dafür tun musst? Einen Online Fragebogen ausfüllen. Es geht um Spitznamen im Deutschen und Deine sprachliche Intuition.

Voraussetzungen:

- Du must Deutsch als Muttersprache sprechen und mindestens 18 Jahre alt sein.
- Du solltest ca. 15-20 Minuten freie Zeit haben um diesen Fragebogen an einem Stück konzentriert ausfüllen zu können.
- Du bist bereit, am Ende der Umfrage Deinen Namen und Deine Email Adresse preiszugeben.
- Du solltest den Fragebogen **so bald wie möglich** ausfüllen.

Ist doch gar kein schlechter Deal, oder?

Und falls Du nicht der/die Glückliche sein solltest, der bei der Verlosung gewinnt, vielleicht reicht es ja schon zu wissen, dass Du uns mit Deiner Teilnahme einen grossen Gefallen tust!

[Klick hier um zum Online Fragebogen zu kommen](#)

Vielen Dank für Deine Hilfe!

webmaster: DeutschExperiment@gmail.com
Fragen und Anregungen richten Sie bitte an DeutschExperiment@gmail.com. Vielen Dank!

Appendix II.B: Snapshot of a sample page of web-survey

Experiment - FormSpring

https://www.formspring.com/forms/?246775-XyYf0gyuxA

1. Wie gut oder wie schlecht hört sich der folgende Spitzname für den dazugehörigen Phantasienamen für Sie an?

NOLFI für NOLFANDER

Bitte geben Sie Ihre Antwort gemäss der folgenden Skala an, wobei "1" für "sehr gut" und "10" für "sehr schlecht" steht.

1 2 3 4 5 6 7 8 9 10

sehr gut ----- gut ----- schlecht ----- sehr schlecht

(Freiwilliger zusätzlicher Kommentar:)

References

- BAILEY, TODD M. and ULRIKE HAHN. 2001. "Determinants of wordlikeness: Phonotactics or lexical neighborhoods?" *Journal of Memory and Language* 44:568-591.
- BERENT, IRIS; DONCA STERIADE; TRACY LENNERTZ; and VERED VAKNIN. 2007. "What we know about what we have never heard: Evidence from perceptual illusions." *Cognition* 104:591-630.
- BERENT, IRIS, and TRACY LENNERTZ. 2008. What we know about what we have never heard before: Beyond phonetics. Reply to Peperkamp. *Cognition* 104:638-643.
- CELEX German database (Release D25) [On-line]. (1995). Available: Nijmegen: Centre for Lexical Information [Producer and Distributor].
- COETZEE, ANDRIES W. 2004. *What it means to be a loser: Non-optimal candidates in Optimality Theory*. Ph.D. Dissertation, University of Massachusetts, Amherst.
- COETZEE, ANDRIES W. 2006. "Variation as accessing 'non-optimal' candidates." *Phonology* 23:337-385.
- COETZEE, ANDRIES W. 2008. "Grammaticality and ungrammaticality in phonology: *Language* 84:218-257.
- DAVIDSON, LISA. 2000. "Experimentally uncovering hidden strata in English phonology." *Proceedings of the 22nd annual conference of the Cognitive Science Society*, ed. by L. Gleitman & A. Joshi. Mahwah, NJ: Lawrence Erlbaum Associates.
- FÉRY, CAROLINE. 1997. "Unis und Studis: die besten Wörter des Deutschen." *Linguistische Berichte* 172:461-489.
- FRISCH, STEFAN. 1996. *Frequency and similarity in phonology*. Ph.D. Dissertation, Northwestern University, Evanston.
- GOUSKOVA, MARIA. 2004. "Relational hierarchies in OT: The case of syllable contact." *Phonology* 21:2:201-250.
- HAYES, BRUCE P. 1998. "Gradient well-formedness in Optimality Theory." *Optimality Theory: Phonology, Syntax, and Acquisition*, ed. by Joost Dekkers, Frank van der Leeuw and Jeroen van der Weijer, 88-120. Oxford University Press.
- HAYES, BRUCE and WILSON, COLIN. 2008. A Maximum Entropy Model of Phonotactics and Phonotactic Learning. *Linguistic Inquiry* 39:3:379-440.
- ITÔ, JUNKO, and ARMIN MESTER. 1997. "Sympathy Theory and German truncations." *Proceedings of the Hopkins Optimality Workshop/Maryland Mayfest 1997. University of Maryland Working Papers in Linguistics* 5, ed. by Viola Miglio and Bruce Moren, 117-138.
- KISSEBERTH, C. (1970). "The treatment of exceptions." *Papers in Linguistics* 2:44-58. "LAUT-BUCHSTABEN-ZUORDNUNG KONSONANTEN." *Canoo.net: Free online German language resources*. 24 February 2008. <[http://www.canoo.net/services/GermanSpelling/Amtlich/LautBuchst/pgf32.html?MenuId=OfficialSpelling1_016](http://www.canoo.net/services/GermanSpelling/Amtlich/LautBuchst/pgf32.html?Me nuId=OfficialSpelling1_016)>.
- MATTESON, E. (1965). *The Piro (Arawakan) language*. Berkeley: University of California.
- MCCARTHY, JOHN J, and ALAN PRINCE. 1994. "The Emergence of the Unmarked: Optimality in prosodic morphology." *Proceedings of the North East Linguistics Society* 24, ed. by Mercè González, 333-79. Amherst, MA: GLSA.
- MORETON, ELLIOTT. 2002. Structural constraints in the perception of English stop-sonorant clusters. *Cognition* 84:55-71.
- PATER, JOE. 2010. "Morpheme-specific phonology: Constraint indexation and

- consistency resolution.” *Phonological argumentation: Essays on evidence and motivation*, ed. by Steve Parker, pp. 123-154. London: Equinox.
- SCHUHMAN, KATHARINA. 2007. *The Phonology of German I-Truncations*. Ms. Stony Brook University.
- SCHUHMAN, KATHARINA. 2010. “An OO-Analysis of German I-Truncations.” *eLanguage: LSA Meeting Extended Abstracts 2010*.
<http://elanguage.net/journals/index.php/lsameeting/article/view/505>
- WIESE, RICHARD. 1996. *The Phonology of German*. Oxford: Clarendon Press.
- ZURAW, KIE. (2009). “Frequency influences on rule application within and across words.” *Proceedings of CLS (Chicago Linguistic Society)* 43.