# The Realisation of /r/ in Swiss German and Austrian German

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## ABSTRACT

Rhotics are generally believed to be phonetically heterogeneous. Ladefoged and Maddieson [11, pg 245] stated that the only true unity of rhotics "seems to rest mostly on the historical connections between these subgroups and on the choice of the letter 'r' to represent them all". However, there are some generalizations to be made for all r-sounds regarding phonological behaviour, phonotactic properties, and synchronic and diachronic alternations [12, 1, 27]. For German /r/ realisation a large segmental variation has been described in the literature leading some authors to conclude that a positive description of the German phoneme /r/ does not make sense [10]. /r/ produced by German speakers has previously been described in comprehensive corpora and /r/ was found to have undergone dramatic changes. An investigation carried out in the early 1970s showed that /r/ in the syllable rhyme was realised most frequently as a trill or a fricative. More recent studies have shown that /r/ was realised mainly as rhotacized vowels (or vocalised /r/ terms here used synonymously) [24]. The present paper (i) provides evidence that the process of /r/vocalisation is independent of regional variation and spreads from the north to the south in the German speaking countries in Central Europe and (ii) investigates the allophonic alternation of trills and taps and their interaction with prosodic structure using cross-varietal data from two standard varieties (henceforth SV) of German spoken in Switzerland and Austria.

## 1. INTRODUCTION

Rhotics (or /r/-sounds) vary greatly including variable manners and places of articulation. Rhotics are described as trills, fricatives, approximants, taps/flaps, and vocalised /r/, however, not without controversy e.g. about fricatives [7, 26]. Rhotics are also produced in several different places throughout the vocal tract e.g. coronal and dorsal. However, fundamental questions regarding class membership of rhotics from a phonetic and/or phonological perspective remain unanswered despite a dense body of studies concerned with /r/-sounds in many different languages. Hitherto, no common articulatory, acoustic or auditory phonetic property has been found to distinguish rhotics as a group from other sound classes. A relatively large number of studies have shown a low F3 to be characteristic of many rlike sounds, however, this is not the case for the entire set of what we presently believe to be rhotics [12, 11]. In the attempt to provide evidence to show that rhotics behave phonologically, like a natural class similarities were found with respect to the phonotactic positioning of /r/ in consonant clusters. This allows languages, syllabic variants of generally non-syllabic /r/, synchronic and diachronic alternates and phonological constrains to /r/ to be applied without being limited to a specific type of /r/ [27]. These generalizations in co-occurrence with the inability to formulate a segmental phonetic definition remain a paradox. A solution to the paradox has been proposed by Wiese [27] who classifies rhotics on the basis of phonotactic properties and more specifically with respect to their location on the sonority scale. A definition of /r/-sounds on the base of prosody and/or phonotactics would resolve the problem of the large scale segmental variation.

## 2. /r/-REALISATION IN GERMAN

The realisation of /r/ in standard German has undergone dramatic changes within the last century, noticeable for many speakers of German in their own or public speech. In the beginning of the previous century /r/-sounds were predominantly realized (prescribed and described) as alveolar trills [r] [16]. In the second half of the 20th century a transition took place towards the realisation of an uvular fricative [s] or approximant [s] (applying the IPA symbol for the uvular fricative and modifying it using the diacritic',' to lower the fricative which in turn results in the realisation of an approximant) [3, 23]. However, it goes without saying that almost the entire range of known /r/ variants can be found in the German regional varieties. In comprehensive investigations of the phonetics of /r/-sounds in German [e.g. 6] within regional varieties and within the standard variety [e.g. 23] a large number of variants was described. Previous descriptions of /r/-realisations in Austrian German (henceforth AG) and Swiss German (henceforth SG) mainly provide hypothetical statements. Most authors agree that in AG consonantal /r/-sounds are realized as trills [14].In [20] both, apicoalveolar [r] and uvular trills [R] are described as the norm whereas in [21] (the Austrian extension of [16]) only apicoalveolar articulation of /r/ was permitted. Vocalic realisations or deletions of phonetic content of /r/ were previously described for AG [e.g. 13, 15, 5], however, generally without empirical verification. Previous studies in SG /r/ showed a large variability of possible realisations [8]. Using a distinction with respect to the phonotactics and the duration of the syllable nucleus preceding the /r/-sound this study shows that generally in SG trilled realisations of /r/sounds prevail except in /r/ following long vowels where [J] produced most frequently. Nonetheless, was the apicoalveolar trill was still realized in 34% of the targets.

Saarbrücken, 6-10 August 2007

Interestingly, SG norms do not allow vocalized realisations only apicoalveolar and uvular trills are permitted. Additionally, in coda position fricatives are allowed. According to codifications and descriptions of AG vocalized /r/-sounds are characterised as 'vernachlässigte' ('neglected') /r/-realisations and do not correspond to a standard pronunciation [21]. In contrast, German norms [e.g. 19] allow for rhoticised vowels in /r/-realisations following long vowels and in unstressed affixes. Their occurrence is documented in the literature since the beginning of the 20th century [25]. (Note that the discussion of prescriptive and descriptive norms and codifications is currently debated in sociolinguistic studies dealing with German standard variation [e.g. 4]). The present study aims to provide evidence that previously found changes in the pronunciation of /r/ are not limited to the standard variety spoken in Germany but can be found in the present-day SG and AG standard varieties. The hypotheses for the present following: Cross-linguistic investigation are the characteristics in the /r/-realisations in SG and AG standard varieties remain limited to the consonantal correlates of /r/. The realisation of rhoticised /r/-sounds is evident in SG and AG which in turn implies a demand for changes in the descriptive codification of the pronunciation of /r/ in the SG and AG standard varieties. The second part of the study addresses issues of allophonic variation. Trills and taps have been found in both varieties and evidence will be provided that instead of being random this alternation is triggered by prosodic structure.

#### 3. MATERIAL & METHOD

The analysis is based on directly comparable cross varietal data produced by SG and AG newsreaders. The material consists of read speech produced by an equal number of five male newsreaders per variety. In total ten SG and AG speakers read the same text: eleven news messages. The recordings were carried out on DAT in sound proof cabins of the Swiss German and Austrian German public broadcasting agencies DRS, SFDRS, and ORF. The material was subsequently digitised at a sampling rate of 16kHz, 16 bit, mono format. The transcription was carried out by two German, one SG and one AG trained phoneticians with a high level of inter-transcriber agreement. The following realisations were found in the present data: [r] apicoalveolar trill; [R] uvula trill; [r] apicoalveolar flap (or tap);  $[R^1]$  uvula tap; [1] apicoalveolar approximant; [1] voiced uvular fricative;  $[\chi]$  voiceless uvular fricative;  $[\chi]$  voiceless velar fricative; [y] voiced velar fricative; [y] diphthongal realisation of Vr; [v] monophthongal realisation of Vr; [v] voiced uvular approximant; [0] /r/-elision (no auditory or acoustic cues). The /r/ realisations were organized using an adaptation of Ulbrich's categories [23]. However, the /r/-realisations in onset position (word, syllable and consonant cluster) did not show different patterns in either the SG or the AG variety and were therefore summarised (see Fig.1).

Fable 1: Grouping and number of /r/ re	ealisation
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group	description
1	Word onset (7), syllable onset (13), onset in conconnet dustar (10)
	in consonant cluster (19)
2a	Coda following short vowels (9)
2b	Coda in unstressed prefixes (8)
2c	Coda in unstressed suffixes (12)
3a	Coda in pluri-syllabic words following long vowels except [a] (9)
3b	Coda in mono-syllabic words following
	long vowels except [a] (11)
3c	Coda following [a] (9)

### 4. **RESULTS**

The present analysis revealed cross-varietal differences in the /r/- realisation in onset position. In both, SG (illustrated in white columns) and the AG (illustrated in white columns) consonantal /r/-patterns were found to prevail. In coda position however, a similar tendency towards vocalized /r/- realisations was found.

#### 4.1. /r/ in onset position

Cross-varietal differences between the two groups of speaker were found mainly in the place of articulation. Whilst both groups of speakers realised the majority of onset /r/ as trill (and taps); the place of articulation differed significantly ( $F_{(1:9)} = 4,32$ ; p<.05). SG speakers preferred the apicoalveolar place of articulation whereas AG speakers mainly realised onset /r/ in the uvular place of articulation. Also, AG speakers produced noticeably more fricatives than Swiss speakers.

Figure 1: /r/-realisations in onset position (%)



## 4.2. /r/ in coda position

Following short vowels in coda position, /r/ was mostly realised as [g] by SG and AG speakers (Fig. 2). A relatively large number of targets in this position were produced as a consonantal variant of /r/. More than 25% were realised as an apicoalveolar tap by SG speakers. An apicoalveolar trill was realised in 12%. Monophthongal vocalised variants were produced in 15%. For AG speakers more than 10% of the targets were transcribed as deleted. Additionally, a relatively large variety of consonantal variants in that position was found, showing a preference for the realisation of uvular variants.

Figure 2: syllable coda following short vowel



The realisation of r/ in coda position of unstressed prefixes and suffixes was found to be nearly identical in both groups of speakers. Fig. 3 summarises those results. The realisation patterns of /r/ following long vowels were found to be independent of the syllable number of the target word. Fig. 4 summarises the results for group 3a and 3b, initially considered in [23]. In unstressed affixes both groups of speakers realized the majority of the target /r/ as a rhoticised monophthongal vowel (60% AG; 80% SG). The AG data, however, showed a relatively large proportion of diphthongal /r/-realisations (20%) and consonantal /r/ variants (20%) with a large intra-speaker variation. The realisation patterns in coda position following long vowels (Fig. 4 and Fig 5) are not as conclusive as the results reported for the previous categories. A preference was found in both groups of speakers for a vocalized realisation of /r/. Nonetheless, SG as well as AG groups showed a large intraspeaker variation in the realisation of consonantal variants.

Figure 3: syllable coda in prefixes and suffixes (%)



Manners and places of articulation varied strongly within and across subjects. Although this is more evident in the SG data compared to the AG data, especially following long vowel [a:]. In both groups only 20% of the analysed targets were produced with a monophthongal vocalized [v]. In 20% of the AG and 30% of the SG data /r/ was described as deleted. Comparing /r/ in coda position, following long [a:] the largest amount (<50%) of consonantal /r/ variants was produced by both SG and AG data.

# 4.3. Trill and tap alternation

The following section deals with the analysis of the alternation between trill and tap variants. The speakers of the two varieties alternated between a trill and its weakened (or hypoarticulated) variant, a tap. The alternation appears consistent across the two varieties except that the place of articulation varies. In the literature similar alternations were

described e.g. in Brazilian Portuguese and were found to be triggered by prosodic structure [17].

Figure 4: syllable coda following long vowel (except [a])



Figure 5: syllable coda following long vowel [a]



This part of the study focuses on the /r/-realisations in onset since only in this position it was consistently produced as a consonantal variant. 40 tokens per speaker were analysed. Two hypotheses were formulated:

1. [r] is realised in accented syllables; [r] is realised in unaccented syllables

2. [r] is realised before strong prosodic boundaries; [r] is realized before weak prosodic boundaries

For the analysis all syllables containing /r/ in onset position were prosodically annotated using the autosegmental framework [2]. Thereby accented syllables, their tonal patterns, their degree of prominence, and their position regarding prosodic boundaries were annotated. The annotation of prosodic boundaries follows the ToBI system allowing for a differentiation of boundary strength [18]. Two correlation analyses were carried out. The results of the first correlation analysis showed that the choice of the consonantal /r/ variant is positively correlated to the accentuation of the target word (r=0.86, p<.05). The second correlation analysis showed that hierarchically higher (stronger) prosodic boundaries trigger the realisation of hyperarticulated trilled /r/-sounds (r=0.69, p<.05). In clitic groups (BI 0) and phrasemedial word boundaries (BI 1) tapped /r/-realisations prevailed. At intermediate or full Intonational Phrase boundaries trilled /r/- realisation were produced in the majority. These results were found crossvarietal and the intra-speaker variation was small. For BI 2 boundaries (disjuncture marked by a pause or virtual pause OR tonally marked) a less clear cut result was obtained; trilled and tapped variants overlapped in the realisation for most speakers independent of their origin.

#### 5. SUMMARY

Cross-varietal differences in the /r/-realisation between SG and AG are most significant in onset position which in turn implies the realisation of the consonantal /r/ variants. Both groups of speakers realized exclusively consonantal variants in the word, syllable and onset consonant cluster position. The manner of articulation was comparable to a certain extent. Mainly trills were produced but also a relatively high proportion of taps which can be interpreted as their weakened variants. However, while SG speakers produced apicoalveolar trills and taps, AG speakers produced uvular trills and taps. A relatively large proportion of fricatives were also found in the AG data. In coda position both groups of speakers produced mainly vocalized variants of /r/ with the exception of /r/ following long vowel. Here, a relatively large number of realisations were found to be consonantal but they showed large intra- and inter-speaker variation.

The relatively large number of fricative realisations in AG involves a process of posteriorisation of trills towards fricatives which has been reported for a number of other languages [9] and the German variety [24]. Previous investigations of /r/ have taken into consideration that the great range of possible pronunciations of /r/ documented for different languages might be conditioned by the syntaxprosody interface rather than being purely allophonic variation as traditionally assumed. The tap/trill alternation in both groups of speakers was found to be the result of the influence of prosodic boundary strength and accent realisation. However, this needs to be followed up using a more carefully designed corpus allowing for more controlled data especially regarding the interaction with other prosodic factors such as phrase final lengthening. Additionally, the question of acoustic, auditory and articulatory correlates of /r/ needs to be addressed. In the present study some /r/realisations have been described as deleted in coda position. However, no minimal pair comparison has been carried out (due to corpus limitations) to examine durational aspects (e.g.  $\langle ia \rangle$  vs  $\langle Jahr \rangle$  = yes vs. year). Lastly, the results remain limited to the population chosen for the present study. A broader investigation needs to address whether these results have broader validity for 'Swiss German' or 'Austrian German' generally.

#### 6. **REFERENCES**

- [1] Barry, W. J. 1995. Schwa vs. Schwa + /r/. Phonetica 52, 228-235.
- [2] Beckman, M.E. / Pierrehumbert, J.B. (1986), Intonational structure in Japanese and English. *Phonology Yearbook 3*, 255-309.
- [3] Boor, H. de/Moser, H./Winkler, C. (eds.) 1969. Siebs Deutsche Aussprache. Reine und gemäßigte Hochlautung mit Aussprachewörterbuch. Berlin. de Gruyter.
- [4] Clyne, M. 1995. The German Language in a Changing Europe, Cambridge. CUP.
- [5] Ebener, J. 1989. Österreichisches Deutsch ein Thema für die Didaktik. In: ide. Informationen zur Deutschdidaktik. Zeitschrift für den Deutschunterricht in Wissenschaft und Schule 2. Wien, 88-98.

- [6] Göschel, J. 1971. Artikulation und Distribution der sogenannten Liquida r in den europäischen Sprachen. In: Indogermanische Forschungen 76, 84-126
- [7] Hall, T. A. 1997. *The Phonology of Coronals*. Amsterdam, Philadelphia. John Benjamins.
- [8] Hove, I. 1999. Die Aussprache der Standardsprache in der deutschen Schweiz. PhD-Diss. University Freiburg.
- [9] Kavitskaya, D. 1997. Aerodynamic constraints on the production of palatalized trills: the case of the slavic trilled [r], in *Proc of Esca. Eurospeech97. Rhodes, Greece:* 751-754.
- [10] Kohler, K. J. 1995<sup>2</sup>. Einführung in die Phonetik des Deutschen. Berlin. Erich Schmidt Verlag.
- [11] Ladefoged, P./ Maddieson, I. 1996. Sounds of the World's Languages. Oxford. Blackwell.
- [12] Lindau, M. 1985. "The story of /r/." In: Victoria A. Fromkin, (ed.). *Phonetic Linguistics*. Academic Press: 157-168.
- [13] Lipold, G. 1988. Die österreichische Variante der deutschen Standardaussprache. In: P. Wiesinger (Ed.): Das österreichische Deutsch. Wien, Schriften zur deutschen Sprache in Österreich. Böhlau. Vol.12. 31-54.
- [14] Moosmüller, S. 2002. Der Stellenwert der phonologischen und phonetischen Variation in der Sprechererkennung. In: A. Braun; H.R. Masthoff: Phonetics and its Applications. ZDL, Vol. 121. Stuttgart, 97-109.
- [15] Muhr, R. 2002. Österreichisches Sprachdiplom Deutsch. Materialien und Handbücher zum österreichischen Deutsch und zu Deutsch als Fremdsprache. Hölder-Pichler-Tempsky. Vol. 4. 27-53.
- [16] Siebs, T. (1900): Grundzüge der Bühnenaussprache. Berlin, Köln, Leipzig.
- [17] Silva, A. H. P. / Albano, E. 1999. Brazilian Portuguese rhotics and the phonetics/phonology boundary. Proc. of the XIVth ICPhS 99, San Francisco. 2211-2214.
- [18] Silverman, K., Beckman, M., Pitrelli, J., Ostendorf, M., Wightman, C., Price, P., Pierrehumbert, J., & Hirschberg, J. 1992. TobI: a standard for labeling English prosody. *Proc.of the ICSLP* (pp. 867–870). Banff, Canada.
- [19] Stötzer, E. (Ed.). 1982. GWdA ,Großes Wörterbuch der deutschen Aussprache'. Leipzig: Bibliograph. Institute.
- [20] Takahashi, H. 1996. Die richtige Aussprache des Deutschen in Deutschland, Österreich und der Schweiz nach Maßgabe der kodifizierten Normen. Frankfurt/M., Duisburger Arbeiten zur Sprach- und Kulturwissenschaft. Vol. 27.
- [21] Trojan, F. 1957. Österreichisches Beiblatt zu Siebs Deutsche Hochsprache - Bühnensprache. Wien.
- [22] Ulbrich, C. 2005. Phonetische Untersuchungen zur Prosodie der Standardvarietäten des Deutschen. In: Hallesche Schriften zur Sprechwissenschaft und Phonetik, Vol. 16. Frankfurt/M. Peter Lang.
- [23] Ulbrich, H. 1973. Zur Kodifizierung der R-Aussprache im Siebs. In: Zeitschrift f
  ür Phonetik, Sprachwissenschaft und Kommunikationsforschung 26, 120-133.
- [24] Ulbrich, H. 2002. R-Aussprache 1966 und 1996 stabile und instabile Realisierungsmodi. In: Jonach, I. (Ed.): Sprache und Sprechen, Vol. 34. München, Basel, 143-152.
- [25] Viëtor, W. (1901). Kleine Phonetik des Deutschen, Englischen, und Französischen. Leipzig: O. R. Reisland.
- [26] Walsh Dickey, L. 1997. *The Phonology of Liquids*. Ph.D. Diss. Dep. of Linguistics, University of Massachusetts.
- [27] Wiese, R. 2003. The unity and variation of (German) /r/. Zeitschrift für Dialektologie und Linguistik, 25-43.