# 2 Different adjustment to English intonation by Northern and Southern German speakers: Comments on Atterer and Ladd (2004)

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## *Abstract*

Atterer & Ladd's 2004 study on segmental anchoring in German prenuclear rises is based on two separate experiments using a German and an English reading task. A joint data set from both experiments shows an interaction between the factors "Speaker Group" and "Reading Task" which has not been accounted for in the authors' article: Southern German speakers adjust their intonation to the target language English, Northern German speakers do not. Thus, the difference between the German and the English pronunciation of prenuclear rises seems to be processed differently by Northern German and Southern German speakers. The different processing may be triggered by the presence or absence of a perceptual contrast immediately after the accented-vowel onset and by the different exploitation of phonetic means in Northern vs. Southern German. As a consequence, the idea of a cross-linguistic continuum within prenuclear rises may be questioned: there is discontinuity in the continuum.

## 2.1 Introduction

Two things are required for a cross-language comparison of intonation: There must be a common object occurring in several languages. And there must be variation concerning this object. In Atterer & Ladd's new contribution on segmental anchoring in German and English (Atterer & Ladd 2004) the common object under investigation is the *prenuclear rise* and the variation looked at is described as *phonetic*, i.e., a phonetic cross-language continuum of alignment is proposed to characterize prenuclear rises in a set of related languages.

Atterer & Ladd conducted two experiments in order to obtain new evidence supporting this cross-language continuum. The *first* experiment included Northern German and Southern German speakers (the latter from Bavaria) who read German sentences. This experiment was to establish alignment differences within German and compare the German data with previous studies on English, Dutch, and Greek (Arvaniti, Ladd & Mennen 2000, 1998; Ladd, Faulkner, Faulkner & Schepman 1999; Ladd, Mennen & Schepman 2000). The *second* experiment was to show the (possible) carry-over of the within-German differences to reading comparable English sentences and at the same time enable a direct comparison to native English. The original data of both experiments were published in the article and were thus offered for further discussion.

The present comment is motivated by a closer inspection of the data revealing additional aspects which have not been accounted for in the authors' discussion of their results. This "hidden message" in the data sheds new light on the phenomenon under discussion. It may also contradict the original conclusions drawn in Atterer & Ladd's article, by showing that there is discontinuity in the continuum of rises.

Atterer & Ladd's conclusions from their experiments are as follows: At least in West Germanic languages (such as English, German, Dutch etc.) there is a unit which can be called "prenuclear rise", characterized as an accent-related L-H sequence in a domain before the nuclear accent of an intonational phrase. This unit can be identified by speakers of these languages and is thus cross-linguistic. But prenuclear rises differ phonetically from language to language (or between varieties of a language). The phonetic variation of prenuclear rises can be understood in terms of a time shift of an F0 minimum and a subsequent maximum (both being linked in a way). Taking this view, it is no longer appropriate to describe this cross-language variation starting from a set of different "crypto-phonetic" labels like L H* or L* H, a gradual variation should be assumed instead (Atterer & Ladd 2004, p. 178). Looking at prenuclear rises in this way is suggested by the slight, although significant contour shifts found in the data: shifts between English and German, shifts between Northern and Southern varieties of German, shifts between speakers of these varieties while reading an English L2 text. In this, German speakers show a later synchronization of the rise than English speakers, and Southern German speakers show a later synchronization than Northern Germans.

The question to be addressed now is whether there is further information in Atterer & Ladd's data which escaped discussion. Here, the crucial point is that they analyse the German and the English reading task separately and do not look at the data set as a whole. In doing so they miss an interesting issue: How do Northern *as opposed to* Southern German speakers cope with an English reading task? Do they do the same thing or do they differ? The answer to this question will allow conclusions on the perceptive or cognitive processing of German native intonation and of the L2 English intonation used by Germans. If there are indications of a

**Table 2.1:** Means of the location of F0 maxima and F0 minima in "prenuclear rises": Northern and Southern German native speakers reading German and English test sentences; for comparison native English speakers reading the English set of test sentences (from Ladd et al. 1999). H(V1) = location of the maximum referred to the vowel onset of the *post*-accentual syllable. L(V0) = location of the F0 minimun referred to the accented vowel onset. L(C0) = location of the minimum referred to the onset consonant of the accented syllable. Temporal distances in milliseconds (ms); cf. Atterer & Ladd (2004), pp. 186 and 190.

| speakers | test sentences | | | | | |
|---|---|---|---|---|---|---|
| | German H(V1) | English | German L(V0) | English | German L(C0) | English |
| Northern German | 21.4 | 10.7 | -39.4 | -41.9 | 38.2 | 49.9 |
| Southern German | 34.0 | 26.1 | -3.1 | -26.5 | 67.9 | 60.2 |
| Native English | | -3.6 | | -86.9 | | -5.5 |

different processing in the two samples examined (Northern Germans and Southern Germans) the different location of rises can no longer be *purely phonetic*.

## 2.2 Reanalysis and results

Potential different adjustment to the English pronunciation of prenuclear rises can be analysed by combining the data from both reading tasks, German and English. The formation of a unified set of data including both experiments may be problematic because the data originate from different collections of test sentences. But on the other hand, the segmental structure of the test words in these sentences has been arranged to be similar consisting of vowels, nasals, and liquids. Thus, the material used in the experiments is appropriate for a comparison across languages, despite possible objections. Combining the data from the German and English reading tasks (i.e. experiments 1 and 2) we arrive at the table of means (Tab. 2.1).

This table contrasts the Northern German and the Southern German versions of the German and English sets of sentences showing the location of F0 minima and maxima in prenuclear rises (labelled as L vs. H). The minima and maxima refer to three points in segmental structure: The F0 minima are related to the onset of the accented syllable (C0) and to the accented vowel onset (V0). The F0 maxima are related to the end of the accented syllable, i.e., the vowel onset of the first post-accentual syllable (V1); cf. Atterer & Ladd (2004), pp. 186 and 190.

The table of means can be subdivided into three sections for H(V1), L(V0), and L(C0) showing whether and how the Northern and Southern German speakers adjusted their intonation to the target language, i.e., to L2 English as opposed to the corresponding German variety (L1). Repeated measures ANOVAs can be calculated on each of the three partial tables (2.2 SPF design in Kirk 1982). But, more suitable than ANOVAs would be a series of paired samples *t* tests analysing the differences between the German and English reading tasks for the Northern German and the Southern German speakers. These tests allow a better comparison to the results already published in Atterer & Ladd's paper, because here the power of the tests would be similar. Therefore the following discussion is based on a series of six *t* tests comparing the means in Table 2.1. The probabilities of the six *t* tests are given in Table 2.2.

For the three measurements taken we arrive at the following results combining both experiments reported in Atterer & Ladd:

(1) For the *synchronization of the F0 peak* a slight adjustment towards the target language is found in both samples with the peak position shifting about 10.7 ms and 7.9 ms to the left for the English text. This shift is significant only for the Northern German sample. However, the results concerning the F0 maximum should be re-examined using the *accented-vowel onset* as a reference — which may be particularly appropriate if prenuclear rises are conceived of as contours instead of as sequences of tonal units and in view of the fact that the same patterns can also be produced on single monosyllables. A look at the German data with the German text shows that the difference found between Northern German and Southern German speakers is largest when the F0 maxima are compared with the accented-vowel onset (viz. 16.6 ms; cf. Tables 1 and 2 in Atterer & Ladd 2004, pp. 186 and 188). The difference is smaller with the onset or end of the accented syllable taken as a reference (viz. 9.9 and 12.6 ms). This observation may also concern the adjustment to English intonation. Perhaps the accented-vowel onset is a better reference also with respect to the issue of speakers' adjustment to L2 pronunciation.

(2) For the *position of the initial F0 minimum* of the rise (L(V0)) compared with the accented-vowel onset an interaction is found between the speaker group and the target language. I.e., Northern German speakers *do not adjust* their F0

**Table 2.2:** Tests of the mean differences between the German vs. English reading tasks comparing Northern German and Southern German speakers. t, df, probabilities, significances based on the probabilities (significant = *; with $\alpha \leq 0.05$).

| | speakers | *t* | df | p | |
|---|---|---|---|---|---|
| H (V1) | Northern German | 2.481 | 6 | 0.048 | * |
| | Southern German | 2.177 | 6 | 0.072 | |
| L (V0) | Northern German | 0.576 | 6 | 0.585 | |
| | Southern German | 4.678 | 6 | 0.003 | * |
| L (C0) | Northern German | -2.567 | 6 | 0.043 | * |
| | Southern German | 1.503 | 6 | 0.184 | |

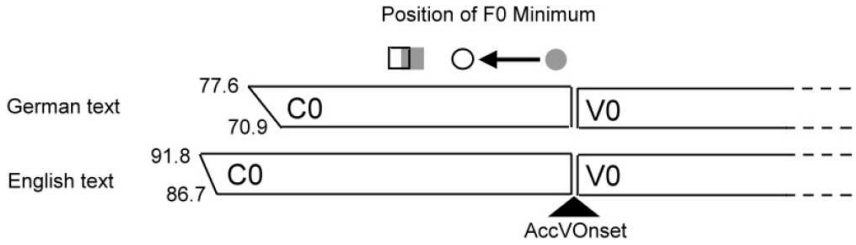


**Fig. 2.1:** Location of the initial F0 minimum in prenuclear rises. Northern German and Southern German speakers reading German and English test sentences. The F0 minimum is related to the segmental structure of the underlying accented syllables. The segments were C0, V0 etc. The accented-vowel onset (AccVOnset) is used as a point of reference. Squares: Northern German speakers; circles: Southern German speakers. Filled squares and circles: German test words; empty squares and circles: English test words. The duration of the pre-accentual consonant (C0) is shown by bars for the German and English text and for the Northern German and Southern German speakers. Cf. mean values in Table 2.1.

minimum at all, whereas Southern German speakers show a clear adjustment in the L2 condition with a shift of the minimum of 23.4 ms towards the native English pronunciation (significant; p=0.003). See Fig. 2.1.

(3) A similar tendency is found if the *beginning of the accented syllable* is chosen as a reference: Again the Southern German speakers show a slight adjustment to the target language (which, however, fails to be statistically significant). The Northern German speakers do not adjust, they show a paradoxical result instead. So, again there is an interaction between the factors "speaker group" and "German vs. English test sentences". As demonstrated in Fig. 2.1, it is the longer onset consonants in the L2 condition that may give the impression of the Northern speakers moving their F0 minimum in the opposite direction and the Southern speakers showing only a slight adjustment towards the target language (compared with the results for the accented vowel onset as a point of reference): The onset consonant has a duration of 91.8 ms for the Northern German speakers and 86.7 ms for the Southern German speakers, whereas in the German reading task the consonant duration only amounts to 77.6 ms and 71.0 ms respectively (durations calculated from Tables 2 and 3 in Atterer & Ladd 2004, pp. 186 and 190), see, again, Fig. 2.1). Furthermore, averaging the Northern German and Southern German results, the effect of the reading task on the location of the F0 minimum is lost with the initial consonant used as a reference. Again, this may be an indication that the accented-vowel onset is the most sensitive criterion for assessing contours.

## 2.3 Conclusions

What can be concluded from these additional results derived from the comparison of the German and English reading tasks in Atterer & Ladd's study?

Atterer & Ladd's discussion concentrates on their finding that in prenuclear rises there is an alignment continuum with slight, but significant steps ranging from English via Northern German to Southern German. This continuum is established using German and English native data and is strengthened by the observation that the differences found between the Northern and Southern varieties of German are transferred to the German L2 pronunciation of English. Further languages may be included in the alignment continuum (e.g. Dutch).

By contrast, the present additional analysis deals with interactional effects, i.e., with the different coping of the Northern and Southern German speakers with the English reading task. It is by analysing this interaction between speaker group and reading task that differences between the two German varieties can be tested, because the interaction can be an indication of deviating representations of English as opposed to native German intonation for the two speaker groups. If an interaction of this kind can be confirmed and the speaker groups *show* a different adjustment to the target language in the L2 condition, this may be taken as an evidence against a gradual transition between the prenuclear rises of Southern German, Northern German, and English. Instead, the interaction may be a point in favour of a different processing of nuclear rises by the speakers of these languages or varieties. Thus, in this case the *common object* of the cross-linguistic comparison, the prenuclear rise, either does not form a homogeneous class or its *variation* cannot be treated as a phonetic continuum.

Indeed, the second view on Atterer & Ladd's data, combining their two experiments, reveals that interactional effects exist: Only the Southern German speakers clearly move towards standard English intonation; the Northern German speakers do not change their prenuclear patterns. Therefore, the idea of an alignment continuum of prenuclear rises may be questioned by the same set of data originally used to support it. But the data also give an indication of what the character of the cross-linguistic variation in prenuclear rises could be: The different adjustment to the L2 condition shows up in the location of the initial F0 minimum of the contours measured. From Table 2.1 on p. 4 it can be seen that at the same time the *location of the initial minimum* is the decisive feature to distinguish the Southern variety of German from the Northern one and English — Concerning the location of the F0 maximum there are to date no clear results.

Following these observations, a tentative explanation of the different melodic adjustment by the two speaker groups

should include the fact that the Northern and the Southern German speakers already differ in their prenuclear rises when they speak German. In this, the particular role of initial low F0 in accent-related pitch patterns should be accounted for. Starting here, the different melodic adjustment can be understood in three ways:

(1) Southern German speakers may be more sensitive to differences between English and German prenuclear patterns because, for their variety of German, these cross-language differences are simply quite large. Northern German speakers may ignore the differences because for them they are smaller and thus may not exceed a critical value. So, one group forms a contrast between their native intonation and their L2 intonation, whereas the other group seems to assimilate the foreign intonation to their native intonation system.

(2) But this explanation does not capture the particular character of the differences observed between Northern German and Southern German speakers. The behaviour of the two speaker groups can perhaps be better understood when looking at the German data more closely: When reading the German test sentences, Northern German speakers have a clear *preaccentual* F0 minimum (or low turning-point) whereas Southern German speakers have the initial F0 minimum immediately before, or at, or *after* the accented vowel onset. Thus, the accented vowel onset can be used as a segmental landmark functioning as a critical point of reference for distinguishing contours. The rises of the native English and the Northern German speakers begin on the same side of this landmark, whereas the rises of the native English and the Southern German speakers do not: I.e., for the Southern Germans the rising flank of the peak is placed almost completely in the accented vowel. Moreover, sometimes the accented vowel includes a low stretch of contour preceding the rise and containing the low turning point (cf. Fig. 1 in Atterer & Ladd 2004, p. 184). As a consequence, there is a clear perceptual difference for English and Southern German prenuclear rises, but only a slight one for English and Northern German. This argument is related to new studies by Kohler (2004) and Niebuhr & Kohler (2004) who pointed out that landmarks of the kind discussed here are important for the understanding of categorical perception in intonation. However, the adjustment differences between Northern and Southern German speakers are no immediate evidence that Southern German speakers "have" a prenuclear L*H accent as opposed to LH* in Northern German. Instead, the Southern variety of German supplies its speakers with the *perceptual preconditions* allowing them to move towards English intonation; Northern German is different in this respect. Thus, although the Northern German intonation is closer to English the Southern speakers may be more sensitive to some aspects of English intonation (such that they show a larger degree of adjustment).

(3) The different use of initial low pitch in Southern German as opposed to Northern German prenuclear accents can perhaps be further explained with respect to Gussenhoven's approach to intonation (Gussenhoven 2002, 2004). Accord-

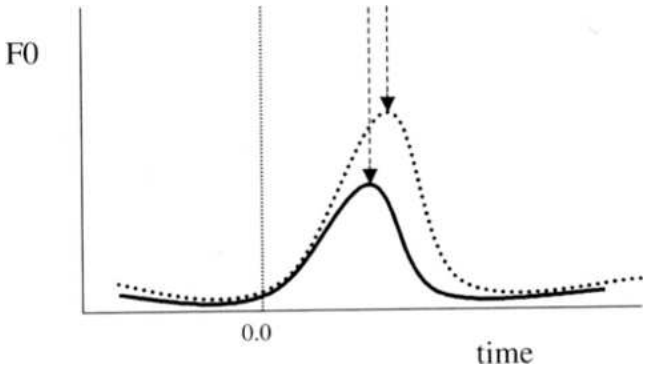


**Fig. 2.2:** "Hypothesized relation between high peaks and late peaks" (From Gussenhoven 2002, p. 90). The continuous line shows the location of the F0 maximum in the original peak. Peak *raising* is assumed to be linked with a peak *shift* (broken line). Usually being combined, peak raising and peak delay receive the property of "substitute variables", e.g., within the effort code.

ing to Gussenhoven there are "substitute variables in F0 variation" affecting the shape of accent-related pitch peaks (Gussenhoven 2002, p. 90). In particular, a peak delay can be a substitute for pitch raising. Consequently, the functional meaning of high pitch can also be signalled by a peak delay. Therefore, on principle, two different melodic means can be employed for making a linguistic unit sound more prominent, more emphatic, etc. The interrelation between both means is illustrated in Fig. 2.2 taken from Gussenhoven (2002).

As they are related, peak delay and peak raising may enter a kind of compensatory dialectal variation. In some Southern German dialects, peak delay is a widespread feature in various functional environments (including rises in a prenuclear position). As a contrast, in Northern German the use of peak delay is more restricted. The degree of exploitation of peak delay vs. peak raising may vary on a continuous scale. But, as shown above, the different exploitation of phonetic means can be more or less salient depending on the relation of an auditory event to a perceptual landmark (i.e., the position of the rising flank of a peak relative to the accented-vowel onset) which can be the same or different. If the different exploitation of phonetic means is perceptually salient it can be controlled in articulation and speakers will thus be able to switch and use peak height and peak delay voluntarily — the functional environment being the same. This may be the background of the interaction showing up in Atterer & Ladd's data.

## 2.4 Two remarks concerning internal and external validity

Two remarks may be added concerning the validity of the conclusions from the experiments discussed here. These remarks apply to the reanalysis of Atterer & Ladd's data as well as to the original interpretation in their article. The

first remark is a caveat perhaps affecting internal validity, the second shows that what is found in Atterer & Ladd's data may be a sort of understatement with respect to possible future results — which is a question of external validity.

(1) Atterer & Ladd's experiments are on cross-linguistic variation, yet similar variation occurs within the single languages or dialects to be compared, e.g., Northern German and Southern German. This variation *within* a language or dialect would require a different treatment being subject to the modelling of the individual intonational repertoire concerned. Here, with respect to what is called prenuclear rise in Atterer & Ladd's article, three questions can be asked: (1) Which set of contours is provided in such a repertoire for forming a prenuclear configuration? (2) How are the possible prenuclear contours applied to the one or other functional context? (3) What is the frequency distribution of the contours and functions? In the description of possible forms, we would encounter again the contrast between contours characterized by a rising movement beginning only at the accented vowel and contours with an earlier synchronization of the rise. Again, this type of difference between contours would be perceptually salient. And being part of the within-language variation, the perceptual contrast would have the potential to be associated with a contrast in functional meaning — as already mentioned. Both forms and meanings show a particular frequency distribution characterizing a language or dialectal variety. Thus, the perceptual features of prenuclear contours can, at the same time, convey cross-language and within-language information. In this, the aspect of different intended functional meaning and a probably different exploitation of universal codes would have to be disentangled. At this point we can return to the original cross-linguistic issue: listening to prenuclear rises in different varieties of German, in Dutch, in English, etc., it is actually not clear whether what we hear is different or is a different realization of the same. Therefore, in experimental work on cross-linguistic variation in prosody the functional meaning of recorded data or of experimental stimuli should be controlled (as far as possible). In production studies, the prosodic structure of the recordings should be described in detail, e.g. by prosodic labelling in terms of a current intonation model. In the Atterer & Ladd experiments the formal and functional equivalence of the patterns analysed for the native Southern and Northern German speakers and their L2 English has been taken for granted — The same applies to the present reinterpretation.

(2) Atterer & Ladd investigate a basic distinction between Northern German and Southern German intonation. This distinction was described by Sievers (1912, pp. 57ff), who posited "two contrary systems of melody formation" in German, the Northern one and the Southern one. According to Sievers, all tonal relations are inverted when moving from the one main dialectal area to the other. In this connection, Kügler, in his work on Swabian nuclear rises, speaks of an inversion of tonal targets (Kügler 2004, pp. 76 and 95). However, neither Northern nor Southern German intonation is homogeneous in itself. Rather, both can be understood as collections of more or less closely related varieties which may to a certain degree be different just in the features investigated in the experiments discussed in this comment. In particular, an initial low-pitched stretch or a delayed rising movement within a nuclear or prenuclear peak pattern is most explicit in South West German, Swiss German, Tyrolean German (cf. Barker 2002; Fitzpatrick-Cole 1999; Gibbon 1998; Kügler 2004). For these varieties even stronger effects may be expected than those shown in Atterer & Ladd (2004), who analyse speakers from Bavaria. But Atterer & Ladd's Bavarian data already suggest that Southern German speakers may process accent-related rises in a way different from Northern German speakers. Moreover, this different processing shows up with prenuclear accents — where dialectal diversity is less obvious than in German nuclear accents (cf. Kügler 2004). It should be added that the word "inversion" is misleading as a metaphor for the melodic differences between the German varieties compared here. "Inversion" suggests an interpretation in terms of an arbitrary tonal composition instead of trying to understand the underlying (possibly different) processing.

## 2.5 Summing up

Establishing a set of languages, dialects, or intonational idioms which are different in their averaged prenuclear peak alignments may be a step towards a systematic cross-language description of intonational structure. But labelling this "alignment continuum" as purely phonetic would end the discussion before it has begun. The reanalysis of Atterer & Ladd's data shows that there is discontinuity in the cross-linguistic continuum. This could be the beginning of a discussion, e.g., on the question what the nature of the cross-linguistic variation is and how can it be explained. One factor determining the processing of cross-linguistic variation may be called "perceptual preparedness". I.e., if there is a cross-linguistic shift in the averaged prenuclear alignments observed, there is, nonetheless, a step in the continuum which will cause the impression of an abrupt change, contrast, etc., and will do so because of perceptual preconditions. This, again, will question the idea of the continuum posited. Another factor determining cross-language variation in prenuclear rises may be derived from Gussenhoven's (2002; 2004) perspective: We can ask which means are exploited for which effects in intonation — e.g., for setting a background before a focus. According to Gussenhoven, there is a trading relation between the parameters of peak height and peak delay. That is, peak delay can stand in for peak height. Both aspects, perceptual preparedness and different exploitation of phonetic means, may interact in the cross-linguistic variation of prenuclear rises in the languages and varieties looked at.

From a methodological point of view the above discussion has an ex-post status and is therefore only heuristic. I.e., it must be secured by new research. New studies on dialectal variation in German accent-related contours or on German

native vs. L2 pronunciation of intonational patterns should account for four aspects. (1) In acoustic analyses, time measurements should use the accented-vowel onset as a reference. (2) In addition, the distribution of contour types (pitch accents) within each language or variety should be examined applying prosodic labelling procedures. (3) The functional contexts of the test sentences included should be controlled systematically. (4) The speaker groups under study should be carefully selected each only to contain speakers of a clearly defined variety of German. In particular, South-West German or Swiss German samples should be included.

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## Appendix

The paper presented here was completed in 2005. A more recent study by Kleber & Rathcke (2008) discusses further alignment data collected from East Middle German speakers, using almost the same speech material as in Atterer & Ladd (2004) — although no L2 English condition is included here. According to Kleber & Rathcke's study, there could be an alignment continuum between East Middle German, Northern German, and Southern German speakers concerning the initial low section of prenuclear rises. With regard to the timing of the pitch peak of the rises, East Middle German speakers seem to behave like Northern German speakers — and do not occupy the expected intermediate position between Northern and Southern varieties of German as well. Kleber & Rathcke interpret their data as evidence against an alignment continuum of prenuclear rises over German varieties. Their interpretation may be seen as a support of the above line of argument (that there is discontinuity in the cross-linguistic alignment continuum). However, Kleber & Rathcke, like Atterer & Ladd, do not refer their time measurements to the accented-vowel onset of the rises, and use the accented syllable as a basis of the durational assessments (what they call "normalization"). Taking the onset of the accented vowel as a reference would perhaps change the relation between the three varieties of German compared in the study. Results would, then, be closer to the originally predicted sequence: Northern German — East Middle German — Southern German. Nevertheless, Kleber & Rathcke's Upper Saxonian data confirm that the initial low stretch of prenuclear rises is more variable than the pitch maximum of the rises which is already the case in Atterer & Ladd's data.

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