

# FOREIGN ACCENT IN INTONATION PATTERNS — A CONTRASTIVE STUDY APPLYING A QUANTITATIVE MODEL OF THE F<sub>0</sub> CONTOUR

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## ABSTRACT

The present study examines the influence of intonational contrasts of German and Japanese on the  $F_0$  patterns of Japanese learners of German. It was found that Japanese learners generally place the word accent in compound words on the right-most (the generic) term which suggests that they adopt rules of accent concatenation of Japanese. In contrast to native speakers of German, they tend to place substantially more falling accents at utterance-medial phrase boundaries. The intonational patterns for marking questions are different from those found in utterances of German speakers, where generally only yes-/no-questions feature a question final rise. Prosodic phrases in the Japanese group are generally shorter and are often not determined by the linguistic content of an utterance but by the occurrence of phonetically 'difficult' or possibly unknown words.

## 1. INTRODUCTION

It is widely known that the acquisition of a near-to-native intonation poses one of the most difficult tasks in L2-learning. Yet it plays a crucial role in attaining a sufficient level of intelligibility that a student has to achieve in a target language. The actual degree of proficiency is influenced by a number of interacting factors:

- the relationship between the native language L1 and the target language L2 (syntactically and phonetically remote languages pose more problems)
- the teaching method (communication-oriented or not)
- the language learning 'history' of the student (students already fluent in another foreign language may have less problems with a new L2)
- the individual ability and motivation of the student

Whereas individual problems are difficult to predict, a better understanding of the interaction between L1 and L2 may lead to better teaching methods. Therefore it is necessary to analyze errors made by speakers of a given L1 when studying a particular L2. The present study addresses this problem in the case of learners of German whose native language is the common Japanese (the Tokyo dialect).

## 2. CONTRASTS OF GERMAN AND JAPANESE

In the present study we examine deviations which are possibly caused by erroneous application of L1-habits to L2, known as 'negative transfer', on the example of readings of a

text. According to Schulte-Pelkum, negative transfer can be considered as the result of contrast between L1 and L2 [6, pp.70-73]:

1.  $l1 \supset l2$ : A phenomenon in L1 is less differentiated than in L2
2.  $l1 \subset l2$ : A phenomenon in L1 is more differentiated than in L2
3.  $l1 \cap l2 = X$ , where  $X \neq \emptyset$ ,  $l1 \not\supset l2$ ,  $l1 \not\subset l2$ : Overlapping of phenomena of L1 and L2 not permitting the description of L1 as a subset of L2 and vice versa
4.  $l1 \cap l2 = \emptyset$ : A phenomenon in L1 is missing in L2 or vice versa

In a text-guided experiment we still cannot rule out the possibility that deviations on the intonational level are caused by contrasts of the two languages on the syntactic, lexical or segmental phonetic levels. Difficult speech sounds in a word, for instance, may influence the accentuation of the respective item. The absence of articles in Japanese may lead to their overaccentuation in German, etc.

We now discuss some contrasts of German and Japanese we examined for negative transfer on the intonational level.

### 2.1 Syntax

( $l1 \cap l2 = \emptyset$ ) In Japanese, non-terminality can be signaled by the use of a special inflectional form of the verb called 'chūshikei'. It is also indicated by function words following a content word. Questions in Japanese are generally marked by the sentence-final particle 'ka', reducing the need for intonational cues. The German articles ('der', 'die', 'das') are missing in Japanese.

### 2.2 Phonemes

( $l1 \supset l2$ ) Neyer [5] reports 19 vowel phonemes for German against only 5 for Japanese, and 21 consonant phonemes in German against 13 in Japanese. The German phonemes [h], [ç], [f] and [x], for instance, map onto allophonic variations of the Japanese phoneme [h].

### 2.3 Syllabic Structure

In contrast to the great number of possible syllables of German, the Japanese syllabic system is comparably simple. Phonologically, two types of syllable exist in the common Japanese: (1) The  $/C_i V/$ -type where  $C_i$  is a consonant (including nil) and  $V$  is a vowel, (2) the  $/C_i V C_f/$ -type where  $C_f$  is one of the three 'moraic phonemes' (/H/: elongation; /N/: moraic nasal; and /Q/: gemination of the following consonant). Phonetically, these syllables are given one and two units of time (i.e. one mora or two morae), respectively.

With a few exceptions consonants tend to be separated by vowels (syllable type (1)). For this reason, the consonant clusters of German, where concatenation of up to four or five consonants occurs frequently, may cause difficulties. Japanese speakers tend to insert auxiliary vowels resolving the consonant cluster into a sequence of morae.

## 2.4 Intonation

**Word Accent** The dominant acoustic feature of the lexical accent in Japanese is the  $F_0$  contour. Each mora of a Japanese word is assigned either a high or low tone. A transition low-high or high-low occurs after the first mora. In the former case a high-low transition may be found after the  $M$ th mora. Hence there are  $N+1$  possible accent patterns for  $N$ -mora words. The type without high-low transition is called flat or unaccented type and denoted as  $(N,0)$  whereas the others are denoted as  $(N,M)$ . For the ease of representation we follow Fujisaki's convention and denote the accented word type by 'D' for 'downfall' and the unaccented type by 'F' for 'flat'. Schulte-Pelkum reports the wrong accentuation of German compound words by Japanese students as a result of a contrast  $l1 \cap l2 = \emptyset$ . If we speak of word accent features of German and Japanese in terms of contrasts, in principle they present a contrast of type  $l1 \cap l2 = \emptyset$ , since lexical items of Japanese feature a melodic accent and German words do not. On the level of  $F_0$  patterns, however, Japanese is more differentiated than German and the accent repertory of Japanese contains the German word accent patterns as a subset ( $l1 \subset l2$ ) [4].

**Sentence Intonation** Sentence intonation has been given marginal importance by most authors of earlier contrastive studies of German and Japanese. Lausch (1990) [2, p.25], for instance, assumes that the falling accent in Japanese D-type words causes a speaker quickly to reach the lower limit of his  $F_0$  range, limiting the length of phrasal units. She ignores the fact that prosodic words may be concatenated by 'accent sandhi'.

Schulte-Pelkum [6, p.79] reports that sentence intonation in Japanese is subject to less variations than in German, since it is largely determined by the accent types of the constituents of an utterance. Hence it lacks the discourse organizing flexibility of German intonation.

## 3. SPEECH MATERIAL

All utterances examined are based on readings of a short text designed by the author meeting the following requirements: A coherent text as found in textbooks for teaching German containing various types of sentences with varying complexity (13 sentences: 9 statements, 2 simple questions, 2 wh-questions). The text describes a personal experience with public transportation systems in Berlin and Tokyo in the style of a short story. The text was translated into Japanese trying to keep a balance between closeness to the German version and naturalness of Japanese. The German and Japanese versions were read by 20 Japanese university students of German (5 males and 15 females at the end of

the 2nd year of German at Dokkyō University, Saitama) and the German version by 26 German subjects (15 males and 11 females from Berlin).

Hence there are three speech corpora evaluated for the study:

**Corpus JG** : The German text read by Japanese students of German.

**Corpus JJ** : The Japanese translation of the German text read by Japanese students of German.

**Corpus GG** : The German text read by native speakers of German.

## 4. METHOD OF ANALYSIS

The present study applies Fujisaki's quantitative model to the analysis of the  $F_0$  contours produced. The model has been proved to apply well to both languages [1, 3], a prerequisite for the study. The utterances were either recorded on tape or DAT and converted at 10 kHz/16bit. An auditory analysis was conducted to detect mispronunciations in the JG material. Utterances with an apparent lack of fluency in this set were excluded from further analysis. The  $F_0$  contours were extracted for the remaining utterances and analyzed using the quantitative model by the method of Analysis-by-Synthesis. The parameters determined from sets JG and GG were compared to examine deviations and their relationship with the sources of L1-interference as discussed above.

On the basis of the accent and phrase components of the quantitative model thus determined, deviations were examined on two different ranges within the  $F_0$  contour: a) local differences (word accentuation, realization of phrase boundaries), b) global differences (phrasing).

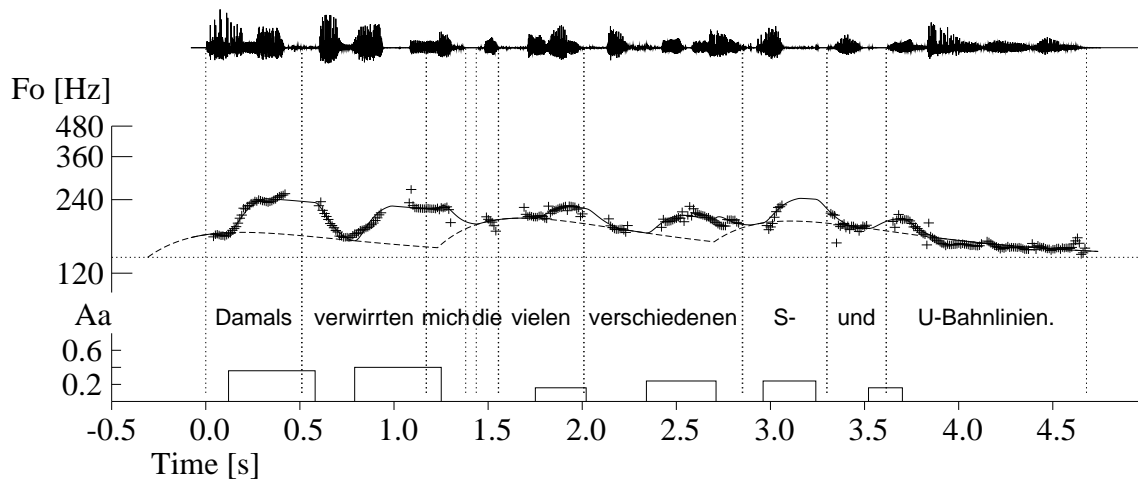
## 5. RESULT OF ANALYSIS

Examples for most cases of L1-interference predicted were found in the material, but with vast individual differences. Figures 1 and 2 show examples of analysis results for the sentence "Damals verwirrten mich die vielen verschiedenen S- und U-Bahnlinien."— "*At that time I was confused by the great number of various city train and subway lines.*" from sets GG and JG respectively. Figure 3<sup>1</sup> displays the corresponding Japanese sentence "sono toki, watashi ga tomadotta no wa, densha ya chikatetsu no shurui ga ooi koto deshita." from set JJ. At the top of all figures, the speech waveform is displayed. The curve drawn using + symbols indicates the measured  $F_0$  contour, the solid line the  $F_0$  contour produced by the Fujisaki-model and the dashed line its phrase component part. The accent commands are displayed at the bottom.

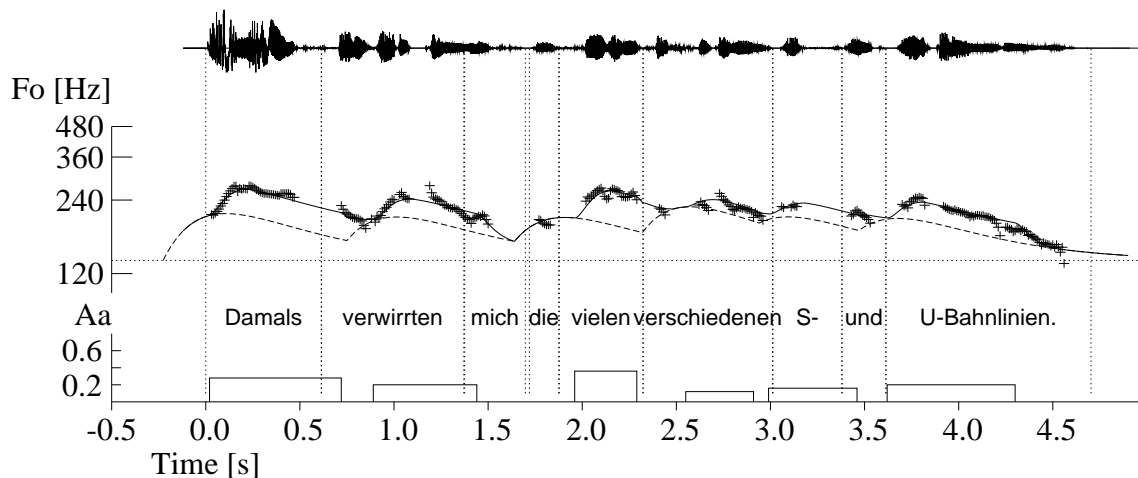
**Phonemes** Although all speakers showed the typical bias by the Japanese sound inventory, none of them exhibited significant syllabic errors (vowel insertion etc.)

**Accent Components** The most consistent error found was the wrong placement of the word accent in longer words

<sup>1</sup>Analysis by kind support of Hiroya Fujisaki.



**Fig. 1.** Example of analysis result: “Damals verwirren mich die vielen verschiedenen S- und U-Bahnlinien.” — “At that time I was confused by the great number of different city train and subway lines.”, German speaker MM (set GG).



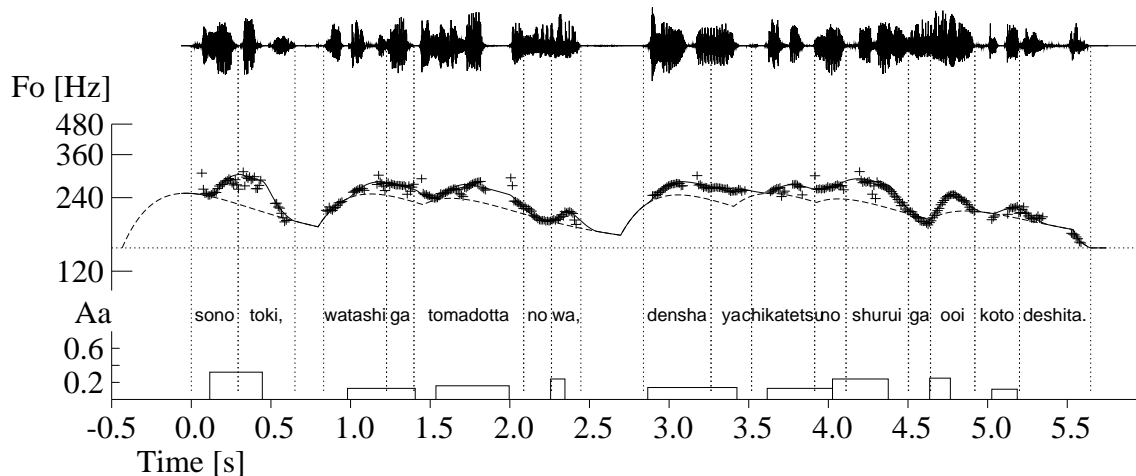
**Fig. 2.** Example of analysis result: “Damals verwirren mich die vielen verschiedenen S- und U-Bahnlinien.”, Japanese speaker MK (set JG).

and compound words. The word accent was generally placed on the generic term instead of the modifier (Example: ‘U-Bahnlinien’— ‘subway lines’ becomes \*‘U-Bahn<sup>h</sup>linien’) (see Figures 1 and 2). The tendency to shift the (falling) compound accent to the right-most item may be influenced by the way Japanese F-type words are concatenated to following D-type words (see Figure 3: “chikatetsu no shurui” — “types of subways”).

Unlike the generally falling Japanese accent, German features a rising accent before utterance-medial phrase boundaries. (For examples of phrase-boundary accentuation compare the instances in Figures 1 and 3: “Damals ver<sup>h</sup>wirren mich // die vielen ver<sup>h</sup>schiedenen //...” and “sono toki\

// watashi ga tomado\tta no wa //...”) Ten selected major phrase boundaries in the German text were examined for the occurring accent patterns. This revealed 98 % rising patterns in set GG, but only 67.5 % in set JG. Hence, the Japanese speakers can be considered to have partially applied their accentuation habit to German.

Question-final rise in German native speakers is generally found in yes-/no-questions, but less frequently in wh-questions, whereas Japanese subjects almost equally produce it in both types of questions. In set JJ (where particle ‘ka’ occurs) the intonational cue is even more reduced (see Table 1). Syntactic units absent in Japanese (articles, for instance) seldom received excess prominence (less than 10 %) though



**Fig. 3.** Example of analysis result: “sono toki, watashi ga tomadotta no wa, densha ya chikatetsu no shurui ga ooi koto deshita.”, verschiedenen S- und U-Bahnlinien.” — “At that time I was confused by the great number of different city train and subway lines.”, Japanese speaker NM (set JJ).

misreading of these items (‘die’ instead of ‘der’) occurred more frequently.

**Table 1.** Rates of occurrence of question-final rising intonation [%].

	yes-/no-questions	wh-questions
Set GG	98	4
Set JG	68	73
Set JJ	45	43

**Phrase Components** In Figure 2 we see that the Japanese speaker phrases more often than the German native speaker and that the slope of the phrase component is steeper. The overall  $F_0$  pattern resembles the Japanese version in Figure 3 (falling movement at phrase boundaries). Apart from this L1-influence on the phrase level, inappropriate additional phrasing was found where hesitation before a phonetically difficult item occurred. Candidates were, for instance, words starting with an [f]: ‘Fahrkarte’, ‘Fahrschein’—‘ticket’<sup>2</sup>.

## 6. DISCUSSION AND CONCLUSION

In the present paper we only addressed a small part of intonational features examined in the study. We have shown that Japanese speakers partly carry over their intonation habits to German. It must be stressed, however, that within the material examined, great variations in performance were found. Whereas some speakers were already near-to-native as to their intonation, others were obviously overtaxed by the text and hardly managed to read it fluently. Performance that

<sup>2</sup>In some cases it was not clear whether the difficult sounds actually caused the problem or the word was simply unknown.

was acceptable in shorter sentences of the text, deteriorated in the more difficult ones.

The data used in this study is rather limited and only permits tentative conclusions. We believe, however, that the proposed approach presents a good starting point for further investigations and search for objective and effective means for foreign language teaching.

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