Luxembourgish intonation: continuation and final patterns

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Abstract

In this study final and continuation intonation phrases (IP) (subdivided into pragmatic and syntactic continuations as well as lists) are described phonetically and compared to each other. Investigation parameters are the pitch height at the end of each IP, the height of the fall in the nuclear structure and the peak position within the nuclear syllable. Seven Luxembourgish native speakers provided the data during a structured reading task. Results reveal a clear difference between the individual IP types apart from a tendency to an approach of pragmatic continuations and finals.

Index Terms: Luxembourgish, intonation, continuation, finality

1. Introduction

Luxembourgish is one of the youngest Germanic languages and can therefore not look back at a long research tradition. Only in the last few decades scholars started to do research in Luxembourgish linguistics. Although many gaps have been filled, prosody and especially the field of intonation, have been neglected. Although there are some earlier studies [1, 2], a systematic description of Luxembourgish intonation has not yet been provided.

A previous study [3], however, looked at final and continuation Intonation Phrases (IP) regarding their patterns and describes a high fall pattern for finals and a high mid-level pattern for continuations. High falling patterns for finals are not unusual, but the high mid-level contour seems to be typical for Luxembourgish. Many languages, e.g. German – the linguistically and geographically closest language to Luxembourgish – express continuation with a variety of rising contours ending thus with a high boundary tone H% (cf. [4] for the German intonation inventory). The mentioned contour seems close to what for many languages is called the calling contour [5], usually annotated without a boundary tone [6]. Other languages like Spanish [7] dispose of a similar contour, marking continuation and propose a mid tone at the end of the contour. The discussion whether this annotation is appropriate for Luxembourgish is not the main focus of the present paper. However this study will determine the location of the mid level in relation to the span, which might give evidence for a systematic pattern.

As for the functional categories applied in this study, the given categories in [3] will be maintained as they do not limit intonation to a syntactic level. On the contrary, they allow for a broader view into conversational structure without, however, excluding syntax. Nevertheless, a further subdivision of the category 'continuation' (cf. [8] on this matter) seems necessary in order to get a more detailed description of this group.

The first aim of the present study is to describe final and continuation intonation phrases on the basis of phonetic parameters. Measurements of the pitch fall after the peak can for example give insight into the actual pattern of the high mid-level contour.

The second aim is to compare the functional categories 'finality' and 'continuation' to each other to see if and how they differ. To justify a comparison the category 'continuation' is subdivided into syntactic and pragmatic continuations (cf. [9]) as well as lists. Syntactic continuations are marked by a syntactic element that demands a continuation (such as *if…then*), whereas the term *pragmatic continuation* is used for situations in which the listener expects a continuation in terms of the content or action (cf. [10]), without however relating to a syntactic indication. Lists comprise at least three one-word elements in this case. This leaves four categories to be compared in this study based on phonetic measurements.

2. Method

Many researchers address the problem of non-comparability of IPs and the difficulties when analysing spontaneous speech [11–13]. This is all the more applying to an explorative study that aims to get a first impression of the intonation system and inventory of a language. Read speech delivers not only comparable data, but may also serve as a starting point for subsequent analysis in natural speech. This explains the choice of a reading task for the data collection.

2.1. Participants

Seven Luxembourgish native speakers (3 female, 4 male) with only Luxembourgish as L1 were recorded in this experiment. To avoid dialectal or foreign language influence, the chosen participants all originated in the central canton Luxembourg and have not lived abroad. Age and gender are not considered in this paper, because the number of speakers does not seem sufficient to make statistically relevant statements about it.

2.2. Experiment

Participants had to read out 32 target sentences embedded in a short story, placing them into a context. The target sentences were in direct speech in order to give the speakers the possibility to familiarize themselves with the context and to actually acquaint themselves with the situation. The only instruction was to produce the target sentences as naturally as possible and to repeat them in case of uncertainty or dissatisfaction with their own performance. Participants repeated the task both to ensure the context had been understood and to get another data set. For this study only the repetition was taken into account.

The set-up was carefully designed, taking into consideration several factors such as the general categories of continuation,

finality or interrogation (where continuation is subdivided into syntactically motivated and pragmatic continuation as well as listing elements), the 'utterance type' (e.g. yes/no questions, declarative questions, enumerations) and the semantic feature model for German intonation by Peters [6]. He assigns a semantic feature to each tone depending on their tone type (starred tone, boundary tone, …). Amongst others, the informational structure and the conversational structure are included in this experiment design. Applying Peters' model, several groups, with subgroups including the utterance types, can be formed.

The target sentences assigned to each group were chosen according to, for instance, the number of syllables following the nucleus, in order to give evidence of compression or truncation as well as of the whole contour. Each category consisted of at least one target sentence with 2-3 syllables following the nucleus, analysed in this study. Additionally, the phonetic surrounding (voiced + no pitch deviating sounds) and the length of the vowels have been taken into account. In total, the participants had to read 32 sentences (henceforth referred to as *utterances*, comprising sometimes more than one IP) of which 4 final and 24 continuation intonation phrases (the rest being questions) in which 6 pragmatic elements, 7 syntactic and 11 listing (see (1)-(4) for examples).

Examples:

(1) <u>final</u>:

   Ech hunn e Répondeur.
   'I have got an answering machine.'

(2) <u>pragmatic continuation</u>:

   De Film ass eriwwer, du kanns eis elo sichekommen.
   'The movie has finished, you can come and pick us up.'

(3) <u>syntactic continuation</u>:

   Du bass net nëmme liddereg, mee och nach frech.
   'You are not just lazy, but also cheeky.'

(4) <u>list</u>:

   Méinden, Dënschden, Mëttwoch, Donneschden, Freiden, Samschden, Sonnden.
   'Monday, Tuesday, Wednesday, Thursday, Friday, Saturday, Sunday.'

2.3. Data analysis

For this experiment only the nuclear contour (term used as in [14]) has been considered. Measurements concerning the nuclear accent do not include the syllable onset. Pitch values are represented in semitones.

The first parameter is the minimum pitch at the end of the intonation phrase (PitchMinIP). This parameter has been related to the overall span of the utterance by arithmetically subdividing the latter into quarters (represented schematically in Fig.1). The utterance can comprise more than one IP, but needs to be informationally completed (term used in the sense of [6]). This procedure allows a normalisation of the values. The obtained value was then assigned to one of these quarters (in this example marked in light red), the highest as the first and the lowest as the fourth quarter. This parameter is not only important to compare continuation and final IPs but also to find evidence for a boundary tone in continuation IPs.
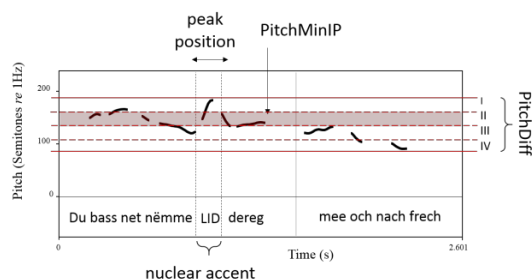

Figure 1: *Schematized representation of the investigation parameters: PitchMinIP (in red), PitchDiff, peak position.*

Another parameter to be investigated is the fall from the nuclear peak until the end of the IP (pitch maximum-pitch minimum=PitchDiff) (see fig.1). It differs from the PitchMinIP in that this parameter is not represented as a proportion. This value is particularly interesting for the comparison between continuation IPs as explained in the introduction.

A third parameter is the horizontal peak position (see Fig.1). For this, the nuclear syllable is theoretically subdivided into quarters and the highest F0 point is proportionally measured to the syllable length (not including the syllable onset). This parameter allows firstly, to determine the pitch maximum within the syllable and secondly, to see whether the peak position is located outside of the nuclear syllable.

This study examines the difference between finals, pragmatic continuations, syntactic continuations and lists regarding the three mentioned parameters (PitchMinIP, PichDiff and peak position).

3. Results

The experiment produced a total of 28 final IPs, 42 pragmatic as well as syntactic continuations and 77 listing elements. Obvious errors were excluded which reduced the number of items. The higher amount of lists is due to the fact that each list obviously consisted of more than one list element. The smaller amount of final IPs can be explained by the fact, that finals, unlike the continuations, are not subdivided into further categories when considering the semantic or syntactic features. They therefore are considered to form a consistent group with a small variability and the number of items seems sufficient to show tendencies.

3.1. PitchMinIP

Tabel 1 displays how often the different IP types end in each quarter.

quarter	final	pragm. cont.	synt. cont.	list
I	0%	0%	5%	17%
II	0%	0%	57%	43%
III	5%	38%	27%	32%
IV	95%	62%	11%	8%

Tabel 1: *Comparison between the frequency of the final pitch continuations and finals assigned to quarters of the IP span.*

Finals end in 95% of the cases in the 4th quarter, which means that they end close to the baseline. None end in the higher half of the pitch range.

Pragmatic continuations do not show the same frequencies, but also end quite often (over 60%) in the lowest quarter or in the 3rd quarter (38%). It seems that a preference for the lower levels is given.

The pitch of syntactic continuations can end in all four quarters but more than half (57%) end in the second quarter. Taken together with the ones ending in the third quarter (27%), they show a clear preference for a high-mid level. The same is true for lists, with a slightly higher preference for the first quarter and a more balanced 2nd and the 3rd quarter (43% and 32% respectively). To avoid incomparable data, lists in which the speaker applied a grouping of elements were excluded from this parameter.

It seems as though a medium high pitch at the end of an IP clearly marks the continuation function whereas a low pitch ending does not necessarily mark a final IP. Conversely, a final IP usually ends very low whereas the continuation types have to be considered individually: syntactic continuations and lists predominantly end in the second or third quarter whereas the pragmatic continuations mainly end in the lowest quarter. Thus, the PitchMinIP is not the decisive parameter for the discrimination between pragmatic continuations and finals.

3.2. Fall (PitchDiff)

A difference in PitchDiff (see Fig.3) seems obvious between on the one hand, the finals and the pragmatic continuations and on the other hand the syntactic continuations and the lists. Finals and pragmatic continuations show a similar median PitchDiff of 11.5st and 12.1st respectively. However, the values for the pragmatic continuations present a wider scattering around the median value as well as a slight positive skewness approaching the values to the ones of the finals again. In comparison, the syntactical continuations and the lists show an overall smaller scattering with a median PitchDiff of 7st and 4.56st respectively. Both, but especially the lists, are relatively stable. The value of 0st in the category 'list' can be explained by the occurrence of monosyllabic words which are apparently only realised by the plateau. A decline in the median values is noticeable from the highest values in the final and pragmatic continuations to the lowest in the lists.

The data were statistically analysed in a one-way ANOVA. An effect of IP type was found ($F_{[3.163]}=49.71$, $p<0.0001$). A following Tukey's test showed a significant difference between all the compared categories ($p<0.001$) apart from finals and pragmatic continuations. The significance indications were not added to the graph in order to maintain its clarity.

Surprisingly, pragmatic continuations can show an even higher fall than the finals. This might, however, be due to an overacting of the speakers in situations where, for example, grandparents talk to their grandchildren. The higher variation in the values for the pragmatic continuations as well as the similarity to the finals lead to the assumption that other factors than the PitchDiff mark the continuation. The difference between pragmatic continuations and syntactic continuations indicates a different pitch pattern. The same counts for the difference between pragmatic continuations and lists.
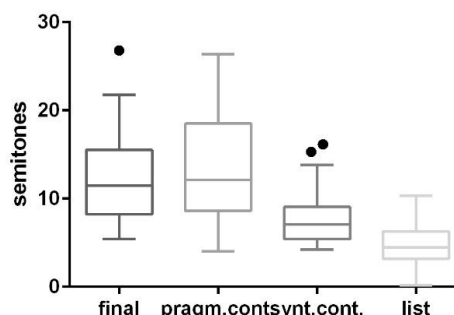

Figure 3: *PitchDiff for finals, continuations and lists*.

3.3. Peak position

The peak position within the nuclear syllable is presented in figure 4 (represented horizontally to capture the temporal course).

The peak positions of finals are always located within the nuclear syllable with a preference for the first half (median: 32%). The peak positions of pragmatic continuations show a wider scattering than the ones from the finals and can occur somewhat later, but are mostly located in the first half of the syllable as well. The peak positions of syntactic continuations, however, range from the second quarter of the syllable until the following syllable, that is, outside the nuclear syllable. No clear preference seems to be given for the peak positions of this IP type, but a tendency towards a later peak is noticeable. As mentioned before, no peak appears in the first quarter (unlike the other IP types), which corresponds to the trend of a later peak. Finally, lists present a mid-late peak position and, with two outliers, stay within the nuclear syllable.

The data were statistically analysed in a one-way ANOVA and an effect of IP type was found ($F_{[3.148]}=17.09$, $p<0.0001$). A following Tukey's test showed a significant difference between final and syntactic continuations ($p<0.0001$), pragmatic and syntactic continuations ($p<0.0001$) and syntactic continuations and lists ($p<0.0001$).
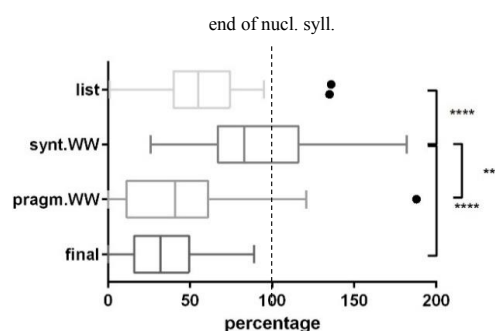

Figure 4: *Peak position as percentage of the nuclear syllable per IP type*.

4. Discussion and conclusion

The first aim of this study was to describe the four intonation phrase types based on a set of phonetic parameters in order to be able to compare them to each other in a second step.

Summed up, finals end low after a great fall (PitchDiff: 12.4st) and present a peak position in the first half of the nuclear syllable. Pragmatic continuations end mostly low after a great fall (PitchDiff: 13.8), but present a large scatter on this parameter. Their peak position can also be found mostly in the first half of the syllable.

Syntactic continuations end on a high-mid level after a fall of 5.4-9st and present a widely scattered peak position that can even be located in the next syllable. A tendency for a later peak can nevertheless be observed.

Finally, the listing IPs end on a high-mid level, present a low fall (4.5st) and show a mid to late peak.

By resuming the descriptive parameters, a similarity between finals and pragmatic continuations is already noticeable, whereas the syntactic continuations and lists show different values for all the parameters.

Indeed, differences between the four categories (final IP, pragmatic continuation IP, syntactic continuation IP and listing IP) occur for the three investigation parameters (PitchMinIP, PitchDiff and peak position) when analysing the data statistically. The only exception is the comparison between pragmatic continuations and finals. Still, the results show that the subdivision of the general category 'continuation' has proved useful, as significant differences between the subgroups have emerged.

The convergence of the values from final and pragmatic continuation IPs for the three analysed parameters is striking. This fact taken together with the correlation between high fall and a low pitch at the end of an IP as well as the lower fall and the mid level ending of the pitch, leads to the conclusion that continuations can be expressed by (at least) two different contours. This can be confirmed just by looking at the actual patterns of pragmatic and syntactic continuations represented schematically in table 1.

Table 1. *Schematized representation of the continuation pitch patterns.*

syntactic continuation - high-mid level:

(cf.[9])

pragmatic continuation - high fall:
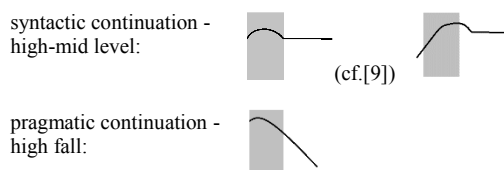
The similarity of the contours for finals and pragmatic continuations suggest that other prosodic cues mark continuation here as it is pragmatically given. The broadness of the category *pragmatic continuation* does not seem to be a major issue as the shape is very constant and therefore justifies its inclusion.

As for the syntactic continuations and lists, the mid final PitchMinIP confirms the findings in [3], but shows a lower fall for the lists, which brings them close to the calling contour. The higher fall in syntactic contours might be a consequence of a greater emotional involvement, which is not necessary in lists.

The difference in the peak position might occur due to the number of syllables following the nuclear accent (cf. [6, pp. 190-191), because the lists mostly consisted of bisyllabic words with stress on the first syllable, whereas the number of syllables following the nuclear accent in the syntactic continuations varied.

Finally, it is important to keep in mind that these findings are based on read speech and need to be verified in natural speech in order to make a statement on the complete Luxembourgish intonational inventory.

5. References

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