Phonetic erosion and information structure in function words: the case of *mia*

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Abstract

The purpose of this paper is to examine the prosodic correlates of a grammaticalisation process that leads to the formation of a function word. In particular, our case study will tackle the pattern of negation renewal known as Jespersen's Cycle (JC). In JC, a negative reinforcer carrying contrastive meaning grammaticalises to a function word denoting polar negation. We want to show that this change fits in with prosodic change: specifically, the grammaticalised item undergoes prosodic reduction. We test the latter hypothesis on the peculiar Italo-Romance dialect Gazzolese, where *mia*, the particle undergoing JC, can be used both as the erstwhile contrastive function and as a function word denoting negation (it can appear, for example, in Broad Focus statements). The results confirm that when *mia* is used as a function word, it displays a shorter duration, a reduced intensity excursion, and does not associate with a pitch accent, in comparison to the original contrastive context.
These results show that the change in function word can be appreciated on different phonetic/phonological levels: the metrical one and the intonational one, mediated through the role of the lexical item within information structure.
Index Terms: function word, grammaticalisation, Jespersen's cycle

1. Introduction

1.1. Function words

Function words such as auxiliaries, pronouns, and complementisers are known to have phonological properties significantly different from those of lexical words [1, 2]. Function words are often phonetically reduced [3, 4, 5, 6]. However, they may also appear in both a strong, stressed form, and a weak, unstressed one [1]. The occurrence of either form is linked to the position and informational function of the word in the sentence [1, 2]. Additionally, certain words (such as 'nevertheless' in English) cannot be clearly assigned to the class of function or lexical words, as they carry a grammatical meaning but their phonological properties are not typically those of function words. Moreover, syntactic categorisation and phonetic/phonological properties interact in a non-trivial way with word frequency [7]. However, the informational import of the function word in the sentence is not always taken into account in the analysis of the phonological properties of such elements. In a diachronic perspective, function words often arise from the grammaticalisation of lexical items [8].
The process of grammaticalisation typically involves a combination of semantic bleaching, i.e. loss of lexical meaning, structural reanalysis, i.e. re-assignment of the item to a new syntactic category, and phonetic erosion, i.e. loss of phonetic substance [9]. In this paper, we expand further on the common tenets on phonetic erosion. Specifically, we aim at unearthing prosodic correlates of a grammaticalisation process that produces a function word. For doing so, we examine the phenomenon known as Jespersen Cycle, which is a diachronic process leading to the formation of a new polar negation from an originally lexical word.

1.2. Jespersen's cycle and information structure

Jespersen's cycle (henceforth JC) is long established as the phenomenon behind the diachronic renewal of negation in several languages [10]. The most notorious example of JC is found in French, where the original negator *ne* is flanked by the pragmatic reinforcer *pas* until both elements are compulsory for the expression of polar negation. Eventually, *pas* will replace the former *ne* and will grammaticalise as the only negative marker: the original lexical word becomes a function word. This is illustrated in example (1) (but see [11] for a recent overview).

(1) a. Jeo **ne** dis
b. Je **ne** dis **pas**
c. *Je dis* ***pas***
'I don't say'

Recent literature reviewed the role of information structure in JC [12, 13]. In particular, in [13], *pas* is described as a special negator contrasting old-discourse information. After rounds of reanalysis, its usage was extended to the denial of brand-new information, allowing *pas* to occur in Broad focus statements.
Differently from French, Italian and many Italo-Romance dialects have a particle *mica/mi(n)(g)a* [14, 15] (developed from the lexical word *mica* 'crumb'), similar to *pas* that however can be exclusively used to deny old information [16]. The use of *mica* in Italian is illustrated in example (2), where the brand-new reply with *mica* is incompatible with the previous question. Vice-versa, in example (3), the proposition is explicitly activated in the previous turn, and the corrective function in the reply licenses *mica*. In other words, Italian *mica* has not undergone the passage from pragmatic particle to function word marking polar negation. Its usage, therefore, cannot extend to the Broad-focus context.

(2) a. *Cosa fai se non ti porto il maglione di lana?*
'What happens if I don't bring you the woollen sweater?'
b. ***Non cucio mica la manica.***
'I won't sew the sleeve at all.'

(3) a. *Cuci la manica, stasera?*
'Are you sewing the sleeve tonight?'
b. ***Non cucio mica la manica**, stasera.*
'I won't sew the sleeve, tonight.'

1.3. Grammaticalisation and phonetic erosion

While phonetic erosion at the segmental level has been described as a typical aftermath of grammaticalisation [8, 17] (see the classical example *going to* > *gonna*), little has been said on its prosodic features ([18, 19] for examples of study in this sense). Certainly, this lack must be attributed to the scarcity of available spoken data from the past.
At least theoretically, we can expect a change in prosodic features as well. It is commonly accepted that different informational configurations, such as different types of focus, are mapped by distinct prosodic properties [20, 21, 22]. A possible *sequitur* of this is that *pas* and *mica* change their prosodic features when grammaticalising from the older Contrastive focus function (CF) to the more recent Broad focus condition (BF). In other words, it can be expected that a change in information structure (and its grammatical restrictions) is replicated at the interface with prosody. We aim at finding experimental support for this prediction. To experimentally test this hypothesis in this paper, we rely on controlled acoustic data. Controlled data will be complemented with natural spoken data in later steps.

1.4. JC cycle in Veneto: why bother

To examine the phonetic correlates of the transition from reinforcing lexical adverb to the function word for polar negation, we cannot rely on languages such as French, since JC is already concluded in this language. In Italian, on the other hand, the effects of JC cannot be observed on *mica*. In other words, French is at an over-late stage and Italian may possibly be at an over-early stage for our purposes. In order to test our main hypothesis, so to compare experimentally the emerging negator, a language with both conditions is needed. In this paper, therefore, we focus on one dialect spoken in Veneto dialect, i.e. the Gazzolo dialect or Gazzolese (see Figure 1), where the change is still in progress.

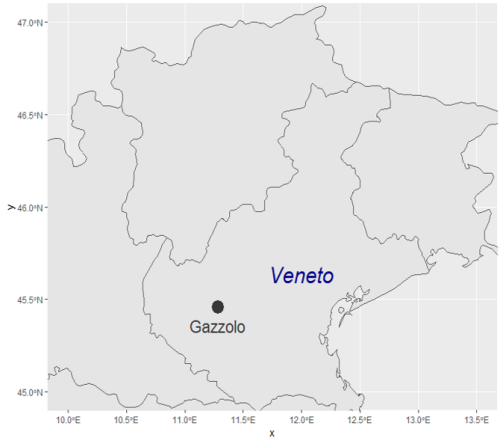

Figure 1: *Veneto region and Gazzolo*

While the neighbouring varieties such as Venetian and Paduan use *miga* as a reinforcer together with the polar pre-verbal negation *no* 'not', in the Gazzolo dialect, the function word *mia* can also be used alone (without *no*), as a marker of polar negation.
In other words, Gazzolese can employ *mia* both in BF as a function word denoting negation and as a pragmatic lexical particle in CF (see examples 4 and 5). Hence, Gazzolese can be seen as belonging to a more advanced stage in JC, where the change is ongoing and both the former and latter functions are equally available. With this in mind, Gazzolo is a suitable testbed for the aforementioned hypothesis: it allows us to zoom into the moment in which the adverbial reinforcer is re-assigned to the polar negator, i.e. when 'people change language' [23].
Besides the primary goals of the paper, the study of JC in Gazzolese can offer empirical insight into different phonological issues. First of all, the status of function words is still much debated, i.e. whether they should be treated separately in the mapping mechanism [2]. By examining the phonetic properties of *mia* in different informational contexts, this study can illustrate the function of information structure in driving the way prosodic interface handles a word as a function or a lexical item. Secondly, the different conditions of occurrence *mia* open up future research paths on the perception of lexical and function words, whether they should be investigated as a categorical distinction or a more gradient one. This latter topic may contribute to understanding graduality in grammaticalisation process.

2. Hypotheses

We hypothesise that the re-assignment change of *mia* to function word will correspond to a different set of acoustic features on the prosodic level. In turn, acoustic features will provide cues to the phonological properties of *mia* in the two functions. In particular, based on the available literature [24, 25, 26], the difference between the two elements can be seen in terms of reduction. More specifically, we put forward the following main hypothesis:

(H1) When *mia* is used in BF with new information, i.e. as a function word carrying the polar negation meaning, it is prosodically reduced as aftermath of grammaticalisation.

Operationally, hypothesis (H1) will be investigated by subsetting it into three parts, corresponding to the three acoustic dimensions of duration, intensity and pitch.

(H1a) *mia* in BF statements has shorter duration than *mia* in CF statements.
(H1b) *mia* in BF statements displays a smaller intensity excursion than *mia* in CF statements.
(H1c) *mia* in BF statements displays a smaller f_0 excursion than *mia* in CF statements.

The reason for this specific choice is twofold. First, we consider the most straightforward acoustic dimensions for exploratory reasons. On the basis of the experimental output, further complex variables (e.g. Tonal Center Of Gravity, [27]) will be surveyed. Second, duration and intensity are correlates of prominence and stress and can hence affect accentual distribution [28, 29, 30, 31].

3. Experimental design

Productions from 12 native speakers from Gazzolo (6M, 6F) were elicited and recorded in .wav format at 44kHz. All speakers declared to possess a high level of dialectal proficiency and were aged between 20-40. On a screen, written dialogues were prompted eliciting the two different pragmatic categories. The target dialogues comprised a set of 5 sentences with *mia* in BF context (example 4) and 5 sentences in CF (example 5); 40 fillers were included.

(4) a. *Cossa feto se no te porto el magion de lana?*
'What happens if I don't bring the woollen sweater?'

b. ***No cuzo mia la manega.***
'I won't sew the sleeve.'

(5) a. *Cuzito la manega, stasera?*
'Are you sewing the sleeve tonight?'

b. ***No cuzo mia la manega****, stasera.*
'I won't sew the sleeve, tonight.'

The stimuli were presented twice in a pseudo-randomised order, obtaining a sample of 240 observations (2 categories * 5 lexicalisations * 2 randomisations * 12 speakers). Monte Carlo simulations were run using *simr* [32] in order to ascertain whether the number of observations is appropriate: a statistical power of 80% was obtained.
For the sake of comparison, the segmental layout was kept as constant as possible across categories and lexicalisations. More precisely, all target sentences shared the same syntactic structure (NEG + Verb + *mia* + Object), with the same syllable count. *Mia* was followed by similar nuclear words with the article *la* plus a noun with the structure ˈCVCVCV starting with /m/ (see previous examples).

4. Results

All analyses were conducted in Rstudio running R version 4.1.2, using packages *lme4* [33], *ggplot2* [34], *effsize* [35], *sjPlot* [36], *itsadug* [37], *mgcv* [38], *rPraat* [39]. The modelling process started by keeping maximal the random effect structures, with random intercepts for items and speakers, and random slope for category. Then, less complex models were compared by using Anova, the best fit was decided on the basis of the lowest Akaike Information Criterion. Before interpreting the model, common statistical assumptions were visually checked. All scripts and statistical analyses are available upon request to the authors.

4.1. Segmental duration

Duration measurements were automatically extracted and log-transformed to reduce the skewness of the distribution (as suggested by [40]). We fitted a linear mixed model to predict length with type. The best-fit model included type, speaker and item as random effects. The model's power is substantial (conditional $R^2 = 0.56$). The model's intercept, corresponding to the Contrastive Focus condition, is at -1.65 $(22\ ms)$. The effect of the Broad Focus condition is statistically significant and negative ($\beta = -0.11$, 95% CI $[-0.16, -0.06]$, $t(200) = -4.11$, $p < .001$; $Std.\beta = -0.22$).
Effect sizes were also checked by using Cohen's d coefficient, the d estimate was $d = 0.58$, denoting a medium effect between pragmatic effect and the duration of *mia*.

4.2. Intensity excursion

Local minima and maxima in the interval containing *mia* were extracted from each IntensityTier using rPraat. Again, a linear mixed model was performed to test the relation between intensity excursion and type: speaker and item were considered as random intercepts. The model with type as random slope produced singular fits and was discarded. The best-fit model has a substantial conditional $R^2 = 0.35$. The intercept, corresponding again to the Contrastive Focus condition, is at 8.6 dB. The effect of the Broad Focus condition is statistically significant and negative ($\beta = -1.16$, 95% CI $[-2.15, -0.17]$, $t(200) = -2.31$, $p = 0.022$; $Std.\beta = -0.32$). Effect sizes, always computed with Cohen's d coefficient, revealed a small effect ($d = 0.34$).

4.3. Pitch

Before applying any quantitative method, a qualitative exploration was carried out by inspecting visually the f_0 curves on Praat.
It was observed that Contrastive Focus sentences typically show a peculiar prominence associated to *mia*, typically shaped as a rising pitch accent. This is illustrated in Figure (2).

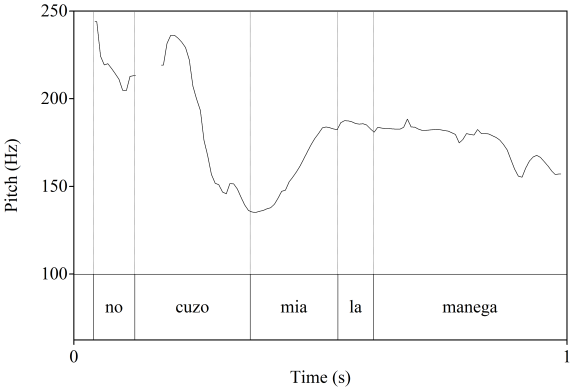

Figure 2: *An example of Contrastive Focus statement.*

On the other hand, a less dynamic pattern is found in Broad Focus statements, where the pitch trajectory is stable on *mia* (*modulo* microprosodic effects of nasals [41]) and tonal events are found elsewhere (Figure 3).

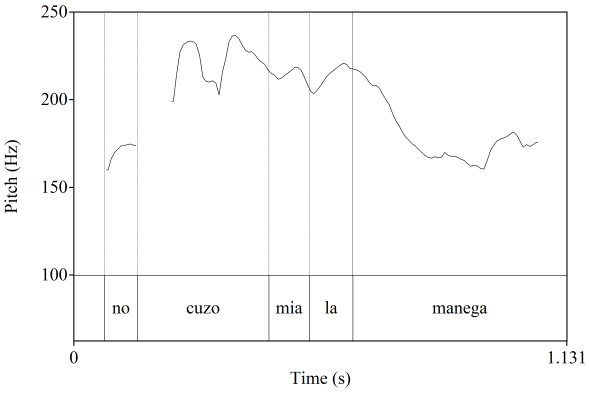

Figure 3: *An example of Broad Focus statement.*

In order to size more systemically the f_0 trajectory, ten equidistant pitch points in the interval containing *mia* were automatically extracted using Parselmouth [42]. In order to estimate the pitch trajectories on *mia*, Generalised Additive Mixed Models were run [43]. The best model, obtained by model comparison, has speaker specified as random effect and category as random slope. The model explained 78% of the variance

($R^2 = 0.78$). The effect of the Broad Focus condition is statistically significant ($\beta = 23.64$, 95% CI $[12.67, 34.62]$, $p < .001$; $Std.\beta = 0.41$). To illustrate our results, we present the plot of the estimated curves (Figure 4) .

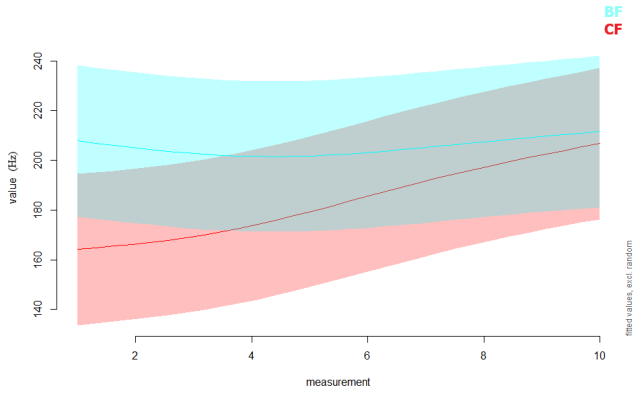

Figure 4: *Estimated pitch curves of the two types for mia in Broad Focus condition (BF, in sky blue), and mia in Contrastive Focus condition (CF, in red), obtained by the function plot_smooth() in the package itsadug.*

While the fitted curve for BF keeps a constant and steady profile, CF exhibits a bigger tonal excursion, displaying a steeper rise. The difference of pitch trajectory and height at the onset of the word is statistically significant, as appreciable in Figure 5.

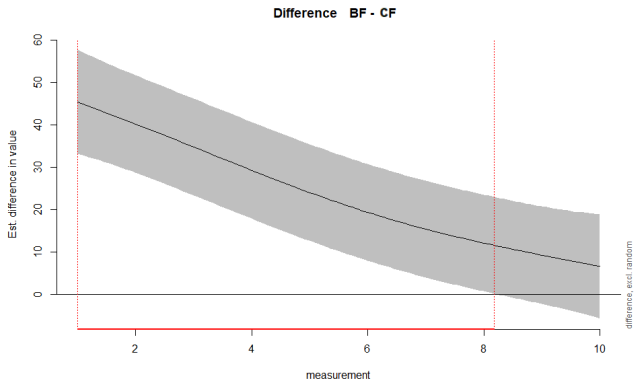

Figure 5: *Difference between the two fitted curves, obtained by the function plot_diff() in the package itsadug. The area where the two curves are statistically different is marked in red.*

5. Discussion

The results confirm that Gazzolese distinguishes between *mia* in different informational contexts. Indeed, *mia* presents different prosodic properties, depending on the focus condition.
Firstly, *mia* is significantly longer in CF than in BF (H1a). Secondly, *mia* has a higher intensity excursion in CF in comparison to BF (H1b), although the effect size was small (but not negligible).
Overall, these results indicate that, when it appears in BF contexts, *mia* is reduced both in terms of duration and intensity excursion, compared to CF.
Additionally, the pitch contour on *mia* in contrastive Focus condition displays a significantly larger pitch excursion (H1c).
These results fit the picture of the typical phonetic erosion induced by grammaticalisation. Reduction in duration and intensity excursion are intrinsically intertwined with the absence of appreciable pitch movement on *mia*. Arguably, if the *mia* is acoustically reduced, it will not be suitable as seen as a metrical head any longer: *mia* as a function word in BF is not a docking site anymore, and cannot lend prominence for Pitch Accent [31]. Based on these observations, we argue that phonetic erosion not only concerns segments, but also prosodic properties.
Interestingly, the grammaticalisation process in JC is mediated through categories of information structure. It is this categorical leap that plays a role in the different phonological representations of the item.
In the case at stake, *mia* is in the process of being assigned to two different categories (lexical item vs function word negator). The distribution of these two categories depends on the informational context; in turn, the informational context will drive the phonetic realisation of *mia* - as well as its phonological properties.
As we mentioned earlier, these results give the chance to survey the effects of an ongoing change due to JC on prosodic properties, which cannot be observed in other languages, such as French. In addition, they point out the role of information structure in the distinction between lexical and function words, thereby contributing to the understanding of syntax-prosody interface. Future research needs to tackle other issues that remain open, concerning both the production and the perception of lexical/function words such as *mia*. For instance, it would be useful to examine spontaneous data and investigate if the distinction between the lexical *mia* and the functional *mia* is perceptually categorical or continuous [1].

6. Acknowledgements

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