

Prosody and function of “iconic lengthening” in Jaminjung

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1 Introduction

The connection between the form of signs in human language and the world they depict has been debated for a long time – Plato indeed discusses in the *Cratylus* (in Ohala 1997) whether an object could have a specific, ‘inherently correct’ name derived from the object itself. The prevailing idea in modern linguistics is that the link between form and meaning is arbitrary, at least since Saussure (1916), who viewed language as a system of conventional symbols, hence making arbitrariness one of its foundational principles. Few would nowadays argue for a ‘natural’ connection between any given word and its referent, with the exception of onomatopoeia. However, linguistic research has shown that iconicity is found in all levels of language: from phonology and morphology to syntax and semantics. ‘Iconicity’ being taken here as including a wide range of phenomena which have been referred to in the literature as sound-symbolism, mimetics, ideophones, and iconicity. Important to this research is the distinction between iconic and diagrammatic iconicity, first introduced by the philosopher Pierce in the 19th century. In iconic iconicity, the resemblance of the sign and its object is based on common features inherent in both: by inspecting the iconic sign we may gather some true information about its object, as for instance, in the aforementioned onomatopoeia. In language however, the similarity is more often diagrammatic, that is to say the relationship between signs mirrors a similar relation between objects or actions. Think of an iconic diagram as a systematic arrangement of signs; none of which necessarily resembles its referent but whose relationships to each other mirror the relationships of their referents. In syntax for example, the structure of sentences can be viewed as iconic, because the sequence of forms usually conforms to the sequence of experience (Haiman 1985; Givón 1991 *inter alia*).

Iconicity, however, is indisputably part of prosody. Intonation conveys the structure of sentences: the rises, falls, and discontinuities of the melodic tune reflect, more or less, the syntactic divisions of sentences. Furthermore, each sentence is expected to contain one particularly important point marked with an accent, in other words, the most pragmatically or semantically salient part of the sentence is iconically marked by a more salient prosody, be it increased intensity, wider pitch excursions or longer durations. The fact that intonation also expresses the attitude and emotions of the speaker in a most iconic manner is usually considered outside the remit of linguistics. Indeed, a vast amount of effort has been expended, and is continuing to be expended, in trying to disentangle the ‘linguistic’ and ‘paralinguistic’ functions of prosody, with the claim that the former achieves some level of arbitrariness and can thus be part of grammar.

Iconicity in prosody is usually associated with pitch (or its acoustic correlate, fundamental frequency). Based on observations of animal as well as human communication, Ohala (1984) first proposed the ‘frequency code’ to account for an iconic association of pitch with size: high or rising pitch suggests small size, submission, courtesy, and uncertainty, while a low or falling pitch suggests large size, assertiveness, aggression, confidence, and threat. Gussenhoven (2002) extended these findings to include two more ‘biological’ codes: the ‘effort’ and ‘production’ codes, the first related to the amount of energy expended on speech production, so that more effort will lead to more precise articulatory movements, and to more canonical and more numerous pitch movements; the second on how much energy is generated during the exhalation phase of the breathing process, so that high pitch is associated with the beginnings of utterances and low pitch with the endings. These codes are used to express meanings, which may or may not be universal. In order to maintain the crucial argument of arbitrariness in language, Gussenhoven stresses the importance of separating the phonetic from the phonological level, arguing that when the universal form-function relations become grammaticalised, they are not necessarily maintained, as illustrated by the seemingly common loss of iconicity of the informational interpretation of the frequency code in the question and statement intonation.

The use of iconic prosody to mark categories usually associated with syntax is less well documented. The phenomenon under scrutiny here, involving the lengthening of a segment to indicate durativity, is not unique to Australian languages but has been reported for languages as far apart as Japanese (Iwasaki 2002) and Zulu (Childs 1994). This paper thus contributes to the expanding cross-linguistic body of research calling for a reassessment of the mappings between form and meaning in grammar.

In this paper, we discuss a construction that displays iconic lengthening in Jaminjung, a severely endangered language of Northern Australia. Jaminjung is part of the non-Pama-Nyungan group, which comprises roughly a fifth of all Australian languages, mostly those of the loosely related families found in the top north of the Northern Territory and Western Australia. The phonology of Jaminjung is similar to that of other Australian languages: it has a typically small inventory of vowel phonemes and a relatively large number of place distinctions for consonants. It has no fricatives, and the voicing of occlusives is not distinctive. Word order is not syntactically motivated; the arguments of verbs and their marking patterns can be freely omitted after an ergative alignment. It has a rich verbal morphology with sets of pronominal prefixes marking Agent/Object and Subject attaching to verbs. It is also distinctive in that inflected verbs form a closed class; they usually form complex predicates with members of an open word class which carry much semantic weight, here termed ‘coverbs’.

We make use of the Construction Grammar model in which language is viewed as a repertoire of more or less complex patterns (constructions) in which form and meaning are integrated in conventionalized and, in some respects, non-compositional ways. ‘Form’ here can refer to any (or combinations of) syntactic, morphological, or prosodic patterns, and “meaning” is taken in a broad sense that can include lexical semantics, pragmatics, and discourse structure. We also follow Chafe (1987) in defining an intonation unit (IU) as a stretch of speech uttered under a single intonation contour, delimited by pauses, changes in tempo, and other prosodic cues, and usually, but not

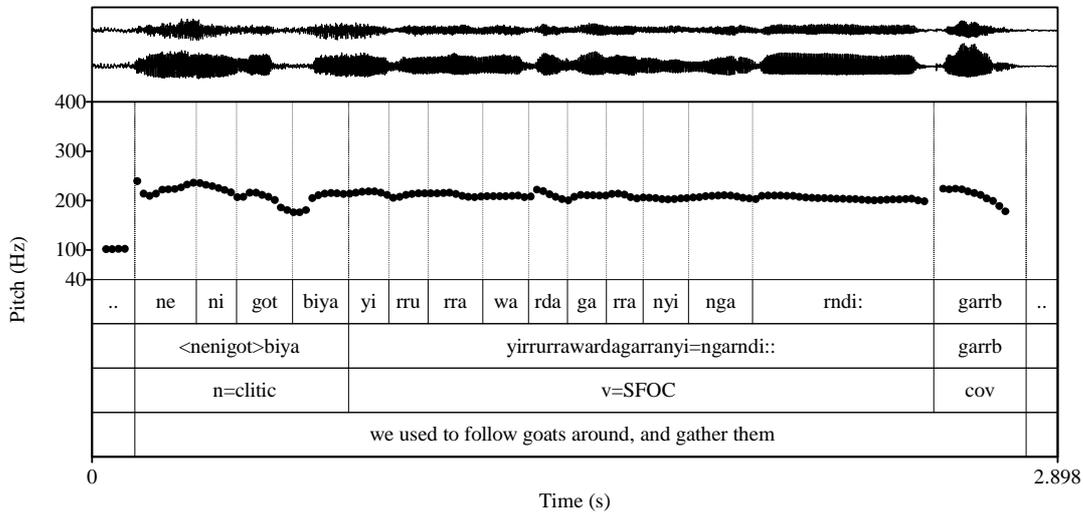
always, corresponding to a clause. For intonation, we make use of the Parallel Encoding and Target Approximation model (Xu, 2005), PENTA hereafter, which defines its key components in terms of function rather than form. It assumes that multiple communicative functions are *concurrently* conveyed through speech. Thus, each individual function has its own ‘scheme’, realized via one or more ‘prosodic primitives’ such as the implementation of a local pitch target, variation in pitch range or duration, or articulatory strength.

The construction under scrutiny typically consists of an intonation unit with extreme lengthening in its (usually) final syllable. It is often, but not always, followed by a second unit, characterised by a sharp falling contour.

Functionally, when used on verbal words, lengthening is a means of representing the durational aspect of an activity, as in (1) where the final syllable of the inflected verb is considerably lengthened in *waya=wung ga-yingi:::*, expressing that the callout continued for some time. When used on nominals and locative demonstratives, it can highlight the physical extent of a material substance or geographical distance. It is clearly iconic in that the extent of the lengthening is directly related to the duration of the event or to the magnitude of the distance or size. Example (2) shows the lengthening occurring on a nominal *wagurra*, ‘rock’, dramatizing the material substance; and example (3) shows it on the inflected verb *yirrunra-wardagarra-nyi=ngardi:::*, ‘follow’, in this case expressing that catching the goats took a long time.

The bounding second intonation unit may be a noun phrase functioning as an afterthought, with locative or allative case (it is never an object), a verbal clause, a non-verbal clause such as a coverb as non-finite predicate, or a pragmatically dependent predicate of the type discussed in Schultze-Berndt (2002), which functions as ‘event delimiting’, since semantically it expresses either a second event delimiting the first event (described in the first IU), or the endpoint of the first event. In example (1) the calling out ends with the arrival of the sunrise, *lany-gu-ngunyi*; in (2) the second IU expresses the goal of the stone grinding; and in example (3) *garb* ‘gather’ marks the end of the chasing after the goats expressed in the first IU.

- (3) *nenigot=biyang yirru-wardagarra-nyi=ngardi:: garrb*
 goat=SEQ 13PL>3PL-IV.follow-IPFV=SFOC gather
 ‘We used to follow goats around then, and gather them.’
 [IP: ES08_A04_03.003-014]



In Section 2, we review accounts of similar constructions in other Australian languages, showing that iconic lengthening is not uncommon and certainly not restricted to Jaminjung alone. We then introduce the corpus used for this study.

Section 3 reports on the comparison of the prosodic correlates of the IUs in complex prosodic sentences made of two IUs, contrasting the lengthened construction with the ‘default’ falling contour usually found in declaratives, and with level and rising (really fall-rise) contours, which also occur in Jaminjung albeit less frequently than the falling contour (see Simard 2010: 319-326). We show that the distinctive prosodic encoding of the lengthened intonation unit is not restricted to extreme durations alone but that it is also marked by a higher relative pitch. We argue that these findings point to the existence of a distinct construction encoded solely by prosodic means, namely lengthening and sustained higher pitch. Although the lengthening itself is gradual, this contour cannot be interpreted simply as a case of paralinguistic information encoded in a gradual manner: the pitch contour is distinct from all other contours, and the grammatical meaning of the construction (durativity, continuation or emphasis on ‘extent’) can be clearly identified. The comparison of the second IU, bounding the first, yields no significant difference whatever type of first unit it follows, suggesting that it is preferable to consider the meaning of the IUs compositionally, the second IU receiving prosodic encodings that reflect their semantic relationship with the first IU.

In Section 4, we discuss the implications of these findings on our understanding of the grammar of Jaminjung, and more generally on our understanding of what constitutes a linguistic sign, currently dominated by the idea of arbitrary connections between linguistic form and meaning. We suggest that the iconically lengthened construction

presented here challenges this view, forcing us to reconsider iconicity as a fundamental feature of language.

2 The lengthened construction

2.1 Lengthening in Australian languages

Studies of Australian languages have identified the iconic lengthening contour as a distinct, recurrent and iconically motivated, but areally restricted, phenomenon (Bishop¹ 2003:89ff, Simard 2010). The construction is well-attested, it has variously been referred to as a ‘narrative high monotone’, ‘stylized high sustained intonation’, ‘continuous action’ and ‘prolonged action’ e.g. Warlpiri (Chapman 2007), Mawng (Hellmuth et al. 2006:3), Bininj Gun-wok (Bishop 2003), Iwaidja (Birch 2003), Gooniyandi (McGregor 1990), Nunggubuyu (Heath 1984), and Alawa (Sharpe 1972).

2.2 Datasets

This study is based on spontaneous or semi-spontaneous speech recorded during fieldwork undertaken by Eva Schultze-Berndt (between 1995 and 2006) and the author (between 2005 and 2007), they consist of:

- narratives consisting of personal anecdotes and mythological stories;
- picture-prompt narratives based on more widely used materials, such as the Frog Story (Mayer [1969] 1994);
- some of the tasks from the Questionnaire for Information Structure (QUIS), materials developed as part of the SFB 632 Information Structure research project (Skopeteas et al. 2006);
- small discourses elicited by means of presenting a verbal or non-verbal context;
- data recorded in the course of the documentation of the ethnobiological knowledge of the speakers.

Given that the datasets are built from a corpus of spontaneous speech recorded in naturalistic conditions, they are limited in the number of utterances they contain: there are 30 tokens of the lengthened constructions and 79 non-lengthened first IUs, which may have a falling (63), fall-rise (14) or level (3)² contour³. Nonetheless, we contend that patterns must be identifiable, otherwise speakers would not use them in their interactions.

Tokens in the datasets are originally identified on a functional basis only: they are all selected from a subset of identified declarative sentences. Subsequently, a formal criterion is introduced in the selection of the datasets, only tokens where lengthening occurs on the final vowel of the first IU are retained. While this appears to be the privileged manifestation of iconic lengthening in Jaminjung, it is important to note that it can occur elsewhere in the IU.

3 Comparison of lengthened and non-lengthened constructions

3.1 Methodology

This section reports on the comparative analysis of the prosodic correlates on the lengthened and non-lengthened constructions. In order to conduct this comparison the

¹ Bishop gives a good summary of the construction in various Australian languages (2003, pp 89-95).

² The results for the level contours need to be treated with caution, given the low rates of occurrence.

³ So far, no obvious syntactic, semantic or pragmatic reasons can explain why speakers use the falling, level or rising contours in the first IU. Further research is needed in this area.

following methodology is used. Firstly, IUs are labeled according to their subtypes and the number of words and their positions in the IUs are coded. Then, all tokens are segmented into syllables; syllable positions within words and within IUs are also coded. The quantitative analysis consists of measurements for each syllable of:

- **Mean F0** — Average of all F0 values in a syllable, in Hz.
- **Excursion size** — Difference between the max F0 and min F0 expressed in semitones for each syllable.
- **Final velocity** — Velocity is a measure of the instantaneous rates of F0 change expressed in semitones per second, taken at a point earlier than the interval offset (here 30ms). It is an indicator of the slope of the underlying target of the interval.
- **Duration** — Time interval between the onset and offset of the syllable, in ms.

These raw measurements then allow for the following analyses:

- the mean pitch in the last syllable of the IU relative to the other syllables in the IU;
- the excursion size which is the variation in minimum and maximum pitch within each syllable and between the syllables in the IU;
- the final velocity of the syllables at the boundaries (first, second, penultimate and final) as an indicator of the underlying pitch target;
- the alignment of pitch targets from the most prominent syllable to the final syllable of an IU;
- the syllable duration of final syllables relative to the other syllables in the IU.

In some of the tests, because the number of syllables in IUs varies from 2 to 15 syllables, but with very few tokens of more than 6 syllables (creating many subgroups with very few tokens that complicate the interpretation of statistics), only the syllables at the left (first and second) and right (penultimate and final) periphery are considered. A statistical analysis is conducted to validate the results.

3.2 Results

For lack of space, the complete set of measurements cannot be discussed in this paper, but the results for the overall duration and pitch will serve to distinguish the constructions.

3.2.1 Duration

Syllable durations vary significantly between the 4 types of first intonation units in this test: falling, fall-rise, level and lengthened, ($F(3, 633) = 20.294, p = .000$), which is not unexpected with the extreme values of those in lengthened IUs (Figure 1). When these are not taken into account, the differences in durations between the 3 types of non-lengthened contours (falling, fall-rise and level) are not significant. The measurements also confirm that final lengthening does occur in all types of IUs.

Focusing on the IUs with lengthened syllables, these are found to have an average duration of 641.97ms, markedly longer than that of the previous syllables in the same IUs. Obviously, that average is only indicative, as the speakers may markedly lengthen the vowel, the longest duration in this dataset being 3713.93ms.

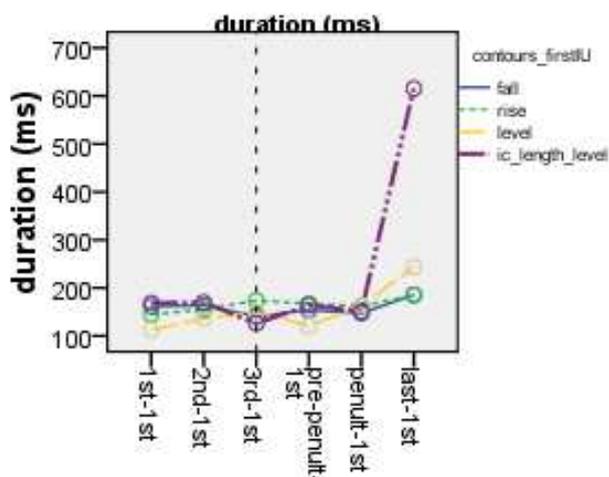


Figure 1) The values of duration in the first IUs with a fall, fall-rise, level, and lengthened contours. Only the first and last three syllables of the IUs are shown.

3.2.2 Overall pitch

Figure 2 shows the average F0 values for the first and last three syllables in lengthened and non-lengthened IUs. The differences in values between all the tested contours are statistically significant ($F(3, 622) = 8.507, p = .000$).

The falling contours have patterns of declining values reminiscent of those of the simple declaratives, starting under 200 Hz and ending around 160Hz (Simard 2010: 302-308). In fall-rise contours, the impressionistic patterns are confirmed by the F0 measurements; they decline until the penultimate syllables, to rise only in the final syllable. Interestingly, but not very importantly for the purpose of this discussion, these fall-rise contours are not just a falling contour with a high final syllable, they indeed have higher F0 values overall than the falling contours.

The level contours start with lower pitch, around 160Hz, and rise slightly in the second syllables to decline only marginally until the last syllable.

Some clear observations can be made from these measurements: the lengthened constructions start with an overall pitch that is very close to that of the 'default' falling contour. But instead of falling sharply, their overall pitch is maintained at a high level until their final syllables (past the dotted line in the graph shown in figure 2).

Furthermore, the measurements reveal that the lengthened construction is not simply an elongated level contour; the pitch in lengthened IUs differs significantly from that of level contours which are lower overall than that of all the other contours.

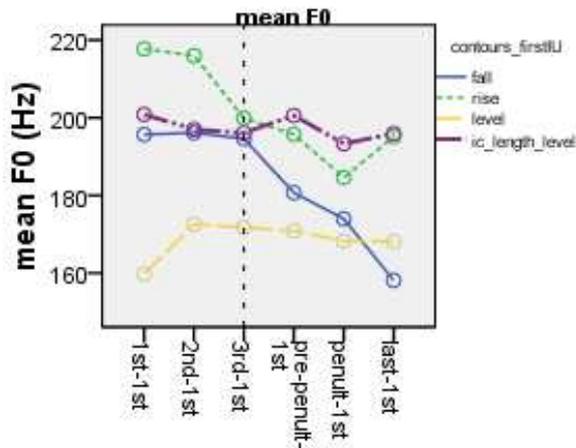


Figure 2) The values of mean F0 in the first IUs with a fall, fall-rise, level, and lengthened contours. Only the first and last three syllables of the IUs are shown.

3.3 Comparing second IUs, whether following a lengthened or non-lengthened first IU: Mean F0 and duration

IUs with a sharp falling contours, functionally described as ‘event delimiting’, are found frequently after an iconically lengthened IU, however they also occur after non-lengthened IUs. This test aims at checking whether they are prosodically identical, or whether their position after a lengthened or non-lengthened IU triggers a different encoding.

The dataset contains the same complex prosodic sentences with lengthened and non-lengthened IUS, it also include prosodic sentences made up of two straightforward verbal clauses, as a comparison point for the second IU.

A full set of measurements were made for all prosodic correlates, including pitch excursion, final velocity and duration. Only the measures of mean F0 are shown here as they are sufficient for our discussion. They indicate significant differences between the subgroups ($F(5, 206) = 5.110, p = .000$). Post hoc tests indicate that IUs we call ‘event-delimiting’ do not vary significantly between each other, but that in turn this group varies significantly with ‘normal’ verbal clauses in second position. The latter are marked by lower averages throughout (Figure 3).

Looking more closely at the ‘event-delimiting’ IUs, the results indicate no significant difference whether they follow a lengthened or non-lengthened first IU. In other words, noun phrases as afterthoughts, non-finite subordinate clauses and pragmatically dependent predicates in the function of “delimiters” have the same prosodic properties following either a lengthened or a non-lengthened first intonation unit. This suggests a distinct ‘event-delimiting’ construction.

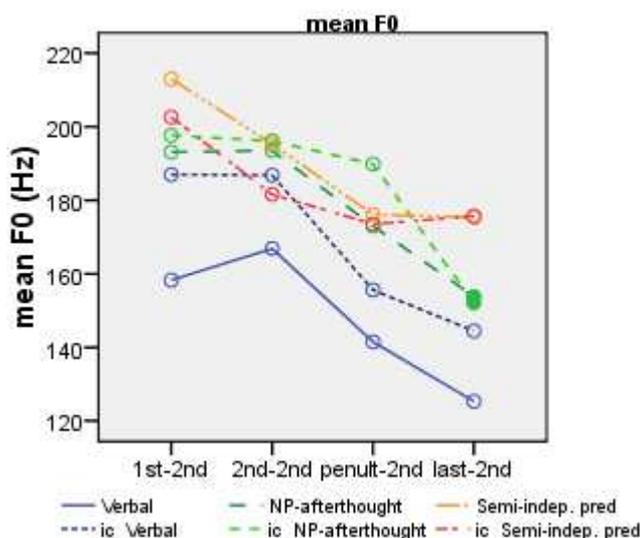


Figure 3 A comparison of the mean F0 values of the various subtypes of IUs in second position, according to whether they follow a lengthened IU or not.

4 Discussion and conclusion

These findings confirm the impression of a “high” level contour, as described for other northern Australian languages, e.g. Bininj Gun-wok (Bishop and Fletcher 2005: 338), and points to the existence of a distinct construction encoded by prosodic means, in this case both lengthening and sustained higher pitch. This cannot be interpreted simply as a case of paralinguistic information encoded in a gradual manner. Although the lengthening itself is gradual, the pitch contour is quantitatively distinct from all other contours, and the grammatical meaning of the construction (durativity, continuation, highlighting of ‘extent’) can be clearly identified. Indeed, these findings suggest that when occurring on verbs, the prosodic morpheme [High:] typically encodes a sense of durative/progressive aspect, regardless of the tense-aspect marking on the verb.

A second conclusion can be made from the investigation of the complex sentences that contain an IU with an iconically lengthened syllable. Apart from confirming the prosodic correlates of the lengthened unit, it also suggests that the meaning of successive IUs in complex sentences should be viewed as compositional⁴, each contributing its meaning to the sentence as a whole. To sum up, Jaminjung complex sentences are usually made up of a succession of IUs corresponding to verbal clauses which prosodically have a ‘default’ falling contour, but other configurations occur: the first intonation units may also receive a rising or level contour, the function of which remains to be elucidated. We have studied an alternative here: IUs corresponding to a stylized lengthened high level contour used to iconically represent the duration of an event or the extent of a material substance or geographical distance. They are often bound by a second IU with a sharp falling contour described as ‘event delimiting’, the encoding of which expresses both their syntactic integration and their semantic relationship with the main clause. The compositional interpretation of the meaning of

⁴ The use of ‘compositional meaning’ here is not to be equated with the same term used by Pierrehumbert and Hirschberg (1990), who state that the meaning of an intonational contour can be compositionally derived from its components, namely its pitch accents, phrase accents and boundary tones.

successive IUs in complex sentences is preferred because these IUs with a sharp falling contour, ‘event-delimiting’, can occur both after lengthened and non-lengthened first IUs.

We can thus posit the iconically lengthened construction as an integral part of Jaminjung’ grammar. This fits well with the description of a ‘construction’ as understood in Construction grammar as an idiomatic instantiation of a conventionalised form-meaning mapping.

This study also aims to contribute to a better understanding of the notion of iconicity and its place in our understanding of language. Language is commonly understood to be a system of conventional symbols shared by a community of users. It is usually held that convention alone determines the relationship between form and meaning. At the lexical level for example, the relation between a word’s form and its referent is determined by convention and is hence arbitrary, with the notable exception of onomatopoeia. However, researchers are increasingly challenging this view (see Perniss et al. 2010 for a review and an application to sign languages). Their studies include a wide range of phenomena, referred to as sound-symbolism, mimetics, ideophones, and iconicity; they may vary in their exact definitions, but all have in common some non-arbitrary, iconic mapping between form and meaning. Moreover, the notion of iconicity can also be applied to the structure of sentences, in which, as suggested by Croft (2003: 102) ‘the structure of language reflects in some way the structure of experience’. The organization of the signs in a sentence can be viewed as mirroring that of the objects or actions in the world e.g. as in the famous collocation *veni, vidi, vici*: a temporal sequence of actions is reflected in the sequence of the three verbs.

We would also like to suggest that the study of constructions such as the one investigated here reveals the importance of realizing that iconicity in language is semantically motivated. Indeed, the perception of iconic features in language depends on speakers and hearers being capable of connecting meaning with its formal expression. We suggest that the iconically lengthened construction presented in this paper is a good example of an iconic and motivated form-meaning mapping. We also argue that this does not contradict the interpretation of these IUs as constructions, as far as this particular mapping is language (or areally) specific, that one would have to acquire the combination of the intonation contour with the function of expressing durative/continuative meaning in order to become a fully competent speaker, and that as such it constitutes a distinct construction type. Iconic signs like other signs still need to be decoded.

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Abbreviations used in interlinear glosses

ABL	Ablative case	LOC	Locative case
ALL	Allative case	NEG	Negative particle
COMIT	Comitative case	OBL	Oblique pronominal
CONTR	Contrastive focus marker	PL	Plural
DAT	Dative case	PROX	Proximal demonstrative
DEM	Demonstrative (distance-neutral/recognitional)	PRS	Present
DU	Dual	PST	Past (perfective)
ERG	Ergative case	RESTR	Restrictive clitic ('right there/then')
IMPF	(Past) Imperfective	SG	Singular
IRR	Irrealis		

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