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Linear Lengthening in Iwaidja: An Event-Quantifying Intonation at the Phonology to Semantics/Pragmatics Interface

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Abstract: This paper investigates the meaning of a specific intonation contour called linear lengthening intonation (LLI), which is found in the northern Australian language Iwaidja. Using an experimental field work approach, we analysed approximately 4000 utterances. We demonstrate that the semantics of LLI is broadly event-quantificational as well as temporally scalar. LLI imposes aspectual selectional restrictions on the verbs it combines with (they must be durative, i.e., cannot describe 'punctual', atomic events), and requires the event description effected by said verbs to exceed a contextually determined relative scalar meaning. Iwaidja differs from other northern Australian languages with similar intonation patterns in that it does not seem to have any argument NP-related incremental or event scalar meaning. This suggests that LLI is a decidedly grammatical, language-specific device and not a purely iconic kind of expression (even though it also possibly has an iconic dimension).

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1. Introduction

This paper will explore a remarkable intonational contour found in Iwaidja, a severely endangered Indigenous Australian language spoken in northwestern Arnhem Land, now mainly on Croker Island (cf. Figure 1). It will be based on data collected in the remote community of Minjilang (Croker Island, N.T.) using experimental elicitation methods as well as more traditional questionnaire-based investigations over the course of several years (2013–2019). It elaborates on preliminary results presented in Mailhammer and Caudal (2019) and will primarily be concerned with the semantics of this contour.
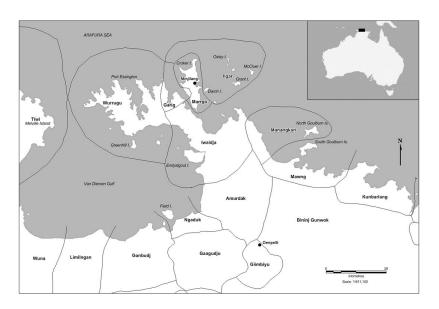
Figure 1. Croker Island and Indigenous languages and their historical locations in northern Arnhem Land, from Mailhammer and Harvey (2018).

1.1. Linear Lenghtening Intonation at a Glance: Formal Properties

Many descriptions of Australian Indigenous languages mention a specific intonation as part of the tune inventory, characterised by a plateau in F0 finishing on a mid to high tone, plus additional lengthening of the last syllable nucleus in the intonational phrase, followed by a drop on the next intonation unit. Example (1) illustrates this phenomenon in Iwaidja, the language under scrutiny in this paper, and Figure 2 gives a graphic representation generated using Praat, cf. Boersma and Weenink (2021). In Iwaidja examples LLI is marked with a double colon "::" in interlinear glosses.[1]

(1) *Barda r-aka-n*   *lda* *jamin::*   *bartuwa.*
     Then 3sg.m>3sgANT-argue-ANT and 3sg.RECP.   EndSequence

'Then they argued for a long while, and (finally) stopped [lit. 'that was it'].

Figure 2. Linear lengthening intonation in Iwaidja, from Mailhammer and Caudal (2019) with added arrow pointing to the relevant section.

Following Mailhammer and Caudal (2019), we will call it *Linear Lengthening Intonation* (LLI). LLIs are widely attested across Australian languages, especially northern Australian languages—cf. Birch (1999), Bishop (2002), Simard (2010, 2013), Ross (2011) and Fletcher (2014). Their formal properties appear reasonably clear, recurrent across all the Australian languages in which they have been documented so far, cf. Simard (2013, p. 67). Lengthening (noted in Figure 2[2] by the symbol H(::), lengthened high tone) and final high tone at the end of the intonational phrase (noted by H%, high boundary tone) are the two core criteria

for identifying LLI in Iwaidja. Figure 2 demonstrates that, at least in this language, linear lengthening intonation need not show a plateau contour. Although the linear F0 progression can precede the last nucleus by a substantial amount of time, linear lengthening occurs on the last syllable of a word, which need not be the stressed vowel; see, e.g., *jamin* in Figure 2, a contrastive pronoun used in reciprocal constructions. The following intonational phrase can show a falling contour (as in Figure 2); a following intonational phrase can also be altogether missing or preceded by a pause of up to ten seconds. By and large, therefore, lengthening appears to demarcate the end of a prosodic unit, possibly an intonational phrase. Note that while we identified examples in our corpus showing not only lengthening of the verb's final vowel, but also of an argument NP or a VP modifier, these are clearly marginal. It is unclear to us whether certain particle-like words or postverbal clitics could combine with LLI marking in Iwaidja, as some do in, e.g., Anindilyakwa, cf. Bednall (2020)—but this would be hardly surprising, as such particles are sometimes difficult to distinguish from clitics, and are known in Iwaidjan languages to be elements of the extended verb template (Singer 2006, pp. 73–74). However, some postverbal clitics/particles do seem to reject LLI marking in Iwaidja, in particular *kirrk* 'completely'—we will come back to this later in the paper.

LLI, as shown in (1), formally and semantically contrasts with other prosodic lengthening, notably one conveying great spatial distance (we suffix the lengthening semi-colons with a D to distinguish this lengthening from LLI). The Iwaidja distal deictic *baki*, 'over there', has a lexicalised, mandatory lengthening attached to it (speakers rejected made-up examples without lengthening), approximating something like lexical tone (i.e., it contrasts with *baki* 'tobacco') (2).

(2) *Baki::::$_D$!*
     There::::$_D$
     'Over there, a long way away!'

Such lengthening is not associated with temporal properties, and cannot be followed by the kind of drop found with LLI. Bednall (2020) observes additional formal prosodic differences between 'true' LLI, and (possibly) distance-related prosodic marking in Anindilyakwa—thus, it can occur on the first syllable of a word, unlike LLI, which is always word final. For want of enough data points relating to, e.g., space-measuring lengthening in Iwaidja, we will leave this issue aside for future research, and focus instead on LLI, whose function is purely temporal-measuring.

1.2. Existing Analyses and the Semantics of Linear Lenghtening Intonation

In sharp contrast to its formal properties, the semantics of LLI has so far proved elusive (Sharpe 1972; Simard 2013). Existing analyses typically ascribe LLI an iconic status regardless of the language in which it was identified. For instance, Bishop (2002, p. 82) claims that it 'dramatises' the ongoing nature of the action' or 'the extent of some referent'—qua an 'amount of a material substance', or 'extent of a geographical region'. However, from a theoretical semantic point of view, what this 'dramatization' function is really about is not very clear; several theoretical concepts come to mind—scalarity in the sense of e.g., Kennedy (2001), and/or some sort of expressive meaning, which could warrant for instance a multi-dimensional semantic approach (see, e.g., Potts 2005, 2007; Gutzmann 2015). Identifying the correct theoretical analysis and formal modelling for the semantics of LLI in Iwaidja will be of central importance to the present account.

It must be stressed that comparative facts alone are sufficient to suggest that the iconic view may not be warranted, at least not in the sense of an on-line, synchronically productive device. Thus, in Anindilyakwa, LLI is most commonly hosted by a special clitic *=wa* (glossed XTD 'eXTendeD' by J. Bednall in his work), possibly derived from adverbial *ngawa* ('still'), cf. (3)–(4), Bednall (2020).

(3)　　*nanga-luku-lukwa-mərrkaju-wa*　　　　　　*d-adə-m-aləka-langwiyu...wa*
　　　　3m/3f-rdp-tracks-follow-pst　　　　　　　　3f-f-inalp-foot-abl.prg . . . xtd
　　　　yingə-ləkarrki-lyəmada
　　　　3f-tracks-disappear-∅
　　　　'he kept following her tracks until they disappeared' ['Search' z47-8, Egmond (2012, p. 275)]

Interestingly, *ngawa* itself can bear LLI as an isolated word:

(4)　　*Engka*　　　　　　　　*na-rndarrka.*　　　　　　　*Na-lawurrada*
　　　　NEUT.OTHER NEUT/NEUT-GRAB-∅　　　　　　NEUT-RETURN-∅
　　　　ebina-langwiya,　　　　　　　　　　　　　　*nga...wa*
　　　　NEUT.THAT.SAME-ABL.PRG　　　　　　　　　still . . . xtd
　　　　'It [the she cat] grabbed another one [another kitten], then it brought [it] back, going
　　　　along the same way (=all the way back)'. [*Bujikeda*, Egmond (2012, p. 220)]

=wa can therefore be regarded as a morphological reflex of LLI—a fact which clearly demonstrates that at least in Anindilyakwa, LLI is not just an iconic intonational contour with a 'transparent' meaning; it involves an arbitrary form/meaning pairing—in this case, what seems to be a conventionalised construction, involving a specific adverbial in a specific syntactic position. In addition, there seems to be substantial formal variation in the inventory of LLI or LLI-like contours available in each given language—as was notably shown in, e.g., Bishop (2002), Bednall (2020). As indicated above, and in contrast to, e.g., Anindilyakwa and Bininj Gun-Wok, Iwaidja does not seem to licence word initial lengthening. If Bednall's (2020) description of two distinct types of lengthening in Anindilyakwa is correct (i.e., if he is correct to assume semantic and phonological differences between word initial vs. word final lengthening, with respectively temporo-spatial/emphatic vs. purely temporal meanings), then LLI is just one out of several 'dramatizing' devices in this language. In this case, we are definitely dealing with two distinct grammaticalised prosodic markings with different form-meaning pairings. Consequently, if iconicity can be invoked, it can only be as a diachronic matter, or as an additional, non-necessary meaning. Synchronically, these constitute two distinct conventionalised form-meaning pairings.

1.3. Background on Iwaidja

Iwaidja is an under-described, severely endangered non-Pama-Nyungan language pertaining to the Iwaidjan language family (Mailhammer and Harvey 2018). Originally spoken in the Coburg Peninsula area of northwestern Arnhem Land, it is now one of several Australian Aboriginal languages spoken on Croker Island. Though until very recently, Iwaidja was the main language of the island, deaths of key speakers in the last 15 years and a general loss of speakers due to non-transmission and migration have adversely affected the speaker base. It is currently unknown if or to what degree Iwaidja is transmitted to children, and there are probably fewer than 50 proficient Iwaidja speakers currently living on Croker Island. These demographic circumstances preclude access to a large pool of speakers, and therefore render extremely difficult the use of quantitative methods in their standard form. Therefore, the type of experimental work we are reporting on in this paper is essentially of a qualitative nature (see Mailhammer and Harvey (2018, p. 332) for details on the documentary status, the level of analysis and the usage of Iwaidja).

Iwaidja can be described as a weakly polysynthetic language (Fortescue 2016), as its verb template is (i) holophrastic but (ii) does not exhibit productive noun-incorporation. Its verb template only comprises four positions, cf. Table 1: the first position is a typical northern Australian pronominal portmanteau exponent, combining person, gender and number information on the verb's valency, plus some TAM information (TAM_1), and optionally, deictic information (with a distal vs. proximal distinction). The verb stem occupies the second position, reduplication exponents optionally occupy the third, and another TAM exponent (TAM_2) occupies the fourth and final position—with TAM_1 and TAM_2 forming a discontinuous single TAM morph, i.e., some manner of circumfixal morph (this is an instance of so-called distributed exponence; see Carroll (2016)).

Table 1. The Iwaidja verb template.

1. Pro.(deixis.)TAM$_1$	2. verb stem	3. (Reduplication)	4. TAM$_2$
nga-	*ngartbuni*		*-Ø*
1SG.PRS-	fall-		-PRS
	'I fall'		

Iwaidja possesses two realis/indicative past tense paradigms. The first of these is an aspectually underspecified anterior tense (ANT), receiving imperfective readings with atelic utterances (except in inchoative, change-of-state contexts, of course), and perfective (or more rarely, perfect) readings with telic and other CoS utterances. The second is a general past imperfective viewpoint (IPFV), with clear pluractional properties as we will see (somewhat reminiscent of imperfective morphology in certain Slavic languages). Given this aspectual partial opposition between the two paradigms, it was highly desirable to control for viewpoint as a key condition of our experiments.

1.4. Our Research Question and Road-Map for the Present Paper

The goal we pursue in this paper is to determine the exact semantics of LLI in Iwaidja and what kind of theoretical and formal concepts should be used to account for its alleged 'intensifying' or 'dramatizing' functions.

The main contribution of the paper is to demonstrate that the semantics of LLI is broadly event-quantificational as well as temporally scalar. This is in a sense different from event scalarity (Kennedy 2012), for its scalar dimension is unrelated to event boundaries and changes-of-state measurement, and rather involves a *contextually determined temporal duration scale*—and a related standard of comparison. We will propose a formal treatment of this typologically unusual category[3] at the semantics/pragmatics interface, reflecting on what we believe to be a kind of semantic/pragmatic complexity on a par with that of, e.g., tenses and temporal discourse connectives. We will specifically argue that it is at once a sentence-level marker, i.e., a VP-modifier constraining the aspectual type of VP-denoted event predicate, and a discourse connective-like item relating two distinct intonation units with respect to temporal ordering.

The paper is structured as follows. In Section 2, we elaborate on the experimental fieldwork we conducted to study LLI-marked event descriptions, using specially designed video clips to elicit naturalistic event descriptions, combined with targeted, questionnaire-based elicitation, conducted on this intonation contour in Iwaidja. As we will see, the methodology underlying our experiments rests on a classic two-component model of aspect (Smith 1991; Klein 1994), distinguishing between viewpoint aspect (essentially, functions denoted by inflectional verbal morphology, ranging over event predicates denoted by verbs) and event structure aspect (or so-called Aktionsart).

Section 3 discusses the results of our fieldwork; we will notably show that the behaviour of LLI in the data we collected is consistent with the view that it denotes an event predicate modifier—i.e., something akin to an aspectuo-temporal adverbial. In addition to this, we will also demonstrate that LLIs also behave like discourse-level aspectuo-temporal markers. They often associate with overt discourse connectives (e.g., the *bartuwa* discourse connective ('and then/that's it')), reinforcing the inherent temporal ordering function of LLIs, and making explicit their interaction with discourse structural parameters. Indeed, LLIs constrain the establishment of discourse relations (Asher and Lascarides 2003); the rising pitch vs. low pitch intonation units involved in a LLI pattern such as in Figure 1 must be related by *Narration*, *Result* or, exceptionally, *Elaboration*.[4] These facts reflect, we will argue, on the typologically complex and fine-grained grammar of event descriptions (especially with respect to event duration, closure and ordering) in Iwaidja, and in general, in Australian languages, cf. Caudal (2022b).

2. Materials and Methods: Experimental Elicitation of LLI-Marked Utterances in the Field

The data presented below were collected experimentally in the community of Minjilang (Croker Island, N.T., Australia, cf. Figure 1), between 2013 and 2018, either by Patrick Caudal and Rob Mailhammer, or by Rob Mailhammer alone, partly assisted by Bruce Birch. They are outcomes of a long-term collaborative project dedicated to the study of the TAM system of Iwaidja, which began with the creation of a dedicated experimental database, namely the Event Description Elicitation Database (EDED).

2.1. The Event Description Elicitation Database: Constitution and Features

The Event Description Elicitation Database (EDED) was originally devised to elicit naturalistic event descriptions in under-documented languages with complex tense-aspect systems, i.e., combining aspectually meaningful lexical verbs (i.e., endowed with Aktionsart meanings), and aspectually meaningful inflectional markers.

The EDED event type ontology can help elicit both simplex and complex event descriptions. Simplex event types comprise: (a) simple stative, positional stimuli (such as those expressed in English by the positional, stative meanings of *sit* (as in 'be sitting') or *stand* (as in 'be standing'); (b) simple activities; (c) simple telic events (both achievements and accomplishments). Complex stimuli include: (a) iterated simplex events, (b) sequences of one or several simplex events, (c) temporal embedding of a simplex, telic event into a complex or simplex event and (d) sequences of distinct iterated simplex (=complex) events.

In addition to Aktionsart features, EDED targets the elicitation of aspectual viewpoint features in the sense of Smith (1991), in combination with all major Aktionsart classes, and including various aspectually coerced readings in the sense of de Swart (1998). Cases include (i) unfinished, imperfectively viewed accomplishment descriptions (e.g., 'Rob was cutting the bread/the tree'), (ii) inchoative states and activities and (iii) non-culminating/avertive readings ('X tried and failed to V/X nearly Ved').

Perfective vs. imperfective viewpoint readings are elicited by means of the visual rendering in the clips of temporal ordering between events—namely strict succession for perfective viewpoint-inducing stimuli, vs. temporal overlap/partial ordering for imperfective viewpoint-inducing films. This corresponds to the now well-known discourse structural effects of aspectual classes of tenses: thus, within a Segmented Discourse Representation Theory (SDRT)-based discourse structural approach (Asher and Lascarides 2003) to context, temporal succession typically associates with the computation of *Narration*, *Occasion*, *Continuation* or *Result* rhetorical relations, whereas temporal overlap will typically lead to *Background* rhetorical relations; cf. e.g., Vet (1980), Molendijk (1983), Lascarides (1992), Asher et al. (2007) and Caudal (2012).

EDED was created over three years, in 2013–2014, by Patrick Caudal and Rob Mailhammer. Additional clips were created in 2016 by Patrick Caudal with the assistance of James Bednall. It currently consists of 250+ short video clips, arranged in different experimental protocols.[5] Each of these protocols comprises between 34 and 83 video clips. The different protocols target the following phenomena:

- Protocol I: interactions between inflectional aspect/viewpoint and event structure
- Protocol II-IV: interactions between tense-aspect information and motion/posture (with sitting, standing, lying, squatting postures, plus iterative vs. eventive events being represented in the films)
- Protocol V: event structure, tense-aspect marking, event reduplication/habituality
- Protocol VI: a combination of all the above

2.2. Using EDED in the Field

In the field, we used EDED protocols with eleven participants, mostly in Minjilang (with one field trip in the community of Warruwi on South Goulburn Island). Nine of these participants were native speakers of Iwaidja (5 male, 4 female, between 40 and 75 years old). Seven completed the experiment in Iwaidja only; two participants also completed it in

English; two participants were proficient speakers of Iwaidja who acquired the language in late childhood or adults (late bilinguals). These two participants completed the experiment in English only. All participants were shown a series of 34 video clips (List V, 2014); some were shown earlier, longer series I, II and III (see Appendix A). Our typical recording setup involved one to three informants, and at least two linguists. Informants were shown each of the films sequentially on a computer screen, and were then prompted to describe what happened in Iwaidja, using one of three past contexts:

1. simple, non-iterated event description context ('X did Y (once)') (prompt: 'what happened *nanguj* ['yesterday']/*wularrud* ['a long time ago']?')
2. iterated past event description ('X did Y for a long time') (prompt: 'what did he/they keep doing till the sun went down *nanguj* ['yesterday']?')
3. past habit context ('X used to do Y') (prompt: 'what did he/they keep on doing all the time *wularrud* ['a long time ago']?

Their answers were recorded using audio and video recording equipment, with up to two video recorders (front/back view); see Figure 3.

(**a**)

(**b**)

Figure 3. Picture (**a**) shows a stimulus as seen by the informants, while picture (**b**) shows a typical set up (with from left to right: linguists Patrick Caudal and Bruce Birch, informant KM, linguist Rob Mailhammer, and informant AB; this photograph was taken on 11 July 2013 at Adjamarduku outstation, Croker Island).

This study and relevant protocols were approved by the Ethics Committee of Western Sydney University (H10237), Chief Investigator Robert Mailhammer.

3. Results

Due to the limited number of participants (by laboratory standards)[6], we were unable to construe our fieldwork experiment into a quantitative research project. We collected, transcribed and collected around 4000 utterances using EDED and complementary questionnaires bearing on a variety of TAM phenomena. However, only a fraction of these utterances bears LLI marking.[7] The resulting corpus is evidently too limited to warrant the application of efficient quantitative methods—in contrast to other contributions to the present volume.[8] LLI was identified perceptually and acoustically in terms of the pitch contour using the formal criteria in 1.1. In general, this was a straightforward process, as LLI is very salient. Both authors identified LLI and there was no disagreement.

Although the empirical generalizations we will propose here are based on solid, iterated attestations of certain phenomena or on grammaticality judgments, it is impossible to measure quantitatively what could be coined 'semantic tendencies' of LLI marking, and in general rank parameters constraining the interpretation of LLI, in a manner comparable to, e.g., Caudal and Bednall (this volume). Such a task will have to be deferred until substantial further investigations can be conducted in the field.

3.1. The Aspectual Profile of LLI: Event Structure Selectional Restrictions, and Distribution with Imperfective Contexts, Posture Serial Verbs Plus Reduplication

Our fieldwork using the EDED database was complemented by translation tasks from English targeting durative contexts ('it lasted for a long time'); the questionnaires were specifically designed so as to cover most Aktionsart parameters (i.e., telicity/atelicity, dynamicity/stativity, durativity/punctuality, scalarity/non-scalarity). It eventually appeared that non-durative, punctual telic events tended not to associate with LLI. This was further confirmed by attempts at eliciting acceptability judgements on made-up Iwaidja punctual telic utterances bearing LLI marking. Several speakers (KM, CM, JC and RN) were adamant that prompt (5) was impossible (see (5)–(7)); some even questioned the very point of producing such forms.

(5) Linguist: "Would you be happy to say something like　　**riwukban*
　　　　　　　　　　　　　　　　　　　　　　　　　3SG.M>3SG.ANT-GIVE-ANT

arlirr::?　　　　　　　Or　　　　　*karlu?'*
stick::　　　　　　　　　　　　　　NEG?
JC:　　　　'*Arlarrarr*'
　　　　　　NEG/nothing
　　　　　　'No'　　　　　(TAIM141124JCRNKMededIw_PC, RN: 01:13:13-40)

(6) [Another informant also reacting to prompt (5)]
RN: 'Uh??　**'ri-wukba-n::*　　　　　　(*arlirr*) Why would you want to say that?'
　　　　　3SG.M>3SG.ANT-GIVE-ANT::　　(stick)
　　　　　'he gave (the stick)'::　　　　　(ibid.)

(7) [Same informant as in (6), rejecting another prompt similar to (5)]
RN: 'But you can't say　**ri-wukba-n::*　　　　　　*ya-wara-n.*
　　　　　　　　　　3SG3SG.M>3SG.ANT-GIVE-ANT　3SG.DIST.ANT-go-ANT
No sense'　　　　　　　　　　(TAIM141124JCRNKMededIw, RN: 01:14:17-21)

In contrast, LLI can associate with 'durative' telic event descriptions (accomplishments), cf. (8)–(9)—note that, while (8) does not clearly culminate, (9) clearly does; it even incorporates a maximal degree modifier (*kirrk* 'completely/all') which makes it clear that the maximal degree on the scale associated with the event was reached, and the entirety of the associated incremental theme (the clothing) was hung up. Similarly, in (10) the overt quantifier *wardad* ('one') makes it clear that a single tree is affected, and *bartuwa* indicates that it was thoroughly and successfully cut. Consequently, LLI cannot be described as semantically imposing a detelicising interpretation with verbs; rather, it appears to leave culmination as a matter of contextual, pragmatic inferences.[9] The non-culmination reading of (8) is contextually determined, not enforced by LLI (though it undoubtedly helps in this example). We will return to non-culminating readings of LLI-marked verbs below.

(8) *Iyi,*　　*nganduka*　*a-bi-ny*　　　　*mana?*　　*Ri-ldalku-ny:*
　　Yes,　　PRO.INT　　3SG-say/do-ant　maybe　　3M.SG>3SG.ANT-CUT-ANT
　　'Yeah, what might he have been doing ?　　　　He was cutting::'
　　(TAIM20130711aM-KM+AB, KM: 00:45:51.071–00:45:53.751)

(9) *Ri-walkarti-ny::*　　　　　　　*buldirrk:i: ... ki*　*r-arndala-ng::*
　　3M.SG>3SG.ANT-PUT.UP-ANT　　clothing　　　　3M.SG.>3SG.ANT-
　　　　　　　　　　　　　　　　　　　　　　　　　PUT.TO.DRY.ANT

kirrk.　　*Ka-walkarti-ny*　　　*yurrngud*　*kirrk,*　*bartuwa.*
ALL　　　3F.SG.ANT-PUT.UP-ANT　high　　　　ALL　　　finished.
'He hung all the clothing up:: he put it to dry (in the sun):: completely. She hung it all up, finished'
　　　　　　　(TAIM20130711aM-KM+AB, KM: 00:46:47.318–00:46:52.558)

(10) *ri-ldalku-ny::*　　　　　　　*wardad*　*ri-ldalku-ny::*　　　　　　*bartuwa*
　　　3M.SG>3SG.ANT-CUT-ANT　one　　　3M.SG>3SG.ANT-CUT-ANT　finished
　　　"He cut it (long time). One he cut (long time) and that was it'
　　　　　　　(TAIM141126ILededIw, IL:00:51:23.800–00:51:27.525)

This suggests that LLI imposes aspectuo-temporal restrictions on the event predicate conveyed by the verbs. More specifically, it seems to select a durative event predicate, whether telic or atomic, and clearly rejects what can be characterised as atomic telic event predicates, cf. Dowty (1986), Caudal (1999)—i.e., as non-scalar punctual event predicates (achievement verbs).[10]

It does not come as a surprise, therefore, that LLI is repeatedly attested in our corpus in combination with markers which suggests a protracted, durative event description. In particular, LLI often pairs up with posture-verb based serial verb constructions (SVCs), cf. (11). As was shown in, e.g., Caudal and Mailhammer (2017), posture-verb SVCs in Iwaidja contribute an aspectual function whose semantics can be likened to that of a pluractional/iterative/durative aspectual verb 'keep on V-ing' in English. In addition to durative 'keep on' SVCs, LLI can combine with reduplication, either morphological (12) or lexical (13). LLI can also associate with imperfective morphology on the verb, cf. (13)–(15); and strikingly enough, its semantic effect is then often closer to a Slavic-style imperfective affix, rather than to an average, e.g., Romance, imperfective viewpoint tense, as it tends then to have pluractional effect, cf. e.g., (13), which spells out through full, lexical reduplication, the pluractional reading of the imperfective form *ka-ldalku-ngung* ('she was cutting it, cutting it')[11]. Additionally, (14) and (15) are also remarkable examples in that they show a pluractional, atelic reading of a verb, followed by an expression lexicalizing a successful termination—illustrating a common tendency among Australian languages to treat culmination as a non-lexical issue (again, cf. Caudal (2022b) for an extended discussion of this issue).

(11) *a-ringan* *Ø-birda-niny::* *ya-wara-n*
3SG.IPFV-STAND-IPFV 3SG.ANT-SING-ANT 3SG.DIST.ANT-go-ANT
'He sang for a long while [lit. 'was standing singing::'] then he stopped [lit. 'left']'
(TAIM141124JCRNKMededIw_PC.eaf, RN:00:06.20-22).

(12) *a-ringan* *Ø-birdadbirda-niny::*
3SG.IPFV-STAND-IPFV 3SG.ANT-RED.SING-ANT
'He sang for a long while [lit. 'was standing singing::']
(TAIM20130717aW-WM+MM-tasc, MM: 00:56:11.380–00:56:12.860).

(13) *ka-ldalku-ngung::* *k-udba-ng* *ka-ldalku-ny*
3F.SG>3SG.IPFV-CUT-IPFV:: 3F.SG.ANT-PUT.DOWN/LEAVE-ANT 3F.SG.ANT-CUT-ANT
ka-ldalku-ny *ka-ldalku-ny*
3F.SG.ANT-CUT-ANT 3F.SG.ANT-CUT-ANT
'she was cutting and put it down and cut, cut, cut . . . [and then finished]'
(TAIM141126ILededIw, IL: 00:11:16.000–00:11:20.796)

(14) *ri-ldalku-ngung* *artbung::* *bartuwa*
3M.SG>3SG.IPFV-CUT-IPFV again:: finished
'He kept on cutting it again and again . . . then he finished'.
(TAIM141126ILededIw, IL 00:10:45.571–00:10:48.849)

(15) *ri-muni-ny::* *barda* *wurlawu*
3M.SG>3SG.ANT-POUND-ANT then ready
'He kept pounding it [the food] and after a time it was ready.'
(TAIM20130721aM-IL+ISL, IL 00:58:13)

Equally unsurprisingly, LLI can freely combine with all types of reduplicated lexically telic verbs, as they describe durative, pluractional events. Examples (16)–(20) were elicited in an explicitly iterative context ('what did he do till sunset?'). Given such a context, both with and without an overt iterative expression (SVC, duration adverbial or expression), LLI is always warranted. Both SVCs and reduplication are commonly associated with LLI in such contexts; their presence reinforces the markedness of the duration expressed, i.e., contributes to further stressing what seems to be an expressive dimension of LLI—which,

in our opinion, exactly corresponds to its so-called 'dramatizing function', or so-called 'iconicity' in previous work.[12]

(16) *ri-ldalku-ny::*   *ri-ldalku-ngung*   *artbung::*   *bartuwa*
      3M.SG>3SG.ANT-CUT-ANT::   3S.SG>3SG.IPFV-CUT-IPFV   again::   finished
      'he cut and cut and cut, he kept cutting and then was finished'
                         (TAIM141126ILededIw-PC, IL: 00:10:42.469–00:10:48.849)

(17) *nanguj*   *a-ringan::*   *Ø-kartbirru-ny::*
      yesterday   3SG.IPFV.STAND.IPFV   3SG.ANT-THROW-ANT
      'Yesterday, he kept on throwing (the stone)'
      (TAIM141124JCRNKMededIw_PC, JC: 00:46:14.982–00:46:20.000)

(18) *a-ri-ng*   *r-arnaka-ng*   *jurra::*
      3SG.ANT.STAND-ANT   3M.SG>3SG.ANT-STAB-ANT   *paper (bag)*
      ya-wurryi-ngan   *manyij*
      3SG.DIST.IPFV-GO.INTO.WATER-IPFV   sun
      'He kept on stabbing the paper (bag) as the sun was setting'
                         (TAIM141124JCRNKMededIw_PC, JC: 00:28:40-42)

(19) *ri-majbungku-ng::*   *k-artbiru-ny*   *[wardyad]*
      3SG.M>3SG.IPFV-LIFT.HOLD.UP-IPFV:::   3SG.ANT-FALL-ANT   [stone]
      [context: slow motion of throwing a stone]
      'He was lifting up/holding up [the stone] (then) it fell.'
                         (TAIM141124JCRNKMededIw_PC, RM: 00:45:03-04)

(20) *nanguj*   *aringan*   *ri-majbungkungku-ng::*
      yesterday   3SG.IPFV.STAND.IPFV   3SG.IPFV-LIFT.RED-IPFV
      'yesterday, he kept on lifting [that stone]'
                         (TAIM141124JCRNKMededIw_PC, JC: 00:51:30.058-32.000)

Both ANT and IPFV inflectional marking appear in our data (the latter with a durative, single-event reading (19) or a durative, pluractional reading, as in (16), (18) and (20)—where the presence of reduplication morphology enhances the pluractional reading). Sequence (21) gives two formally different utterances describing the same iterated event, with speaker RN reformulating in the imperfective of a previous utterance in the anterior. These two descriptions are therefore truth-conditionally equivalent; this demonstrates the pluractional, durative dimension of the semantics of the Iwaidja imperfective.

(21) JC: *nanguj*   *a-ri-ngan::*   *Ø-kartbirruny::*
         yesterday   3SG.IPFV-STAND-IPFV   3SG.ANT-FALL-ANT::
         ya-wurryildi-ny   *manyij*
         3SG.DIST.ANT-GO.DOWN-ANT   sun
         'Yesterday he kept on throwing [the stone] until the sun went down'
      RN: *Ø-kartbirruku-ng*
         3SG.IPFV-FALL.RED-IPFV

                         (TAIM141124JCRNKMededIw_PC 00:46:14-27)

It is also worth observing the reformulation of (18) given in (22), where another speaker immediately describes the same event, but using a different form; the two utterances are given as nearly truth-conditionally equivalent. Starting from the LLI structure in (18), speaker RN paraphrases it in (22) as a markedly emphatic combination of (i) morphological reduplication (*rarnanarkang*), (ii) lexical reduplication (*rarnanarkang jurra* x 2), (iii) plus temporal ordering (*kayrrik* 'and then') and event-bounding (*burruli* 'good/done') expressions—the latter conveying the temporal and discursive function of the low tone, second intonation unit 'closing off' the phonologically complex LLI structure in (18). It is likely that this overtly emphatic reformulation originates in the already substantially emphatic nature of (18) (due to the combination of LLI with an SVC construction).[13] By event bounding, we here refer to event boundedness, i.e., the fact that context or a linguistic expression specifying a limited duration—here LLI combined with an event-bounding

expression or prosodic unit—can ascribe a final point on the temporal trace of event; see, e.g., Corre (2022), Bogaards (2022), this issue, for a similar concept.

(22)	*r-arnanaka-ng*		*jurra*	*r-arnaka-ng*	*jurra*
	3M.SG>3SG.ANT-STAB.AGAIN -ANT		paper	3M.SG>3SG.ANT-STAB-ANT	paper
	r-arnanaka-ng	*jurra*	*kayirrk*	*kuburruburr*	*burruli*
	3M.SG>3SG.ANT-STAB-ANT	paper	and.then	early.morning	good [done]

'He kept stabbing though the paper, then in the early morning it was done.'

(TAIM141124JCRNKMededIw_PC, RN: 00:30:48–00:31:00)

It seems in fact that combining LLI with reduplication, posture SVCs and imperfective qua pluractionality bears the hallmark of marked durativity in general: it further emphasises their duration. In other words, we believe that the so-called 'dramatizing' function described in earlier works can be captured by likening LLI to a marked duration modifier, i.e., something akin to 'for a long time' (possibly, 'for a really long time'), with 'long' constituting a subjective evaluation. In the discussion below, we will spell out, the theoretical and formal consequences of such a descriptive move.

Examples (21)–(23) illustrate particularly emphatic uses of LLI, in that they combine LLI with a posture SVC, and/or morphological or lexical reduplication. This extreme information redundancy ascribes (23) a four-fold, extremely emphatic durative-iterative reading.

(23)	*A-rin-gan*	*r-ahardalkbikbi-ny::*
	3SG.IPFV-STAND-IPFV	3SG.ANT-JUMP.RED-ANT
	'He stood there jumping (repeatedly)'	
	r-ahardalkbikbi-ny	*a-ri-ngan::*
	3SG.ANT-RED.JUMP-ANT	3SG.IPFV-STAND-IPFV
	'He stood there jumping (repeatedly)'	
	Bartuwa.	*Ri-wularru-ng*
	EndSequence	3M.SG>3SG.ANT-FINISH-ANT
	'That was it.	It finished.'

(TAIM20130711aM-KM+AB.eaf, KM: 00:55:58.000–00:56:03.305)

3.1.1. LLI and Aspectually Coerced Readings of Atomic Telic Verbs

Interestingly, it turned out that several speakers who had rejected some combinations of LLI with atomic telic verbs accepted them with special, marked readings. These uses seem to correspond to cases of aspectual coercion.

First and foremost, we should mention avertive readings (cf. Kuteva 1998; Kuteva et al. 2019) of LLI—where avertive designates a grammatical category covering a wide range of non-culminating meanings. Although the realis past anterior tense (ANT) is used in (24), the result normally associated with the relevant verb is not achieved. Furthermore, (24) closely parallels (25), which has no LLI marking, but bears a modal inflection specifying the 'thwarted' intention underlying the past realis verb (indeed, the FUT inflection often has volitional or hortative meanings in Iwaidja). We take such examples to be 'non-culminating' in a broad sense: although the target terminus point is reached, the teleologically predicted or desired result state does not come to hold; hence, an incomplete culmination (see (Caudal 2022a) for an extensive discussion of avertivity and non-culminating telic utterances in the context of Australian languages). Additionally, (26) further illustrates avertivity in connection with LLI, this time with a 'keep on' construction (*waran (V)* 'he went on (V)'), followed by *karlu* (NEG): the intended goal of the iterative volitional construction with 'go' is thwarted, and the LLI marking contributes to this avertive reading.[14]

(24)	*R-urlukba-n::*	*w-ardajb-ung*
	3M.SG>3SG.ANT-STEP.ON-ANT::	3SG.ANT-COULDN'T.BREAK IT-ANT
	'He repeatedly tried (=tried hard) to break it with his foot but failed.'	

(25) *R-urlukba-n,*   *bana-rnukbun.*
      3M.SG>3SG.ANT-STEP.ON-ANT   3SG.FUT-BREAK-FUT
      'He stepped on it trying to break it.'
      (TAIM20130711aM-KM+AB, KM: 00:51:54.348–00:51:55.468)

(26) *W-ara-n::*   *karlu*   *marukurnaj*   *ri-widari-ny.*
      3SG.ANT-GO.ON-ANT   NEG   PRO.INDEF   3M.SG>3SG.ANT-PREVENT-ANT
      'He went on for a while but nothing. Something prevented him from finishing.'
                                              (TAIM20130721aM-IL+ISL, ISL: 00:49:34)

Apart from avertive readings, one could mention a range of cases in which LLI operates at an event's macro-structural level, i.e., at the articulation between sub-events (see (Caudal 2005) for a discussion). Thus, (27) seems to illustrate a situation where LLI bears on the preparatory stage presupposed by the 'come' verb—it indicates that said preparatory stage was protracted.

(27) *bingk-ung*   *kani::*   *bartuwa*
      3SG.ANT.COME-ANT   here-LLI   EndSequence.
      'he came here slowly and then he was there'
                           (Am_20160609_CMDC_IwAmld, CM:3:04)

Additionally, (28)–(29) illustrate a coerced reading, in which a markedly long interval separates the event's culmination/terminus from its normally expected result state. This interval introduces a temporal hiatus between an event's inner stage and its result stage. This 'hiatus' effect is, to the best of our knowledge, a completely new type of aspectual coercion that has not been documented so far.

(28) *ri-wu-ng ::*   *Ø-kartbuni-ny*
      3SG.M>3SG.ANT-HIT,KILL-ANT   3SG.ANT-FALL-ANT
      'he hit/killed 3sg. After a while, 3sg. fell'
                           (Am_20160608_CMDC_LLI, CM: 1:01)

(29) *ri-wunbu-ng::*   *Ø-kartbuni-ny*
      3SG.M>3SG.ANT-HIT.RED-ANT   3SG.ANT-FALL-ANT
      'he hit 3sg several times [at least twice] and then he fell'
                           (Am_20160608_CMDC_LLI, CM:1:00)

3.1.2. Combination with Degree Verbs and Impact on Nominal Quantification

Although we repeatedly tried to elicit LLI marking on scalar verbs, assuming the combination could convey some kind of high degree, or marked degree reading, or degree modulation in relation to some incremental theme argument or subject argument, we have systematically failed to find empirical support for the idea that LLI could interact with other measurable dimensions in the semantics of Iwaidja verbs; it seems thoroughly restricted to temporal duration. For example, we had absolutely no success in eliciting degree clitic/particle *kirrk* ('completely') with LLI. While *kirrk* can mark the post-lengthening intonation drop, conveying the culmination and closing of a protracted event, as in (9), it cannot be lengthened itself.

Speakers rejected all our attempts at construing such 'high degree' readings with both telic and atelic scalar verbs (i.e., with both open and closed scale verbs, see Kennedy and McNally (2005)). LLI cannot convey a high quantity of any argument either, given a scalar or telic verb. This suggests that if LLI associates with some sort of scalar meaning, its scalar meaning cannot map onto an event structure or argument referent-structure, as it cannot interact with incrementality, or argument structure (including with plural arguments) to mark a high degree. LLI is absolutely not about incrementality (nor any kind of event participant structure) or even culmination—it is telicity-neutral, as we have shown above—but about temporal duration.

Therefore, LLI seems to only relate some utterance to a contextually determined standard of duration—probably on the basis of world-knowledge and specific inferences made in a given context. This does not mean that such readings are impossible for LLI in

other languages; however, claims made concerning the interaction of LLI with nominal semantics in other languages (as in, e.g., Bishop 2002) is not consistent with our data from Iwaidja.

4. Theoretical Discussion and Formal Analysis of Our Results

Let us now turn to the theoretical assessment and formal modelling of our results. Three salient generalizations uncovered during our field experiments need to be accounted for:

1. LLI expresses subjectively marked durativity.
2. LLI does not seem to relate its evaluative dimension to an event's development per se, nor through an event's degree scale, nor through incrementality nor the internal structure of the denotation of some argument.
3. LLI normally rejects atomic telic utterances, but when combined with one, it can give rise to various coerced readings. In addition to this, it can (but need not) have non-culminating/non-resultative interpretative effects.

We will try to address these three different properties within a theoretical and formal model of LLI in the remainder of this paper.

4.1. A Temporal Scalar Meaning

It is obvious from the above generalizations that the semantics of LLI is similar to that of an event description modifier—i.e., some sort of aspectuo-temporal adverbial. As was proposed in Mailhammer and Caudal (2019), we will ascribe a tentative type $\langle\langle e,t\rangle,\langle e,t\rangle\rangle$ to its denotation. To be more specific, LLI seems (i) to be restricted to durative events, i.e., to events with a durative run-trace, and (ii) to convey a relative temporal comparison (in the sense of Kennedy 2001). LLI roughly expresses that the event at stake has a duration exceeding what is normally associated with the relevant event predicate—i.e., what we might want to call a temporal duration standard of comparison.

The idea that event predicates are associated with 'typical duration' is not novel, and has been elaborated upon, and even formalised, in past works, including, e.g., Wyngaerd (2001), Tatevosov (2008) and Gyarmathy (2015), among others; see also de Swart et al. (2022) in this issue, for a detailed crosslinguistic analysis of other durative expressions. Tatevosov (2008) thus proposed to formalise the notion of typical duration (TD), as in (30), where $|\tau(e)|$ notes the duration of the temporal trace of event e. Note that we are assuming TD to be contextually evaluated with respect to the speaker's current beliefs and knowledge base; it is therefore a subjective and contextual standard of comparison—not an intersubjective, immutable standard. Tatevosov's definition being extensional, this might prove problematic—but we will leave the issue of a better definition of TD aside for want of space to address it.[15]

(30)   TD(P) = mean{n | $\exists e[P(e) \wedge |\tau(e)| = n]$}

We will assume that LLI is associated with a durative zero morph in Iwaidja (morpho-phonologically realised by particle/clitic = *wa* in Anindilyakwa), effectively an empty clitic attaching to the final syllable of the verb, and (i) causing the linear lengthening of said syllable and (ii) denoting a second order predicate over 'long duration event' predicate *Lgdur*.

Below, we formalise the semantics of *Lgdur* within Asher's (2011) *Type Composition Logic* (TCL), as this framework makes it possible to state aspectuo-temporal constraints on event types in a straightforward way. Capitalizing on the ontological type hierarchy (i.e., sortal hierarchy) underpinning TCL, we will define NON_ATOMIC as the super type encompassing all event types except atomic telic events. π is a semantic stack argument ascribed to all predicative types in TCL; all type restrictions borne by a given function are stored in π and must be met as the relevant semantic derivation progresses. When they are met, during, e.g., the existential closure of some argument, the relevant restriction is pulled from the stack—or else, if they cannot be met during the relevant functional application, a

type mismatch arises. π^* $ARG_1{}^P$:NON_ATOMIC indicates that P's first argument (its event variable e) must be a non-atomic event type, so that when P is bound and the tense operator binds e, if P is an atomic event predicate, then a type mismatch will arise. (Unless coercion bridging functions can apply and save the semantic derivation day—see below).

To put it in a nutshell, (31) indicates (a) that the predicate at stake must be durative (i.e., it must have a non-atomic run-trace) and (b) that the duration of P-events in the context must exceed the typical duration associated with P; furthermore, (31) also states that LLI requires a past temporal anchoring—indeed, it seems restricted to narrative contexts.[16]

(31) $[\![Lgdur]\!] = \lambda P.\lambda e.[P(e)(\pi^* \; ARG_1{}^P$:NON_ATOMIC$) \wedge |\tau(e)| \succeq TD(P) \wedge \tau(e)<n]$

Through (31), we are proposing a clearly productive, compositional semantic contribution for LLI, which sets this phenomenon apart from other prosodic markers studied so far with respect to their interpretative effects—see, e.g., Portes and Beyssade (2015), who argue against compositional analyses of other prosodic markers in French.

It should be noted that (31) is both similar to, and different from, the denotation of subjectively marked, long duration adverbials such as *for a long time* in English, or in any language possessing comparable markers. Existing formal accounts of such duration adverbials should, of course, be discussed to make the analysis proposed in (31) more precise in many respects—notably for habitual/generic or iterative readings; indeed, LLI-marked utterances frequently combine with morphological reduplication, to convey such meanings—see, e.g., (24) above—and even habitual meanings. Providing an account of such iterative and habitual meanings falls outside the scope of the current paper,[17] but one could of course capitalise on insights offered by existing formal semantic works on unrelated languages focusing on durational phrases, from Geenhoven (2003), Boneh and Doron (2008) to, e.g., Landman and Rothstein (2012a, 2012b). Note that the last analysis allows *for* duration adverbials to combine with accomplishments under certain circumstances only, and that in general, *for* phrases can be problematic with most telic verbs. If our fieldwork observations are correct, LLI in Iwaidja differs from *for* adverbials in that it seems to allow for a wide range of telic verbs—though mostly accomplishments—without giving rise to iterated or habitual readings. However, our description is certainly in need of further data collection and experimental validation in the field with respect to habitual and iterative readings, so we should certainly leave a more precise discussion of such issues to future research. This being said, one important semantic difference between LLI and *for* adverbials is already fairly clearly established: if the lengthening component of LLI is followed by a tune-dropping IU, then the overall meaning is more complex than a mere *for* duration phrase. We will return to this further down.

4.2. Accounting for 'Marked' Readings with Atomic Telic Verbs

As we have seen above, the contribution of *Lgdur(P)* is essentially that whatever event e predicate P describes in the current context, it must be a non-atomic telic event variable, and that the duration of $\tau(e)$, the run-trace of e, must exceed that of some 'mean' P-event (e'). However, what if our LLI marker bears on an atomic telic verb?

Then two situations can hold: either a 'bridging function' (a semantic adaptor, metaphorically speaking) can intervene between *Lgdur* and P, so that an otherwise unwarranted functional application can be salvaged, or no such bridging function can be used, and the relevant combination is ill-formed.

Following a strategy developed in Caudal (2020), we will define such 'bridging functions' as lexically conventionalised meaning extensions attached to lexical verbs, or to verb classes at best. Asher (2011) introduced bridging functions to account for what is generally analysed as cases of aspectual coercion (de Swart 1998). Let us consider (27) again (here repeated as (32)).

(32) Ø-*bingk-ung*   *kani::*   *bartuwa*
       3SG.ANT.COME-ANT   here-lli   EndSequence.
       'he came here slowly and then he was there'
                                        (Am_20160609_CMDC_IwAmld, CM: 3:04)

Setting aside the problem of how *Ø-bingk-ung kani* should be analysed at the syntax/semantics interface and assuming that it can be seen as contributing an event predicate akin to *come* in English, then it normally conveys an atomic event description, cf. (33):[18]

(33) $[\![come']\!] = \lambda e.\lambda x.come'(e,x,\pi^*ARG_1^{come}:\text{ATOMIC})$

The application of *Lgdur* to the denotation of *come'* thus yields a type mismatch (NON_ATOMIC $\neq$ ATOMIC). Following a proposal made in Asher (2011, p. 220), we will here use an aspectual coercion[19] mechanism developed within the TCL framework in order to explain how such mismatches are overcome. Technically, if a function *a* of type α requires as one of its arguments *b* a meaning of type β but is instead combined with an argument *c* with some inappropriate type γ, then TCL will look for some context-dependent bridging function $\mathcal{F}$, capable of "accommodating" a type γ meaning into a type β meaning—i.e., $\mathcal{F}$ takes an argument of type γ, and yields a meaning of type β. One can then apply *a* to the result of the application of $\mathcal{F}$ to *c*. That is: *a:α [c:γ] triggers an attempt at deriving instead a:α ($\mathcal{F}$(c:γ)), with $\mathcal{F}$(c:γ) yielding an *a*-appropriate meaning c':β.

The context-sensitivity of $\mathcal{F}$ is rendered by introducing a *polymorphic type* (Asher 2011, p. 219) event function in its logical form, i.e., an underspecified event predicate noted $\varphi_{\epsilon\ (am,\ ...\ a1)}$, where ϵ (a_m, ..., a_1) indicates an underspecified semantic type ϵ, whose interpretation depends on the typing of its arguments a_m, ..., a_1. To give an example, consider the interpretation of *John finished a cigarette*. The denotation *f* of *finish* must be applied to that of *John* and that of *the cigarette*. However, given that *f* requires an event predicate type as its object argument, the semantic type of *f* does not qualify and a bridging function $\mathcal{F}_{\text{finish}}$ must intervene. It should accommodate *f* by incorporating an underspecified event predicate function $\varphi_{\epsilon\ (am,\ ...\ a1)}$. Contextual as well as lexical/real-world knowledge about the interrelation between the argument types of φ_ϵ will make it possible to infer that a smoking event predicate is here involved: given a human agent type and a cigarette type appearing respectively as the agent referent and object referent types for φ_ϵ in the current context, then the latter will be interpreted as having a meaning akin to the denotation of 'smoke', as human agents typically smoke cigarettes. See Asher (2011, pp. 226–36) for further details, as well as Caudal et al. (2012) for several comparable instances of TCL bridging-function based analyses in another Australian language.

Coming back to the analysis of (32), we will posit a bridging function $\mathcal{F}_1$ capable of overcoming the aforementioned type mismatch, by having the ability to extend the denotation of *Ø-bingk-ung* ('he came') in (27/32) with a 'protracted preparatory stage' component of meaning. We are giving in (34) an implementation of $\mathcal{F}_1$, such that its application to the denotation of *Ø-bingk-ung* results in a logical form endowed with a dual (rather than single) event structure, combining the coming event proper (*e*), existentially bound, with a non-atomic, unbound preparatory event λ-variable *e'*; $\tau(e') < {}^\circ\tau(e)$ notes a left-abut temporal relationship between the runtraces of events *e'* and *e*. The application satisfies π's initial selectional restriction in the latter logical form (namely $\pi^*ARG_1^{come}$:ATOMIC); as the coming event *e* is existentially bound in $\mathcal{F}_1$, the corresponding selectional restriction is retrieved from π. The application of (34) to (33) is given in (34'); it makes the non-atomic *e'* variable the main event variable remaining to be bound for the resulting logical form, so that (32) can be straightforwardly applied to its result, as the latter satisfies *Lgdur*'s own selectional restriction in (31) (i.e., $\pi^* ARG_1^P$:NON_ATOMIC).

(34) $\mathcal{F}_1 = \lambda Q\lambda e'\lambda x\lambda\pi.\exists e[Q(e:\text{ATOMIC},x,\pi) \wedge \phi_{\epsilon\ (\text{NON\_ATOMIC, type}(Q),\ \text{type}(x))}\ (e',x,\pi,$
       $\pi^*ARG_1^\phi: \text{NON\_ATOMIC}) \wedge \text{agent}(x,e') \wedge \tau(e') < {}^\circ\tau(e)]$[20]

(34′) a. $\lambda Q \lambda e' \lambda x \lambda \pi. \exists e[Q(e{:}\text{ATOMIC},x,\pi) \wedge \phi_{\epsilon\ (\text{NON\_ATOMIC, type}(Q), \text{type}(x))}\ (e',x,\pi,$
$\pi^*\text{ARG}_1{}^\phi{:}\ \text{NON\_ATOMIC}) \wedge \text{agent}(x,e') \wedge \tau(e') < {}^\circ\tau(e)]($
$\lambda e. \lambda x.\text{come}'(e,x,\pi^*\text{ARG}_1{}^{\text{come}}{:}\text{ATOMIC}))$

  b $\rightsquigarrow \bigcap \lambda e' \lambda x \lambda \pi. \exists e[\text{come}'(e{:}\text{ATOMIC},x,\pi) \wedge \phi_{\epsilon\ (\text{NON\_ATOMIC, type}(Q), \text{type}(x))}\ (e',x,$
$\pi^*\text{ARG}_1{}^\phi{:}\ \text{NON\_ATOMIC}) \wedge \text{agent}(x,e') \wedge \tau(e') < {}^\circ\tau(e)]$

Furthermore, in (34), $\phi_{\epsilon(\text{NON\_ATOMIC, type}(Q), \text{type}(x))}$ indicates that ϕ_ϵ is an underspecified, contextually determined (preparatory stage) event predicate of NON_ATOMIC (i.e., durative) type, whose sortal type (i.e., lexical event type) can be inferred on the basis of the type of predicate Q and the type of its external argument x. The precise semantic nature of ϕ_ϵ can be contextually determined using a TCL Glue Logic rule (36),[21] following the standard TCL rule format given in (35) (cf. Asher 2011, pp. 227–28). In the absence of satisfying types in the logical form of an utterance, (36) cannot apply, and ϕ_ϵ remains undefined; we will argue that this results in a degraded acceptability for the coerced reading.

(35) $(e \sqsubseteq \text{E} \wedge a \sqsubseteq \text{A}) > \epsilon\ (e, a) = P(e, a)$ (with e event type, a object referent type)

(36) $(e \sqsubseteq \text{COME} \wedge a \sqsubseteq \text{ANIMATE}) > \epsilon\ (e, a) = \text{directed\_motion}(e, a)$

Similar bridging functions can be formulated for all the other coerced interpretations identified in Section 3.1; however, for want of space, we cannot spell them out here.

4.3. On the Temporal Ordering, Discourse-Structural Effect of LLI

In addition to its sentence-level, compositional semantic contributions, it appears that LLI is frequently endowed with a discourse-structural function. In particular, it predominantly appears in sequence-of-event contexts, and can certainly mark event ordering (although this is not necessarily the case). This is quite obvious in its very frequent association with an 'event bounding' expression on its right—qua a post lengthening 'closing off' expression, cf. e.g., *bartuwa* 'that's it/finished', as in e.g., (1), (23) and (32).

This might seem paradoxical given the durative and frequently imperfective aspectual semantics of LLI-marked verbs. However, as we have seen above, the Iwaidja past imperfective tense often appears to have a pluractional semantics in such contexts (cf. e.g., (16)), rather than a bona fide imperfective viewpoint content in the style of, e.g., Romance past imperfectives. After all, imperfectivity does not warrant event overlap; it can be associated with sequences of events—as is shown by the existence of, e.g., 'narrative' uses of various kinds of imperfective tenses, and in general by 'temporal shifts' one can apply to imperfective events as well. See, e.g., Caudal (2022c) for a detailed discussion of such issues in the light of a formal theory of discourse structure.

Following the latter reference, and coming back to a question raised in §4.1, we will propose that LLI has the ability to convey constraints on possible rhetorical relations attaching whatever expression will appear on the right-hand side of the LLI tune, in its 'drop' component. LLI should in a sense be viewed as coming in two brands: a single intonation-unit-based prosodic marker without any drop component (and lacking an event-bounding/temporal ordering function) as in (18), and a double intonation-unit based prosodic marker, with an event bounding function. In the latter prosodic construction, the first position corresponds to the discourse referent attached to the LLI-marked VP, and the second to the 'event bounding' expression attached to the tune-dropping intonation unit (cf., e.g., *bartuwa* in (1)/(23)/(32)); temporally speaking, the contribution of the second elements of such structure can be likened to a temporal discourse clitic of the 'now/then' type, familiar from several works dedicated to Australian languages—see, e.g., Ritz et al. (2012), Ritz and Schultze-Berndt (2015) and Browne (2020).

Although we will not propose a detailed formal implementation of the discourse structural function of the event-bounding, event-ordering type of LLIs[22] here, we will put forth some analytical, formal suggestions. If we assume a SDRT-style approach of discourse structure (Asher and Lascarides 2003), with the additional technical twist that temporal-ordering expressions can convey constraints on discourse relations (as proposed in Caudal (2022c)), and that discourse relations can be incorporated in a compositional semantics,

then we can formulate the two following very coarse-grained, tentative definitions for the discourse structural semantics of the two intonational components of LLI constructions (high contour + plateau intonation unit in (37)), with a durative function meaning, vs. dropping tune intonation unit, with an event ordering function meaning in (38)).

(37)   DurativeLLI =$\exists\beta(\beta$:[. . . V . . .]$\wedge$Lgdur(V) $\wedge$?(α, β) $\wedge\alpha$=?)

(38)   BoundingLLI =$\exists\beta($Sequence_of_Event_Rel(α, β) $\wedge$ α:[. . . V . . .]$\wedge$Lgdur(V) $\wedge\alpha$=?])

The definition in (37) merely incorporates into an undefined discourse structural function denotation, the *Lgdur* non-atomic event, durative scalar function already identified above, and applying to the head verbal predicate V in the DRS dominated by *β*. Indeed, *?(α, β, γ)* indicates that the durative LLI-marked discourse referent *β* can attach to the discourse context at segment *α*, via whichever discourse relation type will be compatible with its semantic profile (we are leaving this as an open question for future investigations).

The definition in (38) stipulates that the meaning of the 'dropping tune' in LLI constructions is to introduce a novel discourse referent *β*, by attaching it to some segment *α* previously introduced by the *DurativeLLI* function (37) (cf. condition *α:[. . . V . . .]∧Lgdur(V)*). It connects *β* to *α* via a sequence-of-event inducing discourse relation type *Sequence_of_Event_Rel*. Discourse relations being binary illocutionary functions between speech act referents, within our TCL-type sortal semantics, they are part of the sortal hierarchy, and *Sequence_of_Event_Rel* corresponds to the supertype subsuming the *Narration*, *Occasion* and *Result* rhetorical functions (see Caudal 2022c).

5. Conclusions

The main contribution of the paper was to demonstrate that the meaning of LLI is broadly event-quantificational as well as temporally scalar (in a sense different from event scalarity, see Kennedy (2012)). We have seen that its scalar dimension is unrelated to event boundaries and changes-of-state measurement (notably qua incrementality, or so-called event scalarity), and rather involves a *contextually determined temporal duration scale*—and a related standard of comparison. We have proposed a formal treatment of this typologically unusual category at the semantics/pragmatics interface, reflecting on what we believe to be a kind of semantic/pragmatic complexity on a par with that of, e.g., tenses and temporal discourse connectives. We have specifically argued that it is at once a sentence-level marker, i.e., a VP-modifier constraining the aspectual type of VP-denoted event predicate, and a discourse connective-like item relating two distinct intonation units with respect to temporal ordering. Indeed, like aspectual modifiers, LLI imposes aspectual restrictions on the event predicate conveyed by the verb—it selects for durative atelic or telic event predicates (it either rejects or coerces atomic telic event predicates), and it often co-distributes with reduplication (full or partial), imperfective inflectional morphology and associated posture serial verb constructions (in the sense of Enfield (2002)), all of which have clear pluractional/iterative/durative effects in Iwaidja.

However, LLIs also behave like discourse-level aspectuo-temporal markers: they often associate with overt discourse connectives (e.g., the *bartuwa* discourse connective ('and then/that's it'), reinforcing the inherent temporal ordering function of LLIs, and making explicit their interaction with discourse structural parameters. Indeed, LLIs constrain the establishment of discourse relations as defined in Asher and Lascarides (2003); the rising pitch vs. low pitch intonation units involved in a LLI pattern such as Figure 1 must be related by *Narration*, *Result* or, exceptionally, *Elaboration*. These facts reflect, we argue, on the typologically complex and fine-grained grammar of event descriptions (especially with respect to event duration, closure and ordering) in Iwaidja, and in general, in Australian languages.

Appendix A

LIST I	LIST II	LIST III	LIST IV	List V (19-11-2014)
1. Door open	1. Open closed door	1. Open closed door	1. Sad	1. Singing no posture
2. Baby sleeping	2. Baby sleeping	2. Baby sleeping	2. Hanging	2. Kissed
3. Closed door	3. Closed door	3. Closed door	3. Baby sleeping	3. Baby sleeping
4. Arguing1 fades in out	4. Arguing1 fades in out	4. Arguing1 fades in out	4. Closed door	4. Sang cooked
5. Started Turning wheel II	5. Started Turning wheel II	5. Started Turning wheel II	5. Extending arms	5. Extending arms
6. Sitting gave axe	6. Sitting gave axe	6. Sitting gave axe	6. Open closed door	6. Pierced
7. Started drinking	7. Started drinking	7. Started drinking	7. Black then white	7. Sit down sneezes stands up
8. Rob cutting Pat greeted	8. Rob cutting Pat greeted	8. Rob cutting Pat greeted	8. White then black	8. Crouch stand iterated
9. Cutting the tree down	9. Cutting the tree down	9. Cutting the tree down	9. Singing no posture	9. Threw stone
10. Started Running	10. Started Running	10. Started Running	10. Coughing	10. Lift crate frustrative
11. Hanging up washing	11. Hanging up washing	11. Hanging up washing	11. Spinning	11. Open fridge
12. Sleeping woke up	12. Sleeping woke up	12. Sleeping woke up	12. Drinking	12. Open fridge frustrative
14. Peeling potato	14. Peeling potato	14. Peeling potato	13. Blinking	13. Hanging up washing interruption
15. Thinking	15. Thinking	15. Thinking	14. Kissed	14. Was knocking ran by
16. Cut tree down	16. Cut tree down	16. Cut tree down	15. Squatting grinding	15. Stood up jumped sat down
17. Argued1 fades in out	17. Argued1 fades in out	17. Argued1 fades in out	16. Sing whistle	16. Cut bread
18. Sleeping starts crying	18. Sleeping starts crying	18. Sleeping starts crying	17. Whistle sing	17. Push fridge frustrative succeed
19. Cutting wood gave	19. Cutting wood gave	19. Cutting wood gave	18. Squatting ground scratched	18. Push fridge frustrative
20. Took bottle	20. Took bottle	20. Took bottle	19. Lying ground ate scratched	19. Broke Stick
21. Cut tree down saw	21. Cut tree down saw	21. Cut tree down saw	20. Scratched started singing	20. Rake sweep go
22. Cutting bread II	22. Cutting bread II	22. Cutting bread II	21. Squatting scratched ground	21. Sneezing

LIST I	LIST II	LIST III	LIST IV	List V (19-11-2014)
23. Sad	23. Sad	23. Sad	22. Cooked sang	22. Switch on
24. Throwing stone imperf	24. Throwing stone imperf	24. Throwing stone imperf	23. Shook took out bread	23. Cut tree down saw
25. Peeled potato	25. Peeled potato	25. Peeled potato	24. Sang cooked	24. Cutting wood gave
26. Broke bottle	26. Broke bottle	26. Broke bottle	25. Draw scratch sing	25. Whistled sang whistled sang whistled
27. Sat Drank Put Down	27. Sat Drank Put Down	27. Sat Drank Put Down	26. Turned Wheel Looked out	26. Eat biscuit
28. Stood up left	28. Stood up left	28. Stood up left	27. Turning looking	27. Sneezing gave water
29. Extending arms	29. Extending arms	29. Extending arms	28. Slid grinding	28. Switch off light
30. Baby crying	30. Baby crying	30. Baby crying	29. Scratching sing whistle	29. Looking ate biscuit
31. Spinning	31. Spinning	31. Spinning	30. Started Running	31. walked sat down slept woke up
32. Jumping pointed	32. Jumping pointed	32. Jumping pointed	31. Running	32. Switch on and off
33. Running	33. Running	33. Running	32. Cutting branch	33. Squatting ground scratched
34. Cut bread	34. Cut bread	34. Cut bread	33. Cut branch	34. Kept dropping stone
35. Hanging up washing interruption	35. Hanging up washing interruption	35. Hanging up washing interruption	34. Breaking stick imperfective	
36. Baby sleeping kissed	36. Baby sleeping kissed	36. Baby sleeping kissed	35. Broke Stick	
37. Cutting tree down saw	37. Cutting tree down saw	37. Cutting tree down saw	36. Receiving	
39. Started walking	39. Started walking	39. Started walking	37. Received	
40. Breaking stick imperfective	40. Breaking stick imperfective	40. Breaking stick imperfective	38. Was piercing	
41. Sleeping	41. Sleeping	41. Sleeping	39. Pierced	
42. Shook took out bread	42. Shook took out bread	42. Shook took out bread	40. Throwing stone imperf	
43. Coughing	43. Coughing	44. Jumped	41. Threw stone	
44. Jumped	44. Jumped	46. Sat down fell asleep	42. Cutting bread II	
46. Sat down fell asleep	46. Sat down fell asleep	48. Sit down sneezes stands up	43. Cut bread	
47. Jumping CUT BEG	47. Jumping CUT BEG	49. Turning looking	44. Peeling potato	
48. Sit down sneezes stands up<	48. Sit down sneezes stands up<	50. Walking sat	45. Peeled potato	
49. Turning looking	49. Turning looking	51. Turning wheel	46. Cutting tree down saw	
50. Walking sat	50. Walking sat	54. Threw stone	47. Cut tree down saw	
51. Turning wheel	51. Turning wheel	55. Broke Stick	48. Sleeping woke up	
52. Blinking	52. Blinking	56. Threw stone better	49. Lying grinding jumped	
53. Sit down sneezes<	53. Sit down sneezes<	57. Turned Wheel Looked out	50. Cutting wood gave	
54. Threw stone	54. Threw stone	58. Dug up	51. Sat Drank Put Down	
55. Broke Stick	55. Broke Stick	61. Kissed	52. Sit down sneezes stands up	
56. Threw stone better	56. Threw stone better	62. Hanging	53. Walking sat	
57. Turned Wheel Looked out	57. Turned Wheel Looked out	66. Laughing	54. Lying eating jumped	
58. Dug up	58. Dug up	67. Throw stick	55. Hanging up washing interruption	
59. Cutting branch imperfective	59. Cutting branch imperfective	68. Cut branch	56. Sitting grinding gave	
60. Drinking	60. Drinking	69. Was piercing	57. Stood up jumped sat down	
61. Kissed	61. Kissed	70. Cooked sang	58. Was jumping ran by	
62. Hanging	62. Hanging	71. Pierced	59. Stood up knocked sat down	
64. Threw stone up	64. Threw stone up	72. Scratched started singing	60. Was knocking ran by	
65. Sitting	65. Sitting	73. Sang cooked		
66. Laughing	66. Laughing	74. Sang scratched		

LIST I	LIST II	LIST III	LIST IV	List V (19-11-2014)
67. Throw stick	67. Throw stick	75. Received		
68. Cut branch	68. Cut branch	76. Receiving		
	69. Was piercing	77. Squatting grinding gave		
	70. Cooked sang	78. Squatting grinding		
	71. Pierced	79. Squatting ground scratched		
	72. Scratched started singing	80. Squatting scratched ground		
	73. Sang cooked	81. Sitting ate scratched ground		
	74. Sang scratched	83. Lying ground ate scratched		
	75. Received	84. Sitting grinding gave		
	76. Receiving	85. slid grinding		
	77. Squatting grinding gave	86. Lying eating jumped		
	78. Squatting grinding	87. Whistle sing		
	79. Squatting ground scratched	88. Sing whistle		
	80. Squatting scratched ground	89. Scratching sing whistle		
	81. Sitting ate scratched ground	90. Draw scratch sing		
	82. Lying grinding jumped			
	83. Lying ground ate scratched			
	84. Sitting grinding gave	Discard 1. Door open		
	85. slid grinding			
	86. Lying eating jumped			

Notes

[1] We use Leipzig Glossing Rules with the following addition: ANT=anterior. We use the standard Australianist practical spelling: <rr> = /ɾ/, <rd> = /ʈ/, <ld> = /lʳ/, <rld> = /ɭʳ/, <rt> = /ɖ/, <rn> = /ɳ/, <ny> = /ɲ/ (Iwaidja) <nj> = /ɲ/ (Anindilyakwa), <ng> = /ŋ/, <rl> = /ɭ/, <y> = /j/, <h> = [ɰ]. Voicing in stops is not contrastive. We generally use voiced symbols, except for /g/ which is spelt <k>, so that sequences /ng/ can be easily distinguished orthographically (<nk>) from the velar nasal /ŋ/, which is written <ng>.

[2] The lengthening part of the contour is signaled by an arrow on Figure 2; it lies on the final syllable of *jamin*, and is followed by a low tone, bounding IU situated on *bartuwa*.

[3] While such intonational patterns are common in Australia, to the best of our knowledge they are only attested in some languages of Papua-New-Guinea (Bruno Olsson, p.c.) and possibly in some Austronesian languages (David Gil, p.c.). So at the global typological level, these phenomena seem to be rare, and restricted to a few zones of the world.

[4] Discourse relations are discussed in a more detailed way further down the paper; see also Caudal and Bednall (this volume) for a more substantial discussion of their interaction with aspectuo-temporal parameters in general.

[5] The various sets of EDED video clips, alongside with the relevant documentation, are accessible upon requests from the authors. To this day, EDED has been used by over 20 other researchers in the field, in order to elicit naturalistic event descriptions in a variety of languages.

[6] Initials of the relevant informants are cited in the examples below, but their names cannot be disclosed here.

[7] Overall, roughly 10 to 15% of the EDED-based descriptions offered by our informants contained LLI marking. However this figure should be considered with the utmost caution, as our elicitation protocols were not even throughout our corpus. Some of our EDED protocols involved prompting speakers for re-formulations in iterative contexts, while others did not; some early protocols did not comprise films with visual iteration of events, while later EDED protocols did. This resulted in significant variations in proportions of LLI in each series of EDED protocol. Also, there are obvious competence effects in the production of LLI. Elderly, more fluent speakers are more prone to using LLI than younger, less fluent speakers; this was independently observed by James Bednall and Patrick Caudal for similar lengthening phenomena in Anindilyakwa, also using EDED protocols.

[8] As an aside, our corpus, like that of Caudal.

[9] This is consistent with a general tendency among at least a number of Australian languages, not to semantically encode (a)telicity in a very rigid way. Iwaidja seems thus to also license non-culminating readings of ordinary, non-LLI marked utterances in the

ANT involving seemingly telic verbs (in the sense of e.g., 'non-culminating accomplishments', cf. e.g., Martin and Demirdache 2020). See Caudal (2022a) for further details on that question in Iwaidja and other Australian languages.

[10] We are departing from claims earlier made in Mailhammer and Caudal (2019), where it was argued that LLI did not tend to associate with accomplishment verbs. A more thorough corpus investigation has proven this generalization to be incorrect.

[11] It is quite difficult to render in English the meaning of the corresponding reduplicated verb root.

[12] Clearly, reduplication also has an expressive/evaluative dimension of meaning, hence its being often associated with various scalar/expressive meanings (depreciative/appreciative, etc.). See, e.g., Legentil (2019) for some observations about reduplication in Iwaidja along these lines. Posture SVCs do not seem to possess a similar expressive meaning, but they certainly convey a scalar temporal content (i.e., 'for a long time').

[13] By 'emphatic', we mean that the speaker further emphasises the evaluative dimension of the temporal duration here measured—it is really, REALLY long.

[14] Caudal (2022a) argues that from an areal typological point of view, reduplication and LLI are common markers for construing avertive readings in numerous Australian languages.

[15] Moreover, whether or not the difference between the event's duration, and the standard of comparison determined by (TD) is emphatic, might well be a contextual matter. When the prosody is extremely marked, or when additional durative markers are used (reduplication, SVCs), then the event being refered to seems to have significantly longer duration than the relevant standard of comparison—hence a feeling of emphasis. However, we will not attempt to formalise further here this possible context sensitivity, as our data is not sufficient for us to ascertain whether non-emphatic readings of LLI are possible, and if so, in what context they appear.

[16] Instances of LLI in our corpus involved a past temporal anchoring; speakers seemed extremely reluctant to produce it outside of such contexts. Whether LLI can mark a present tense-marked utterance, providing it is an instance of so-called 'narrative present', is an empirical question we must leave open for future fieldwork.

[17] For instance, providing a more precise account of (24) would require a detailed formal theory of the meaning of verbal reduplication in Iwaidja. Given the complexity of this question—morphologically, semantically and pragmatically—we cannot address it within the confines of this paper. However, see Legentil (2019) and Caudal et al. (2021) for some tentative, partial implementation, and an overview of this phenomenon.

[18] It should be noted that we did not ascribe DP-type to the subject argument of the verb (unlike in e.g., Caudal et al. 2012), for the sake of simplicity—and because unless the verb receives an explicit subject NP in the syntax, it is actually debatable whether such projections are legitimate for verbal lexical entries given a polysynthetic language such as Iwaidja.

[19] With the important proviso that aspectual coercion is seen as involving conventionalised bridging functions, as suggested in Caudal (2020); the latter reference observes that many aspectual coercion effects synchronically observed, are the result of construction-driven, lexical evolutions through time—therefore, they should not be regarded as lexically 'abstract', semantic-type driven functions. They are conventionalised uses of particular verbs (and/or particular grammatical forms). For want of sufficient data to clarify this issue, we will not discuss here the lexical/syntactic locus of the encoding of bridging functions attached to particular LLI-marked verbs. It could well be that these are collocational matters. For simplicity's sake, we will simply assume they are lexical meaning-extension rules attached to verbs or verb classes.

[20] *e:*ATOMIC stipulates that *e* is of type ATOMIC. Arguments, once bound, are removed from π. This notation indicates that *e* is an atomic event type.

[21] Whether or not (36) would rather make more sense as a lexically encoded kind of implication is an issue we will leave open for future research. A theory in the spirit of James Pustejosky's *Generative Lexicon* (cf. Pustejovsky 1995) could well be a potential solution to such puzzles. Although TCL was construed specifically to address some shortcomings of the *Generative Lexicon* theory, we feel that simply adding declarative rules such as (36) to a Glue Logic component is not a satisfying answer. It intuitively feels too unstructured a model to allow for proper generative control.

[22] While it might be tempting to posit a unified analysis of the two types of LLIs, we do not wish to commit ourselves to such an idea here. First, because positing a unified analysis is not necessarily more parsimonious, as underspecification/ambiguity raises generative concerns which may turn out more costly than positing two separate form/meaning pairings in the first place. More often than not, 'monosemous' analyses merely displace the locus of complexity in language processing (and generation)—they do not always reduce it. Second, because it is quite possible that the event-bounding LLI has different formal properties from the other type of LLI. By itself, this could well suggest we are dealing with separate—though related—intonational constructions. Therefore, we will leave this question open for future research.

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