

Duration iconicity and pace in fictional narrative

An experimental study

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Abstract. This study examines a less well known manifestation of temporal iconicity in narrative: the iconic representation of duration. Work on literary narrative [10] has observed that in scenes (but not in narrative summaries) the time it takes the narrator to tell a sequence of events is roughly the same as the time that sequence takes in the world of the story. If the narration pace remains constant, that implies that a shorter sentence should relate a shorter part of the event sequence, and a longer sentence a longer part. This study is the first to measure the effect of sentence length in words on the readers' impression of duration using a verbal duration estimation task from psychophysics. The results also suggest that that effect might only exist for short events that last seconds and seems to disappear when event duration exceeds one minute.

Keywords: narrative · duration · pace · iconicity · experimental pragmatics

1 Introduction

The meaning of an *icon* resembles its form, or is isomorphic to it in some dimension [12, 22, 30]. One form of iconicity in spoken languages is the chronological representation of event order, famously pointed out by Roman Jakobson:

The chain of verbs—*Veni, vidi, vici*—informs us about the order of Caesar's deeds first and foremost because the sequence of co-ordinate preterits is used to reproduce the succession of reported occurrences. The temporal order of speech events tends to mirror the order of narrated events in time... [17, p. 27]

That tendency is supported by vast empirical evidence [23, 24, 27, 38] and is widely believed to obtain by default, that is, when temporal relations are not otherwise linguistically marked [9, 39].

In contrast, the idea that the duration of an event could be mirrored by the length of the sentence seems questionable at first glance. Isn't duration more closely tied to the world knowledge associated with words? In no world does (1-a) represent a longer event than (1-b), even though the sentence is twice as long. That is simply because the concept of putting down a bag implies a much shorter duration than the concept of building a fence.

- (1)
 - a. A passenger put his bag on the seat.
 - b. Jane built a fence.

However, work on pace in literary narrative [10, 11] suggests that there must exist a correlation between the story time covered by a scene and the length of the corresponding text passage. The goal of this paper is to test that prediction experimentally. Do readers interpret longer sentences as representing longer events, other things being equal?

Section 2 elaborates on the notion of a scene, discusses related insights from literary narratology and their implications for the iconic representation of duration. Section 3 reviews the scarce linguistic literature on temporal iconicity beyond chronological order and presents a possible explanation for why time might be reflected iconically in narrative: the narrator relates the events of the story as if giving a *live report* of those events, which creates pressure to report very short events quickly. Section 4 presents the experimental study; the results partly support and partly disprove that explanation.

2 Pace in fictional narrative

In a modern novel, the narrative typically alternates between two pacing patterns: the *narrative summary* and the *scene* [11]. A narrative summary, such as (2) from J.R.R. Tolkien's *The Lord of the Rings*, is characterised by a fast progression through story time and a low level of granularity in the presentation of events. In 120 words, (2) covers probably between 30 minutes and a couple of hours of events in the world of the story.

- (2) At dusk the Company set out, and turning now half east they steered their course towards Caradhras, which far away still glowed faintly red in the last light of the vanished Sun. One by one white stars sprang forth as the sky faded.

Guided by Aragorn they struck a good path. It looked to Frodo like the remains of an ancient road, that had once been broad and well planned, from Hollin to the mountain-pass. The Moon, now at the full, rose over the mountains, and cast a pale light in which the shadows of stones were black. Many of them looked to have been worked by hands, though now they lay tumbled and ruinous in a bleak, barren land.

A scene progresses slowly through the story time and has a high level of granularity. In roughly the same amount of text, (3) covers between half a minute and a minute of events, and each event expressed by a single sentence (e.g. *Frodo groaned*, *'Come, Mr. Frodo!'* [*Sam*] *cried*.) only takes a few seconds.

- (3) Frodo groaned; but with a great effort of will he staggered up; and then he fell upon his knees again. He raised his eyes with difficulty to the dark slopes of Mount Doom towering above him, and then pitifully he began to crawl forward on his hands.

Sam looked at him and wept in his heart, but no tears came to his dry and stinging eyes. ‘I said I’d carry him, if it broke my back,’ he muttered, ‘and I will!’

‘Come, Mr. Frodo!’ he cried. ‘I can’t carry it for you, but I can carry you and it as well. So up you get! Come on, Mr. Frodo dear! Sam will give you a ride. Just tell him where to go, and he’ll go.’

In his influential work on literary narrative, Gerard Genette [10] defines the pace of a scene as one where story time (the duration of the fictional event sequence) equals the narrative “pseudo-time”. Narrative time is the time it takes the narrator to tell the story. However, Genette rejects the idea of measuring it in time units directly, arguing that the “duration” of a written text can only be assessed by its length in words, lines, or pages. He circumvents this complication by assuming that the equality of story time and narrative time is given in a scene that consists entirely of characters’ speech. Indeed, the story event of Sam uttering “*Come, Mr. Frodo! [...] Just tell him where to go, and he’ll go.*” takes about as long as it would take an oral narrator to utter the last paragraph of (3). Narrative passages that present non-speech events are compared to this golden standard by the extent to which they approximate the speed of speech.

To simplify things for the purposes of the argument in this paper, I will take the expected reading time of a passage as a proxy for its narrative time. After all, this is the way narrative time, as *time* and not some spatial surrogate for time, manifests itself to the reader. Based on a meta-analysis of 190 studies, Brysbaert [5] estimates that the average silent reading rate for adults in English is 260 wpm (words per minute) for fiction. The average oral reading rate is 183 wpm, based on 77 studies. That means that a 125-word-long passage like (3) takes on average 29 seconds to read silently, and 41 seconds to read aloud. This comes close to our intuitive estimate (30–60 seconds) about the duration of the sequence of events it describes. Since the narrative time based on oral reading rate seems to fit that estimate better, I will use that rate henceforth.

Following Genette, now we could define pace as a relation of story time to narrative time, cf. (4). Scenes are passages where this factor is close to one. For instance, the pace of (3) is somewhere between 0.73 (30/41) and 1.46 (60/41). We cannot say exactly how close that factor needs to be to one for the passage to count as a scene, but it should definitely not differ from it by an order of magnitude. For comparison, the average oral reading time for the narrative summary in (2) is 39 seconds. If we assume that the story time of (2) is one hour, or 3,600 seconds, its pace factor is 92.3. That is very far from one.

$$(4) \quad \text{pace} = \frac{\text{story time}}{\text{narrative time}}$$

The assumption that the pace of a scene is defined by a specific constant implies that the longer the scene is in words, the longer the corresponding fictional event sequence is in units of time. That is duration iconicity, at least at the level of an entire scene. But what does it mean at the level of a single sentence that describes a single event? The duration of a sequence of events is a function of (a)

the durations of events it consists of and (b) the durations of intervals between those events. This gives rise to the following hypotheses:

- (5) **Event Duration Hypothesis:**
In a scene, a longer sentence describes a longer event.
- (6) **Interval Duration Hypothesis:**
In a scene, a longer sentence describes an event that is separated by a longer interval from the previous and/or the next event in the sequence.

Since event duration is strongly constrained by the lexical semantics of the verb, cf. (1), while the intervals between events are often not specified, (6) might seem more likely to be true. However, both hypotheses can be true for different types of events, or there could be a trade-off between event and interval duration in the extent to which they “absorb” the narrative time in the story time.

Indirect support for sentence-level distribution of narrative time can be found in discussions of pace in practical guides on the craft of writing. For instance, Rayne Hall [15, p. 13] advises authors to use short sentences like (7-b) instead of long sentences like (7-a) to create an impression of a faster pace in a scene.

- (7) a. He waved his double-barrelled revolver, drawn in a hurry from wherever in the folds of his greatcoat he kept it.
b. He whipped a revolver from the folds of his greatcoat.

It is important to note that *pace* is meant in a completely different sense here. A more suitable term for it would be *event density*, or the number of verbalised events of the main narrative sequence per unit of story time, cf. (8), cf. Wolf’s similar notion of *narrative density* [37]:¹

$$(8) \quad \text{event density} = \frac{\text{number of verbalised events}}{\text{story time}}$$

It should reflect the intuition that in a scene that mostly consists of longer sentences like (7-a) the verbalised events of the main narrative sequence would be more spaced out in the text and the reader would need longer to read about the same number of events than if they were expressed by shorter sentences. But only if reading time correlates with the story time, should that result in an impression of slower progression of the story.

Importantly, the fact that we intuitively perceive a contrast in “pace” or density between (7-a) and (7-b) suggests that the near-equality of narrative and story time in scenes is also realised at the level of individual sentences. We can

¹ A verbalised event is verbalised, i.e. expressed by a specific verb or verb phrase. So, *One by one white stars sprang forth* in (2) is one verbalised event, and not one event per star. Second, only events that are part of the main narrative sequence, or realised by what Labov called *narrative clauses* [21], should count towards (8). That excludes all kinds of states, eventualities realised by tense and aspect forms that do not advance the story time, e.g. the progressive and the past perfect in English [6, 7, 18], as well as eventualities realised by subordinate clauses.

only have such an intuition if the length of the sentence is, in fact, proportional either to the corresponding event duration or to its temporal distance to surrounding events, and so at least one of the two hypotheses in (5) and (6) should be true. To date, linguistic investigations of this phenomenon are almost completely missing. The goal of the present study is to test empirically whether duration iconicity exists at sentence level. Some previous studies tangentially related to this issue are reviewed in the next section.

3 Temporal iconicity beyond order

3.1 Intervals between events

Ironically, the iconic representation of temporal order is not the most interesting type of iconicity featured by Julius Caesar’s saying *Veni, vidi, vici*, ‘I came, I saw, I conquered’ (cf. quote from Jakobson in section 1). Müller [26, p. 305] even describes its association with order iconicity as a “misuse of a quotation”. He points out that a by far more striking effect of the saying is the suggestion of mastery and *swiftness* with which Caesar performed those actions. Müller attributes this effect, at least partly, to asyndeton—the lack of explicit syntactic linkage, e.g. a connective like *and*, between the verb forms—which creates the impression that no time intervenes between the actions.

This echoes some of the observations made in the previous section. Since the phrase contains no other words but the verbs, its event density is maximal for what one could achieve with those verbs. Müller’s reference to asyndeton implies that even such a short word as *and* (or rather its Latin equivalent, *et*, *-que*, or *atque*) would add to the narrative time and to the story time, by consequence. This explanation is in line with the Interval Duration Hypothesis (6), which says that sentence length iconically reflects the length of intervals between events.

Intervals between events have been discussed in connection with order iconicity. Based on ideas from Dowty [9], Zwaan [39, p. 1197] proposes that “the default assumption in the interpretation of narrative time is not only that successive sentences describe successive events but also that contiguous sentences describe contiguous events” (the *strong iconicity assumption*). Zwaan interprets contiguity as a zero or very short time gap between events. His experiments show that adverbials like *an hour/a day later* that contradict that default lead to a greater processing cost than adverbials that agree with it, e.g. *a moment later*.

The only study that I am aware of that explicitly manipulated intervals between events both in the story time (encoded by adverbials) and in the narrative time (by varying the amount of intervening text) was conducted by Rinck and Bower [31]. Participants first memorised the layout of a building with interconnected rooms that contained different objects. Then they read narratives (approx. 20 sentences long) about a protagonist, e.g. the janitor Calvin in (9), who moved about the building performing different actions. There were five versions of the final part of each story: two that contained all the sentences in (9) and differed in the adverbial, e.g. *after ten minutes* vs. *after two hours* in (9-d); two

without the part in (9-c); and one control condition that ended with (9-a) and the entire (9-b)–(9-d) was missing. Then participants saw a probe that named an object and the room that Calvin passed on his way from the repair shop to the experiment room. They had to verify if that object was in that room. Reading times and probe reaction times were measured.

- (9)
- a. [...] So he walked from the repair shop into the experiment room.
 - b. This room was a big mess, and Calvin would have to clean it up before he could go on.
 - c. Looking around, Calvin thought that someone must have had a party in here. He saw empty pizza boxes, Coke cans, bottles of beer, and bits of pop corn everywhere. There was also a puddle of beer on the floor because someone had dropped a bottle.
 - d. After *ten minutes/two hours*, Calvin was finally done cleaning up the room.

If the intervening description in (9-c) increased the perceived time interval between Calvin’s actions of walking into the room (9-a) and finishing the cleaning (9-d), one would expect to observe a similar increase in reaction times as after the adverbial that indicated a longer interval (*after two hours*), cf. the effect measured by Zwaan [39]. Rinck and Bower replicated the effect of the adverbial, but found no effect of the increased narrative time between (9-a) and (9-d).

As it stands, this negative result says little about the iconic representation of interval duration. If the passage in (9) was meant as a scene, then (9-c) would have only added a few seconds to the story time. Such a small increase would be lost in the ten minutes or two hours encoded by the adverbial. If a few seconds is too short to count as a significant gap between events in the sense of Zwaan’s strong iconicity assumption, then the intervening text would have to be much longer to produce any effect.

3.2 Speed and speech rate

One written sentence can be taken to have a longer “duration” than another only if it has more words (or syllables, or letters) and if we assume a certain constant rate of words per time unit that will allow us to translate word numbers into time, as we did in section 2. In contrast, a spoken sentence has a specific measurable utterance duration. Speech rate, on the other hand, is variable, so one and the same sentence spoken slower or faster can have different utterance durations.

Several studies have looked at speech rate and its ability to iconically reflect temporal properties of the described events [25, 28, 29, 33, 34]. In one of the experiments conducted by Shintel, Nusbaum, and Okrent [34], participants watched an animated dot move either left or right at different speeds across the screen, and were instructed to use the sentences *It is going left* or *It is going right* to describe its motion. The mean utterance duration turned out to be significantly shorter for fast animations than for slow animations. Moreover, when these utterances were replayed to listeners, it was found that listeners were better than chance at guessing whether the speaker had watched a fast or slow animation.

However, it was not clear which temporal characteristic of the event was reflected by utterance duration (and speech rate). Since the dots always moved across a fixed distance, faster animations were also shorter and slower animations were longer.² Shintel et al. reasoned that since the sentences were in present tense, speakers might have felt pressed to finish their utterance while the video was playing and modulated their speech rate to fit the video duration rather than to reflect the speed of the event. They conducted a follow-up experiment, in which they kept the duration of the animation constant and only varied the motion speed. Again, utterance duration was found to be significantly shorter for fast animations. Unfortunately, Shintel et al. did not try the reverse—to keep the speed constant and only vary the duration. However, their guess that the speakers were feeling pressure to produce the utterance while the event was in progress is interesting for a theory of duration iconicity.

Shintel et al.’s experimental task could have been interpreted by the participants as to give a *live report* of the animations. Live report as a discourse genre is familiar to most from sports broadcasting and has characteristic properties dictated by the co-temporality of the report and the reported events. For instance, in their corpus study of English and German live football commentary Müller and Mayr’s [25] distinguish between three types of utterances. (a) On-line descriptions are utterances that report the events happening on the pitch and are closely tied to them in time: the onset of the utterance must be no earlier than 0.28 seconds before the onset of the corresponding event and no later than 0.72 seconds after its completion. (b) Off-line descriptions are utterances that report the events after that time frame. Finally, (c) elaborations are utterances that do not report any events on the pitch but give other kinds of commentary, e.g. on tactical issues or statistics. Therefore, on-line descriptions are produced under the highest time pressure, and elaborations under the lowest.

Müller and Mayr found that in on-line descriptions the speech rate was almost identical across all commentators, both English and German, suggesting that there was probably a certain performance maximum that the commentators achieved under the highest time pressure. The speech rate of the German commentators was lower in off-line descriptions and elaborations. Interestingly, the speech rate of the English commentators was not lower in those contexts. Instead, they produced more syllables per utterance. In other words, when the time pressure was low, the German commentators used that extra time to speak slower, whereas the English commentators used it to say more words in longer syntactic chunks (not necessarily full sentences). This suggests that commentators use both strategies to modulate the duration of their utterances—speech rate and word count—in the time afforded to them by the durations of the events on the pitch and intervals between them. This observation is the basis for the explanation for duration iconicity developed in the next section.

² A similar effect on speech rate that could be attributed either to speed or to duration was found by Perlman, Clark, and Johansson Falck [29] in oral reading of short narratives that differed in speed-related vocabulary, e.g. *Bob quickly races (vs. slowly inches) down the highway.*

3.3 The Live Report Hypothesis

I propose that some aspects of temporal iconicity are a consequence of a specific mode of narration used ubiquitously in fiction: the narrator relates the events of the story *as if* giving a live report of those events from the point of view of the perspectival centre [16], which can be their own or that of a character, presumably Frodo in (2) and Sam in (3). Not unlike a football commentator, the narrator is under time pressure to report the events as they happen to the perspectival centre and has to adjust the temporal characteristics of their utterances to those of the events in the story.

First, this approach explains the iconic representation of temporal order. The information about the events becomes available as they happen. If the corresponding clauses overlap or closely follow them, as on-line descriptions do in live reports, then the order of clauses has to match the order of events.

Second, the Live Report Hypothesis explains duration iconicity for short events. If the story events are short and happen in a rapid succession, the narrator does not have the time to produce long utterances. An oral narrator might increase their speech rate to reflect that, while a writer can only use as few words and as few syllables as possible. If they nevertheless produce wordy descriptions, that serves as a signal to the reader that the event took long enough to allow that. So a longer utterance is matched to a longer event. The effect should appear primarily in scenes because of their high level of granularity and the second-by-second mode of presentation.

On the other hand, if the events have long inherent durations, e.g. *The Moon rose over the mountains* in (2), then it does not matter if it is a relatively short or a relatively long event for the moon-rising-over-the-mountains standards, the narrator has enough time to describe it in as much detail as needed in either case. Therefore, we do not expect sentence length to affect the perceived event duration in coarse-grained narrative summaries.

The question is, what does ‘short’ and ‘long’ mean exactly? According to the Live Report Hypothesis, a short event is one that puts enough time pressure on the narrator to report it quickly. This should be an event whose inherent duration is close to the duration of an utterance. So once again we face the problem of determining the duration of utterances that no one really utters. In section 2 we used the average oral reading rate to estimate narrative time based on word count. However, the narrator is not reading the story but telling it as it unfolds before the eyes of the perspectival centre. Therefore, the speech rate of spontaneous narration should provide a more adequate estimate.

Based on a meta-analysis of 18 studies on five European languages, among which English was heavily overrepresented, Kowal, Wiese, and O’Connell [20] estimate the average speech rate for storytelling at 3.43 syllables per second.³

³ Speech rate (in contrast to articulation rate) is calculated based on the entire duration of speech including silent pauses, which take up 33.3% of the duration of spontaneous narration [20, p. 386]. Speakers pause to plan their utterances. Therefore, the estimates for average utterance durations based on speech rate include the average extra time needed for planning. That is a welcome consequence in our setup.

That is approximately 2.79 words per second, or 167 wpm (cf. 183 wpm for oral reading), given the average 1.23 syllables per word for English [20, p. 381].

For example, the sentence *He raised his eyes with difficulty to the dark slopes of Mount Doom towering above him* (3) has 22 syllables and 16 words. With the average speech rate of spontaneous narration, it would take 5.246 seconds to utter. That means that an event that has an inherent duration of 7 seconds should already be long enough to allow for such a wordy description without triggering any effects, so it would no longer count as short by this metric. Of course, the normal duration of raising one's eyes is shorter than that, so the long sentence quite fittingly reflects the difficulty Frodo is facing.

For the purposes of this study, I tentatively set the upper limit for short events at 5 seconds. This should also be the maximum for a short interval between events in a sequence, cf. (5) and (6).

Finally, it should be noted that the Live Report Hypothesis does not explain the iconic representation of speed when it is not tied to duration, as in the second experiment of Shintel, Nusbaum, and Okrent [34] mentioned in section 3.2. Other processes must be responsible for those effects.

4 Experimental study

Human perception of duration can be assessed by simply asking people to estimate it by giving a number and a time unit. Verbal estimation of duration is an established method in psychophysics, where it is used to study human perception of physical events, e.g. auditory and visual signals. Damsma et al. [8] have shown that it is more accurate and precise for that purpose than some commonly used alternatives. In linguistics, Wittenberg and Levy [36] have used this method to measure the perceived duration of events based on a verbal description. It seems a straightforward choice for studying duration iconicity.

The goal of the study is to find out whether there is a real, measurable effect of sentence length on the human estimates of duration of the event(s) it describes, or the intervals between the events. For instance, (10) describes a sequence of two events, Olivia pulling the cord and the curtains swishing open. The event types encoded by these verb phrases are normally very short, taking just a couple of seconds. Moreover, the first event directly causes the second, so no notable time gap is expected to occur between them. So just based on our world knowledge, we could say that the entire event sequence described by (10) would typically take under 5 seconds.

- (10) a. Olivia pulled the cord and the curtains swished open.
 b. Olivia pulled the cord and the sheer lace curtains with delicate floral patterns swished open.

The length of (10-a) is 9 words, so its expected utterance duration is 3.23 seconds in spontaneous narration; (10-b) has 15 words, and an expected duration of 5.38 seconds, which is longer than the typical duration of this sequence. So the question is, will the readers of (10-b) think that the sequence took longer than

Table 1. Examples of single event items with varied inherent event durations

sentence length	sentence	event duration
short	A passenger put his bag on the seat.	0–5 sec
long	A restless sweaty passenger with a bushy moustache put his bag on the empty seat.	
short	A patient spread jam over her toast.	5–60 sec
long	A cheerful curly-haired patient in polka-dotted pyjamas spread apricot jam over her toast.	
short	An employee watered the flowers in the lobby.	1–60 min
long	A slender elegant employee with a short haircut watered the flowers in the deserted lobby.	
short	A contractor built a fence around the plot.	>1 hour
long	An inconspicuous local contractor in a grey overall built a fence around the square plot.	

usual? If either the Event Duration Hypothesis (5) or the Interval Duration Hypothesis (6) is correct, the event sequence should be perceived to be longer in (10-b) than in (10-a).

The second question is whether that effect can be attributed to event duration specifically. If we can measure it for sentences that describe a single event, such as (11), where there is no time interval between events to attribute the difference to, that would support the Event Duration Hypothesis (5).

- (11) a. A passenger put his bag on the seat.
 b. A restless sweaty passenger with a bushy moustache put his bag on the empty seat.

Finally, is the iconic duration effect present across the board or does it depend on the inherent duration of the event? If the Live Report Hypothesis is correct, then we only expect to see the effect for events that typically take up to 5 seconds, like (11). However, there could also be other reasons for duration iconicity. For instance, the pace of narrative summaries could also be constant, in which case we should also find a duration iconicity effect in longer events that typically occur in summaries. Since we know very little about the phenomenon so far, we would like to look at events of different inherent durations: 0–5 seconds, from 5 seconds to one minute, from one minute to one hour, and events that are longer than one hour, exemplified in table 1. This part of the study is exploratory.

4.1 Method

Participants: 50 native speakers of English from the UK (47) and Ireland (3) were recruited via Prolific (www.prolific.com) and received £5.25 for participation. The recruited participants were between 24 and 70 years old, median 44; 17 male, 33 female.

Stimuli: Two sets of experimental stimuli were included: short and long versions of 10 sentences that presented a sequence of two events, like (10), and short and long versions of 32 sentences that presented only one event, like (11).

Event sequence items: Each sentence consisted of two coordinate clauses connected by *and*, as in (10). The event in the first clause was always the cause of the event in the second. The overall length was between 9 and 15 words for short sentences, and between 15 and 24 words for long sentences. The difference between the short and the long version varied between 5 and 14 words.

The first clause was the same across conditions. In the short sentence condition, the subject of the second clause was a short DP, e.g. *the curtains* in (10-a). In the long sentence condition, that DP was enriched with descriptive adjectival and PP attributes, *the sheer lace curtains with delicate floral patterns* in (10-b). In this way, not only the overall length of the sentence but also the distance between the two verbs was increased.

Single event items: The sentences were divided into four groups depending on the typical inherent duration of the described event, cf. table 1, with 8 items per group. The short sentences varied between 6 and 10 words in length, the long sentences between 12 and 18 words. The difference between the short and the long version was 6–10 words.

The subject of the short sentence was a short indefinite DP, e.g. *a passenger*, human in most cases, but some animals and vehicles were also included. In the long sentence condition, it was enriched with descriptive adjectival and PP attributes, e.g. *a restless sweaty passenger with a bushy moustache*. In addition, one or two words were added in the post-verbal part of the sentence, e.g. *the seat* vs. *the empty seat* in (11).

In both sets of items, all the words and phrases added in the long sentence condition were descriptive attributes that characterised the event participants and not the event itself. They were chosen to avoid any inferences of slowness, physical difficulty, greater quantity or longer movement trajectory. For instance, *thick heavy curtains* instead of *sheer lace curtains* in (10-b) could trigger an inference of longer duration independently of sentence length.

The main verb of each clause was in simple past tense and denoted an achievement or an accomplishment [35]. The clauses did not contain any other verbs.

Fillers: There were 34 additional filler sentences. While the experimental sentences were always either minimal (short condition) or very rich in description (long condition), the fillers covered the middle ground between those extremes. They also had less constrained syntactic structure and lexical composition. Some fillers contained manner adverbs like *quickly* and *slowly*.

Procedure: Experimental stimuli were divided into two lists following a standard Latin square design, so no participant saw both the short and the long version of the same sentence. Participants were assigned randomly to the lists.

The experiment was implemented with Gorilla Experiment Builder [1] and participants could access it on line from their own desktop or laptop. They were instructed to read each sentence and to imagine the situation it described as vividly as possible. In the next screen they were asked *How long did that take?* and could answer by typing in a number and choosing a time unit (seconds, minutes, hours, etc.) from a dropdown menu. Participants were told to use the decimal point to enter fractions if necessary, but they rarely used that option.

To motivate the participants to pay attention to the descriptive detail, after 31 of the trials they were asked a question about the sentence. Some of the questions targeted the descriptive attributes used in the sentence. Three practice trials preceded the main session of 76 trials. The median completion time for the entire experiment was 25 minutes 16 seconds.

4.2 Results

The recorded duration estimates were converted to seconds. The resulting values spanned several orders of magnitude and were log-transformed before analysis.

The results for event sequence items (500 observations from 50 participants and 10 items) are summarised in figure 1. A linear mixed-effects model with a fixed effect of sentence length and random intercepts for participants and items was fitted using the lme4 package in R [3]. The model revealed a significant effect of sentence length: long sentences were associated with longer estimated event durations than short sentences ($\beta = 0.295, SE = 0.079, t = 3.72, p < .001$). Interpreted on the original scale, the coefficient corresponds to approximately a 34% increase in estimated duration for long sentences relative to short sentences.

Figure 2 shows the results for single event items (1600 observations from 50 participants and 32 items). A linear mixed-effects model was fitted to examine the effects of sentence length (short vs. long) and inherent event duration (0–5 sec, 5–60 sec, 1–60 min, >1 hour) and their interaction on log-transformed event duration estimates, with random intercepts for participants and items. The model revealed a significant main effect of sentence length, with long sentences yielding larger duration estimates than short sentences ($\beta = 0.393, SE = 0.171, t = 2.31, p = .021$), corresponding to approximately a 48% increase on the original scale. As expected, inherent event duration strongly affected duration estimates, with longer events receiving larger estimates (all $ps < .001$ except the 0–5 sec vs. 5–60 sec contrast).

The interaction between sentence length and inherent event duration was not significant, indicating that the effect of sentence length did not reliably vary across event duration categories. Pairwise comparisons using estimated marginal means (Holm-corrected) examined the effect of sentence length within each inherent event duration category. For 0–5 sec events, long sentences yielded significantly larger duration estimates than short sentences ($\beta = 0.393, SE = 0.171, t = 2.31, p = .021$; $\sim 48\%$ increase). A similar effect was observed for 5–60 sec events ($\beta = 0.392, SE = 0.171, t = 2.30, p = .022$; $\sim 48\%$ increase). In contrast, no reliable sentence length effect was observed for 1–60 min events ($\beta = 0.015, SE = 0.171, t = 0.09, p = .93$; $\sim 1.5\%$ increase) or events longer than

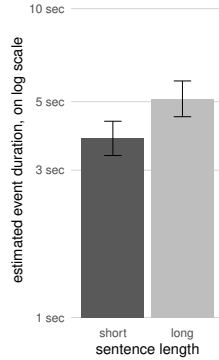


Fig. 1. Event sequences

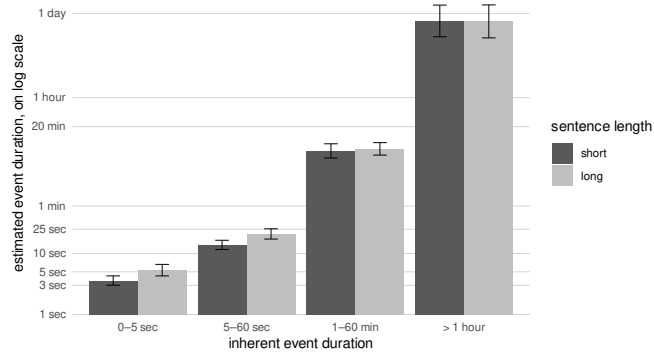


Fig. 2. Single events

1 hour ($\beta = 0.002$, $SE = 0.171$, $t = 0.01$, $p = .99$; $\sim 0.2\%$ increase). Thus, the simple effects analysis suggests that the sentence length effect is present primarily for events whose inherent duration is measured in seconds, and disappears when inherent duration exceeds one minute.

4.3 Discussion

The results show that our intuitions about the iconic representation of duration by sentence length are based on a real measurable effect. The same event or the same sequence of two events is perceived as shorter when it is described by a shorter sentence, and longer when it is described by a longer sentence. In event sequences the effect could be due either to the events themselves or to the interval between them, so either the Event Duration Hypothesis (5) or the Interval Duration Hypothesis (6) must be true. However, the significant main effect of sentence length for single events indicates that the increase in estimated duration for longer sentences cannot be attributed solely to intervals between events. The perceived duration of the event itself is clearly affected by sentence length, which supports (5). This is particularly interesting because the duration of an event (unlike that of inter-event intervals) is partly determined by the event type which is communicated by the symbolic meaning of the verb or the verb phrase. By its nature, building a fence is always longer than putting a bag down regardless of how many words we use to tell about it. However, the length of the sentence appears to modify that duration within its range of variation.

The fact that we did not find a significant interaction between sentence length and inherent event duration for single event items makes it difficult to draw conclusions with regard to the exploratory part of the study. The numeric trend from a 48% increase in estimated duration for shorter events down to 1.5% and 0.2% increase for longer events is consistent with the idea that the iconic representation of duration is no longer available after a certain inherent duration threshold. However, the respective p -values of 0.93 and 0.99 from the pairwise

comparisons test indicate that the measurements for longer events are almost certainly due to chance. More research is needed to establish the iconic duration effect disappearance threshold with certainty.

A more telling finding are the significant effects of sentence length for 0–5 sec and 5–60 sec events in pairwise comparisons. This suggests that the main effect of sentence length for single event items was almost entirely carried by these two categories. For 0–5 sec events this is expected according to the Live Report Hypothesis: 5 seconds is too little time to formulate a long sentence of 12 words or more, therefore readers will infer that the narrator had enough time to describe the event in so many words before having to report the next event. However, an event that lasts 30 seconds is long enough to be described in detail with a long sentence, so the Live Report Hypothesis predicts that events of that length will pattern with longer events and show no duration effect. The significant effect of sentence length for 5–60 sec events speaks against that assumption.

One possible explanation for this finding is that a weaker version of the Live Report Hypothesis is still true, but the upper limit of 5 seconds for short events was set too low. The items in our experiment were not pretested for inherent durations and were not controlled to be evenly spread across the span of 5 to 60 seconds. Better controlled studies might show that the real cut-off point after which the iconic duration effect disappears is in fact lower than 60 seconds. Depending on how low that number turns out to be, it might still be a plausible upper limit for short events. For instance, even if it is technically possible to say a lot of words in 10 seconds, speakers might nevertheless feel under enough pressure not to risk it, and readers might feel that the narrator would not have risked it either. However, if the cut-off point turns out to be close to one minute, we should reject the Live Report Hypothesis and look for another cognitive threshold that could be responsible for the disappearance of the effect.

5 Conclusion and outlook

The main result of this study is the evidence that duration iconicity exists. Readers interpret the length of the sentence to reflect the duration of the event it describes. At least, this is the case in scenes, which present story events in a fine-grained manner so that the inherent duration of each verbalised event is not longer than a few seconds. The picture is less clear for longer events, which can occur in narrative summaries; however, the finding that there might be a maximum duration threshold after which duration iconicity is no longer available suggests that the scene/summary distinction and other techniques writers use to control narrative pace are built on a compelling cognitive foundation.

Not all predictions of the Live Report Hypothesis, which I proposed as an explanation for this pattern, were born out, but there is more to be found out about it. In addition to the issues discussed in section 4.3, one of the consequences of this hypothesis is that the cut-off point for duration iconicity might in fact be variable and also dependent on sentence length. While a long sentence of, let's say, 18 words might fit comfortably in the time span of 10 seconds, an extremely

long sentence of 45 words no longer does. This means that the duration iconicity effect could also apply to events with longer inherent durations, except it would only show up at even higher word counts. The present study did not control sentence length with enough precision to reveal such a pattern. More research is needed to sharpen the picture.

It should also be noted that it is impossible to add more words to a sentence without changing its syntactic structure and semantics. Even though the vocabulary used in the long versions of the experimental items was chosen as to avoid any inferences towards longer event duration, it is hard to be sure that it did not trigger any unwanted inferences at all. The only way to definitely rule out this confound is to use the same sentence in both the long and the short condition and modulate its utterance duration by speech rate in the spoken modality. Previous studies on the iconic uses of speech rate discussed in section 3.2 suggest that duration iconicity could be realised in that way, but since they were more interested in speed, their results for duration are circumstantial and inconclusive. This is another issue to clarify in future research.

What we have learnt about duration iconicity expands the general picture of temporal iconicity in narrative. The iconic representation of event order has received a variety of theoretical explanations, from conversational implicature based on the Maxim of Manner [13], to an entailment of tense semantics [18], to one of the many inferences that are involved in establishing discourse structure [2, 19]. The Live Report Hypothesis can explain both duration and order iconicity, but what is the status of inferences based on it? Are they implicatures, presuppositions, co-suppositions, or at-issue contributions, like durational iconic modulations, e.g. *the talk was loooong*, discussed by Schlenker [32]? And how does it reflect back on order iconicity and what we have known about it so far?

The question about duration iconicity could be stated even more radically. Is it even part of linguistic meaning? Vis-à-vis the Live Report Hypothesis, one could argue that a live commentator, real or fictional, does not *mean* to communicate that an event is short by using a short sentence, but is *forced* to keep it short by the constraints of the communicative situation. So this might be an instance of *natural* [14] or *symptomatic* meaning [4], but it is not part of the speaker's communicative intention. On the other hand, writers of fictional narrative exploit this effect deliberately to create a certain impression of the passage of time in the reader. This is some new food for thought for students of philosophical foundations of meaning.

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References

1. Anwyl-Irvine, A.L., Massonnié, J., Flitton, A., Kirkham, N., Evershed, J.K.: Gorilla in our midst: An online behavioral experiment builder. *Behavior research methods* **52**(1), 388–407 (2020). <https://doi.org/10.3758/s13428-019-01237-x>, Gorilla website: <http://www.gorilla.sc/>
2. Asher, N., Lascarides, A.: *Logics of Conversation*. Cambridge University Press (2003)
3. Bates, D., Maechler, M., Bolker, B., Walker, S., Christensen, R.H.B., Singmann, H., Dai, B., Scheipl, F., Grothendieck, G., Green, P., Fox, J., Bauer, A., Krivitsky, P.N., Tanaka, E., Jagan, M.: Package ‘lme4’ (2024), <https://github.com/lme4/lme4/>
4. Bordwell, D.: *Making meaning: Inference and rhetoric in the interpretation of cinema*. Harvard University Press (1991)
5. Brysbaert, M.: How many words do we read per minute? A review and meta-analysis of reading rate. *Journal of Memory and Language* **109**, 104047 (2019)
6. Caenepeel, M.: *Aspect, temporal ordering and perspective in narrative fiction*. Ph.D. thesis, The University of Edinburgh (1989)
7. Cumming, S.: Narrative and point of view. In: Maier, E., Stokke, A. (eds.) *The Language of Fiction*, pp. 221–254. Oxford University Press (2021)
8. Damsma, A., Schlichting, N., van Rijn, H., Roseboom, W.: Estimating time: Comparing the accuracy of estimation methods for interval timing. *Collabra: Psychology* **7**(1), 21422 (2021). <https://doi.org/10.1525/collabra.21422>
9. Dowty, D.R.: The effects of aspectual class on the temporal structure of discourse: semantics or pragmatics? *Linguistics and Philosophy* **9**, 37–61 (1986)
10. Genette, G.: *Narrative Discourse: An Essay in Method*. Blackwell, Oxford (1986), translated by Jane E. Lewin with a foreword by Jonathan Culler
11. Gingrich, B.: *The Pace of Fiction: Narrative Movement and the Novel*. Oxford University Press (2021)
12. Greenberg, G.: The iconic-symbolic spectrum. *Philosophical Review* **132**(4), 579–627 (2023)
13. Grice, H.P.: Logic and conversation. In: Cole, P., Morgan, J.L. (eds.) *Syntax and Semantics 3: Speech Acts*, pp. 41–58. Academic Press, New York (1975)
14. Grice, H.P.: Meaning. *The philosophical review* **66**(3), 377–388 (1957)
15. Hall, R.: *Fiction Pacing: Professional Techniques for Slow and Fast Pace Effects*. Amazon Digital Services LLC - Kdp (2019), <https://books.google.de/books?id=8cUkzAEACAAJ>
16. Hinterwimmer, S.: Two kinds of perspective taking in narrative texts. In: Burgdorf, D., Collard, J., Maspong, S., Stefánsdóttir, B. (eds.) *Proceedings of Semantics and Linguistic Theory, SALT 27*. pp. 282–301 (2017)
17. Jakobson, R.: Quest for the essence of language. In: *Selected writings, Vol. 2: Word and language*, pp. 345–359. Mouton, The Hague, Netherlands (1971), first published in 1965.
18. Kamp, H., Rohrer, C.: Tense in texts. In: Bäuerle, C.S.R., Schwarze, C., von Stechow, A. (eds.) *Meaning, Use and Interpretation of Language*, pp. 250–269. De Gruyter, Berlin (1983)
19. Kehler, A.: *Coherence, Reference, and the Theory of Grammar*. CSLI Publications (2002)
20. Kowal, S., Wiese, R., O’Connell, D.C.: The use of time in storytelling. *Language and Speech* **26**(4), 377–392 (1983)

21. Labov, W.: *Language in the Inner City. Studies in Black English Vernacular*. University of Pennsylvania Press, Philadelphia (1972)
22. Maier, E.: Pictorial language and linguistics. In: Dupré, G., Nefdt, R., Stanton, K. (eds.) *Oxford Handbook of Philosophy of Linguistics* (to appear)
23. Mandler, J.M.: On the comprehension of temporal order. *Language and Cognitive Processes* **1**(4), 309–320 (1986)
24. Mandler, J.M., Goodman, M.S.: On the psychological validity of story structure. *Journal of Verbal Learning and Verbal Behavior* **21**(5), 507–523 (1982)
25. Müller, T., Mayr, R.: Speech rate, time pressure and emotion in English and German football commentary. In: Weinert, R. (ed.) *Spoken Language Pragmatics*, pp. 160–181 (2007)
26. Müller, W.G.: Iconicity and rhetoric: A note on the iconic force of rhetorical figures in Shakespeare. In: Fischer, O., Nänny, M. (eds.) *The Motivated Sign*, pp. 305–322. John Benjamins Publishing (2001)
27. Ohtsuka, K., Brewer, W.F.: Discourse organization in the comprehension of temporal order in narrative texts. *Discourse Processes* **15**(3), 317–336 (1992)
28. Perlman, M.: Talking fast: The use of speech rate as iconic gesture. In: Parrill, F., Tobin, V., Turner, M.B. (eds.) *Meaning, form, and body*, pp. 245–262. CSLI Publications Stanford, CA (2010)
29. Perlman, M., Clark, N., Johansson Falck, M.: Iconic prosody in story reading. *Cognitive Science* **39**(6), 1348–1368 (2015). <https://doi.org/10.1111/cogs.12190>
30. Perniss, P., Thompson, R.L., Vigliocco, G.: Iconicity as a general property of language: Evidence from spoken and signed languages. *Frontiers in psychology* **1**, 1–15 (2010), article 227
31. Rinck, M., Bower, G.H.: Temporal and spatial distance in situation models. *Memory & Cognition* **28**(8), 1310–1320 (2000)
32. Schlenker, P.: Iconic pragmatics. *Natural Language & Linguistic Theory* **36**, 877–936 (2018)
33. Shintel, H., Nusbaum, H.C.: The sound of motion in spoken language: Visual information conveyed by acoustic properties of speech. *Cognition* **105**(3), 681–690 (2007)
34. Shintel, H., Nusbaum, H.C., Okrent, A.: Analog acoustic expression in speech communication. *Journal of Memory and Language* **55**(2), 167–177 (2006)
35. Vendler, Z.: Verbs and times. *The Philosophical Review* **66**(2), 143–160 (1957)
36. Wittenberg, E., Levy, R.: If you want a quick kiss, make it count: How choice of syntactic construction affects event construal. *Journal of Memory and Language* **94**, 254–271 (2017)
37. Wolf, M.J.: Narrative fabric. In: Wolf, M.J. (ed.) *The Routledge Companion to Imaginary Worlds*, pp. 45–50. Routledge, New York (2017)
38. Xu, X., Kwok, S.C.: Temporal-order iconicity bias in narrative event understanding and memory. *Memory* **27**(8), 1079–1090 (2019)
39. Zwaan, R.A.: Processing narrative time shifts. *Journal of Experimental Psychology: Learning, memory, and cognition* **22**(5), 1196–1207 (1996)