Mapping between Telicity and Event Representations

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Abstract

How does linguistic telicity map onto mental representations of events? Recent work suggests considerable flexibility in how people mentally represent temporal event structure, yet we know little about how linguistic cues modulate these representations. We investigated how different forms of quantization correspond to event construal using a novel experimental paradigm that bridges event perception and linguistic processing. Participants first learned to distinguish bounded from unbounded events, then categorized sentences varying in quantization strength. Our results revealed a systematic relationship between linguistic form and event representation: strongly quantized expressions ("drink one beer") reliably corresponded to bounded event construal and activity descriptions ("did some writing") to unbounded interpretations, while bare plurals ("drink beers") showed genuine flexibility in interpretation. This graded pattern indicates that temporal boundedness in cognition operates along a continuum, with linguistic cues providing weighted probabilistic constraints on event representations. The findings demonstrate how different linguistic forms correspond to varying degrees of flexibility in event understanding, contributing to our knowledge of how language interfaces with event cognition.

Keywords: event cognition; temporal cognition; linguistic aspect; boundedness; telicity; language processing

Introduction

People segment the continuous flow of experience into discrete units called events, defined as "segments of time at a given location with a beginning and an end" (Zacks & Tversky, 2001). A fundamental aspect of this event apprehension is the recognition of *boundedness*—with individuals mentally represent events as either discrete units with clear endpoints or continuous, open-ended processes (Ji & Papafragou, 2020a). This conceptualization process draws on multiple information sources (Elman, 1990; Zacks & Swallow, 2007; Zwaan & Radvansky, 1998), including perceptual features like object state changes (Altmann & Ekves, 2019; Lee & Kaiser, 2021; Magliano, Miller, & Zwaan, 2001; Newtson, Engquist, & Bois, 1977; Sakarias & Flecken, 2019; Zacks, Speer, Swallow, Braver, & Reynolds, 2007) and conceptual factors such as agent goals (Mathis & Papafragou, 2022; Newtson, 1973; Vallacher & Wegner, 1987; Wilder, 1978; Zacks, 2004).

The relationship between linguistic aspect and event structure has been central to theories proposing that language mirrors cognitive event organization (Jackendoff, 1991; Pustejovsky, 1995). A key distinction within lexical aspect is telicity, which distinguishes between predicates with an inherent endpoint (telic) and those without (atelic) (Filip, 2012; Krifka, 1998). Current research suggests that aspectual properties guide rather than determine how we mentally represent described events (Wright, 2014; Smollett, 2005), with telicity emerging compositionally from multiple linguistic elements (Jackendoff, 1991; Kennedy, 2012; Verkuyl, 1972).

In this paper, we examine how aspectual cues in language interact with the cognitive construction of event temporality, focusing specifically on how different components of linguistic input map onto mental representations of event boundedness. Through a novel experimental paradigm combining event categorization with linguistic inference, we investigate how various linguistic elements influence the mental assembly of event representations. This investigation has implications for theories of both event cognition and linguistic aspect, potentially revealing fundamental principles about how language correlates with our understanding of temporal structure.

Telicity and event construal

Lexical aspect encodes the inherent temporal properties of verbs and predicates (Smith, 1997; van Hout, 2016; Vendler, 1967; Verkuyl, 1993). Telicity is a linguistic property that classifies verbal predicates as telic if they encode an inherent endpoint in their meaning (e.g., "reach the summit") or atelic if they do not (e.g., "walk in the park") (Filip, 2012; Krifka, 1998). Consider the following contrast:

(1) a. The girl drew the circle. (telic)
b. The girl painted. (atelic)

While sentence (1)a is traditionally classified as telic and (1)b as atelic. Telicity emerges compositionally from multiple linguistic elements (Jackendoff, 1991; Kennedy, 2012; Verkuyl, 1972), with the interaction between verbs and their arguments playing a crucial role. For instance:

In D. Barner, N.R. Bramley, A. Ruggeri and C.M. Walker (Eds.), *Proceedings of the 47th Annual Conference of the Cognitive Science Society*

(2) a. Sarah erased one mistake. (telic)
b. Sarah erased mistakes. (atelic)

Research shows that telicity guides event construal in systematic ways (Altmann & Ekves, 2019). When presented with quantized expressions like (2)a, participants tend to focus attention on task completion, anticipating a clear endpoint (Altmann & Ekves, 2019; Kurby & Zacks, 2007). In contrast, with bare plurals like (2)b, attention distributes more evenly across the ongoing activity (Altmann & Ekves, 2019). Similar patterns emerge across various predicate types:

(3) a. Jack drank one beer. (focusing on completion)
b. Jack drank beer. (focusing on ongoing activity)
c. David cut a cake. (endpoint-oriented attention)
d. David cut slices. (process-oriented attention)

This guiding role of telicity raises important questions about how different linguistic forms influence event representation. How do various quantization strategies—from explicit numerical quantities to bare plurals—affect event construal? Do certain linguistic forms consistently bias toward bounded or unbounded interpretations? Our study addresses these questions through a novel experimental paradigm that systematically varies quantization across different linguistic expressions.

Cross-linguistic evidence suggests telicity's role as a guide rather than constraint (Munn & Schmitt, 2005). While languages differ in how they mark telicity, they consistently show flexibility in event construal while maintaining systematic patterns of interpretation (Filip, 2012; Verkuyl, 1993). This suggests telicity provides language-specific cues that interact with world knowledge and context to shape, but not determine, event understanding (Zacks & Swallow, 2007; Swallow, Zacks, & Abrams, 2009). These findings indicate telicity operates as part of a flexible interface between language and cognition (Smith, 1997; Verkuyl, 1993), providing probabilistic cues that guide attention and shape mental event representations without rigidly constraining them (Wright, 2014; Smollett, 2005). Our experimental design specifically probes this flexibility by examining how different linguistic forms—from explicitly bounded expressions ("drink one beer") to inherently unbounded forms ("do some writing")—influence event categorization.

Current study

How does telicity guide event construal? While linguistic theory specifies how telicity emerges compositionally, we lack direct evidence for how these linguistic distinctions modulate mental event representations. Here we address this gap by introducing a novel experimental paradigm that directly probes how people mentally represent events described with different quantization properties.

Our study makes two key contributions: First, we introduce a new experimental method that directly measures how linguistic cues map onto event representations. Rather than relying on processing costs (Altmann & Ekves, 2019) or post-hoc judgments, we first train participants to categorize clearly bounded versus unbounded event videos, then test how they categorize sentences with varied quantization. This allows us to directly observe how telicity influences event construal: When people read "drew a circle" versus "drew circles", do they construct fundamentally different event representations?

Second, by examining how different linguistic markers map onto event representations, we address fundamental questions about the language-cognition interface. Does language determine how we mentally represent events, or does it provide looser guidance? The answer has implications for both linguistic theory and cognitive architecture—do mental representations mirror linguistic composition, or does language offer probabilistic cues for constructing event representations?

Experiment

We developed a novel experimental paradigm for exploring event conceptualization: Concept Extension to Language (CELA). This paradigm consists of three distinct phases. First, in the training phase, participants learn to categorize videos showing bounded and unbounded events into different folders (labeled 'A' and 'B'). Second, in the generalization testing phase, participants demonstrate their understanding by categorizing new videos. Finally, in the linguistic inference phase, participants apply this categorization to sentences rather than videos, allowing us to see how linguistic features influence event construal.

To examine how telicity might modulate event understanding, we varied quantization across four levels: number-quantized (e.g., "drink one beer"), indefinite-quantized (e.g., "bake a cake"), bare plurals (e.g., "bake cookies"), and activity descriptions (e.g., "do some writing"). Using neutral folder labels ('A'/'B') ensures participants' choices reflect their event interpretation rather than visual associations. By examining responses across these different linguistic forms, we can better understand how telicity influences the mental representation of events.

Methods

Participants We recruited 38 monolingual English speakers from Prolific, compensating them at an hourly rate of $9.

Stimuli *Video stimuli*: We used 12 videos developed and normed by Ji and Papafragou (2020a, 2020b). Half showed bounded actions with clear endpoints (e.g., fold one napkin) and half showed unbounded actions without clear endpoints (e.g., wave a napkin) (see Table 1). Previous norming confirmed that bounded and unbounded events were matched for perceived intentionality and visual similarity, ensuring that any categorization differences would reflect the bounded/unbounded distinction itself.

Folder stimuli: The folders were labeled with neutral 'A' or 'B' designations. This neutral labeling ensures that participants' categorization decisions are based on their event in-

#	Video	Bounded	Theme Obj.
1	cut tissue in half	Bounded	Singular
2	tear tissue	Unbounded	Singular
3	group pawns	Bounded	Plural
4	mix pawns	Unbounded	Plural
5	blow a balloon	Bounded	Singular
6	blow bubbles	Unbounded	Plural
7	draw a balloon	Bounded	Singular
8	shake a bottle	Unbounded	Singular
9	pile up cards	Bounded	Plural
10	stick stickers	Unbounded	Plural
11	paint a star	Bounded	Singular
12	cut pcs. of a ribbon	Unbounded	Plural

Table 1: Video stimuli shown in training and generalization testing phases. Videos adapted from (Ji & Papafragou, 2020a, 2020b) with permission.

terpretation rather than visual cues.

Linguistic stimuli: Participants read sentences describing various actions and categorized them into the same 'A'/'B' folders used for the videos (see Table 2 for a representative sample). All sentences featured incremental theme verbs, ensuring compatibility with both telic and atelic interpretations.

Item	Sentence	Quantization	Telicity
1	Jack drank one beer.	Number	Telic
2	Sarah erased one mistake.	Number	Telic
3	Michael drew cartoons.	Bare plural	Atelic
4	Lisa polished silverware.	Bare plural	Atelic
5	David cut a cake.	Indefinite	Telic
6	Anna painted a landscape.	Indefinite	Telic
7	Mark did some cutting.	did some Ving	Atelic
8	Laura did some building.	did some Ving	Atelic

Table 2: Sample sentences (linguistic stimuli)

Procedure We ran the experiment online using PCIbex (Zehr & Schwarz, 2018). The study proceeded in three phases:

Training Phase: Participants first learned to categorize videos into two folders labeled 'A' and 'B'. They saw the following instruction:

(4) Welcome! The study begins with watching a sequence of video pairs. Your first task will be to learn how to sort these videos into folders. We will teach you how to put each video into the different folders. After this training, we will go on to the main part. Let's first see how the folders will look like.

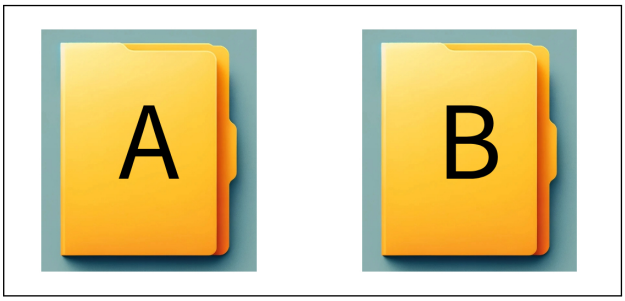

Figure 1: Initial presentation of folders A and B.

After being shown the two folders, participants began the training trials with the instruction shown in (5). For each trial, they first watched a short video clip and then learned which folder was the correct category for that type of event. The video clips showed various everyday actions, such as drawing one balloon or arranging objects. Figure 2 shows a screenshot from one of the training videos:

(5) Now let's see some examples. You will see a video and then see the folder which the video should be put into. Here comes the video. This video goes into folder 'A'.

Figure 2: Presentation of a sample video ("cut a piece of tissue in half") in the training phase.

After each video, participants were shown the two folders again, with the correct category indicated by a dark green frame. This feedback helped them learn the intended categorization pattern. For example, if folder A was the correct choice, it was highlighted as shown below:

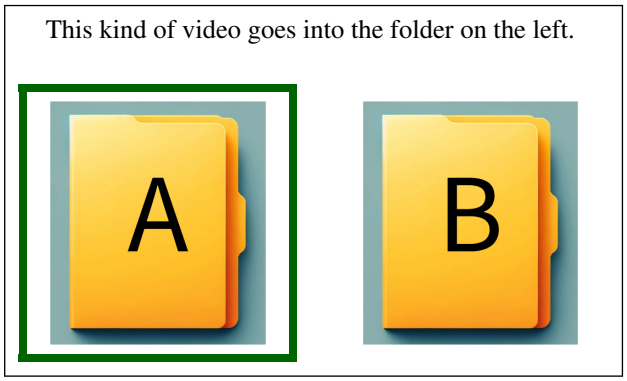

Figure 3: Feedback showing folder A as the correct choice (indicated by dark green frame).

Generalization Phase: After completing the training trials, participants moved on to the generalization phase. Here they watched six new video clips (the last six videos in Table 1) and had to categorize them into folders 'A' or 'B'. The videos included both singular and plural items (e.g., bounded: draw one balloon, pile up cards; unbounded: shake a bottle, stick stickers) to ensure participants weren't using the singular/plural distinction as a basis for categorization. After each video, participants saw the folder selection screen and had to make their choice. Participants were not given any feedback after their selections.

Linguistic Phase: In the final phase, participants categorized *sentences* instead of videos, using the same folder categories they had learned. They received the following instructions:

(6) Great! Now it is time for the main part! However, instead of watching videos and putting the videos into the folders, you will be reading some sentences. If you think the sentences you read should go into folder 'A', then click folder 'A'. If the sentence you read should go into folder 'B', then click folder 'B'. Please respond as QUICKLY as possible! And if you are unsure, just do your best! After each trial, you will see a cross at the center of the screen. Please click on the cross for the next trial. Please read the sentences carefully because there will also be some comprehension questions at the end.

After all target sentences were presented, participants were shown four additional sentences and asked to identify which ones they had previously encountered as a comprehension check.

Results

We excluded eight participants who performed poorly in the generalization phase. We analyzed bounded folder selection rates as the dependent variable.

Folder selection: Using `lmer` in R, we fit a linear mixed-effects model with quantization category as fixed effect and random intercepts for participants and items. The analysis showed a significant effect of quantization category on bounded folder selection ($\chi^2(3) = 124.24$, $p < 0.0001$). Pairwise comparisons revealed significant differences between all conditions (Table 3).

Comparing means against chance level (using `emmeans`) showed that the "did some Ving" condition (e.g., "did some drawing") strongly favored the unbounded folder, significantly below chance ($M = 0.22$, $SE = 0.05$, $z = -4.13$, $p < 0.001$) (see Figure 4). The bare plural condition (e.g., "drew balloons") showed no clear preference, not differing from chance ($M = 0.19$, $SE = 0.05$, $z = -0.15$, $p = 0.88$). Both the indefinite article condition (e.g., "drew a balloon"; $M = 0.19$, $SE = 0.05$, $z = 3.72$, $p < 0.001$) and the number-quantized condition (e.g., "drew one balloon"; $M = 0.32$, $SE = 0.05$, $z = 6.2$, $p < 0.001$) favored bounded folder selection.

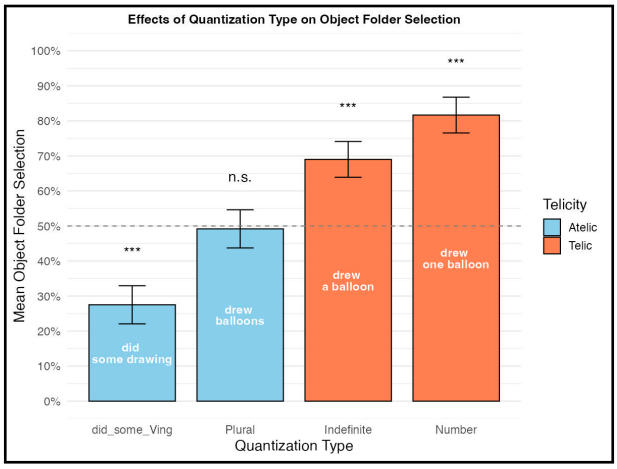

Figure 4: Mean bounded folder selection across quantization conditions. Error bars represent standard errors and dashed line indicates chance level.

Contrast	Estimate	SE	p-value
did some Ving-Indefinite	−0.415	0.052	< 0.0001
did some Ving-Number	−0.541	0.052	< 0.0001
did some Ving-Bare plurals	−0.217	0.054	0.0001
Indefinite-Number	−0.126	0.049	0.0092
Indefinite-Bare plurals	0.198	0.052	0.0002
Number-Bare plurals	0.325	0.052	< 0.0001

Table 3: Pairwise comparisons of quantization categories

Discussion

Our results demonstrate systematic effects of quantization on event construal. At the extremes of our manipulation, we found a clear contrast: number-quantized expressions (e.g., drink one beer") consistently triggered bounded event construal, while did some Ving" constructions (e.g., "did some drawing") reliably elicited unbounded interpretations. This

robust pattern suggests these linguistic forms provide strong and reliable cues for event representation.

The intermediate patterns reveal more complex effects. While indefinite-quantized expressions (e.g., "cut a cake") favored bounded construals, this preference was notably weaker than with number quantification (see Table 3). Most strikingly, bare plurals (e.g., "drew balloons") showed no preference for either bounded or unbounded construal, performing at chance level. This finding challenges traditional assumptions about bare plurals as reliable markers of unbounded events (Verkuyl, 1972), suggesting instead that they allow genuine flexibility in event construal.

The graded pattern across conditions—from strongly bounded with number quantification to strongly unbounded with "did some Ving"—suggests quantization affects event construal continuously rather than categorically. Number-quantized expressions provide the strongest temporal boundaries, while indefinite articles offer weaker but still reliable bounded cues. The chance-level performance with bare plurals indicates true ambiguity rather than merely weak cues, suggesting these forms may leave event boundaries genuinely unspecified. In contrast, "did some Ving" constructions actively promote unbounded construals, perhaps by explicitly focusing attention on the ongoing nature of the activity.

General Discussion

Our findings reveal a systematic relationship between linguistic quantization and event construal, demonstrating how different forms of linguistic expression correspond to varying degrees of temporal boundedness in event representation. The results showed clear evidence for a graded pattern of quantization effects: strongly quantized expressions ("drink one beer") reliably triggered bounded event construal, while activity descriptions ("did some writing") consistently elicited unbounded interpretations. Between these extremes, we found probabilistic rather than deterministic effects, with indefinite articles showing a weaker but still reliable bounded bias, and notably, bare plurals displaying genuine ambiguity in temporal interpretation.

These results illuminate several fundamental aspects of how language interfaces with event cognition. First, they provide empirical support for theoretical proposals that telicity emerges compositionally from multiple linguistic elements (Jackendoff, 1991; Kennedy, 2012; Verkuyl, 1972). The graded pattern across conditions suggests that boundedness operates as a weighting system rather than a binary feature, aligning with proposals that linguistic cues provide probabilistic guidance for event understanding rather than strict constraints (Wright, 2014; Smollett, 2005). The special status of bare plurals—showing genuine ambiguity rather than weak directionality—particularly challenges deterministic approaches to aspectual composition.

Our findings also demonstrate how different linguistic forms correspond to varying degrees of constraint in temporal reference. Strong quantization (numerals) provides clear temporal boundaries, while less specified forms (bare plurals) allow for more flexible event construal. This systematic variation in constraint strength supports theoretical accounts suggesting that temporal boundedness in cognition could be more flexible than a binary dichotomy (Smith, 1997; Verkuyl, 1993). The gradient nature of these effects indicates that event representations could be more complex than initially thought.

Our findings reveal that different forms of quantization provide weighted probabilistic constraints on event representations, rather than deterministic rules. This aligns with recent work suggesting considerable flexibility in how people mentally represent temporal event structure (Ji & Papafragou, 2020a), while demonstrating systematic patterns in how linguistic forms guide these representations.

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