

Eye Movements Reveal Mechanisms of Event Coercion

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Studies have produced mixed results on the processing cost of adding or subtracting the end point of an event representation, or iterating the event without changing its internal structure (Bott, 2010; Brennan & Pytkänen, 2008, 2010; Pickering, McElree, Frisson, Chen, & Traxler, 2006; Pinango, Zurif, & Jackendoff, 1999; van Lambalgen & Hamm, 2005). We conducted a set of eye tracking experiments using proper controls to determine the processing cost of addition, subtraction and iteration. We determined that adding an end-point increases eye fixation time and regressions, and that subtracting an end-point and iterating an event do not.

Addition, subtraction, and iteration are established by point, frequency and measure adverbial phrases (hereafter “adverbs), and by telic and atelic predicates. Point adverbs such as *last year* specify the temporal location of a bounded event (1a). In order to contain the unbounded event of an atelic predicate, *addition* adds an end-point (1b).

1. a. *Sam climbed Mt Everest last year.*
- b. *Sam admired Mt Everest last year.*

Frequency adverbs such as *every year* specify the hiatus between instances of an event. Interpretation of a telic predicate requires *iteration* to shift the interpretation from a single instance to multiple instances (2a). Interpretation of an atelic predicate requires addition of an end-point and then iteration to create multiple instances (2b).

2. a. *Sam climbed Mt Everest every year.*
- b. *Sam admired Mt Everest every year.*

Measure adverbs such as *for several years* specify the duration of an unbounded event (3a). They shift the denotation of a telic predicate to a different type of event. In some cases, *subtraction* removes the culmination to create a homogenous activity (3b). In other cases, iteration may shift the interpretation from a single event to a series of events (3c).

3. a. *Sam admired Mt Everest for several minutes.*
- b. *Sam climbed Mt Everest for several minutes.*
- c. *Sam climbed Mt Everest for several years.*

Point, frequency, and measure adverbs allow us to determine the cost of addition, iteration, and subtraction. For point and frequency adverbs, atelic predicates require addition; telic predicates do not. If addition is costly, atelic predicates (1b, 2b) will be more difficult to process than telic predicates (1a, 2a). For telic and atelic predicates, frequency adverbs require iteration; point adverbs do not. If iteration is costly, frequency adverbs (2a, 2b) will be more difficult to process than point adverbs (1a, 1b). For measure adverbs, telic predicates require either subtraction or iteration; atelic predicates require no operation. If iteration or subtraction is costly, for measure adverbs sentences with telic predicates (3b) will be more difficult to process than sentences with atelic predicates (3a).

Forty-eight participants read 24 sentences that varied in adverb type and predicate type. Following Townsend (2013), the end of the first line of text ended after the adverb as in

Though the hiker climbed a mountain in the Rockies last year,

she still preferred the Adirondacks.

Questions about aspectual meaning (e.g., *How many times did the hiker climb the mountain?*) followed half of the sentences; questions about thematic roles followed the other half (e.g., *What did the hiker climb?*). Analysis of the percentage of trials with a regression and scaled total residual fixation time in a region (i.e., the difference between total fixation time and fixation time predicted from the number of characters in the region) treated both participants and items as random variables.

For point and frequency adverbs, regressions from the adverb (e.g., *last year*) and total time in the predicate (e.g., *climbed a mountain*) were greater for atelic predicates than for telic predicates (Figures 1 and 2, all $ps < .05$ with the exception of item analysis of regressions from point adverbs), suggesting that adding a temporal boundary increases processing difficulty. Within predicate types, eye movement patterns were similar for point and frequency adverbs (Figures 3 and 4, all $ps > .10$), suggesting that iterating an event does not increase processing difficulty. For measure adverbs, eye movement patterns in the adverb and the predicate were unrelated to predicate telicity (Figures 5 and 6, all $ps > .10$), suggesting that iteration/subtraction does not increase processing difficulty.

The data suggest that adding an end-point to an atelic predicate is more costly than subtracting an end-point from a telic predicate or iterating an event. The absence of a telicity effect for measure adverbs suggests that aspectual interpretation with measure adverbs may involve searching world knowledge to determine a plausible temporal distribution of an event (Deo & Pinango, 2011).

References

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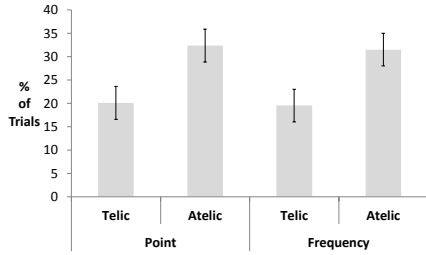


Figure 1. Percentage of Trials with a Regression out of the Adverbial Phrase Comparing Telic and Atelic Predicates (*climbed a mountain / admired a mountain*) within Point and Frequency Adverbs (*last year / every year*)

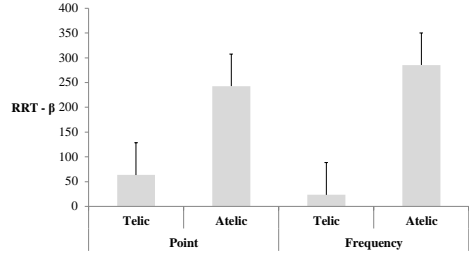


Figure 2. Total Residual Reading Time in the Predicate Comparing Telic and Atelic Predicates (*climbed a mountain / admired a mountain*) within Point and Frequency Adverbs (*last year / every year*)

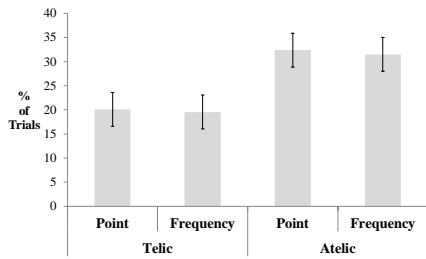


Figure 3. Percentage of Trials with a Regression out of the Adverbial Phrase Comparing Point and Frequency Adverbs (*last year / every year*) within Predicate Types (*climbed a mountain / admired a mountain*)

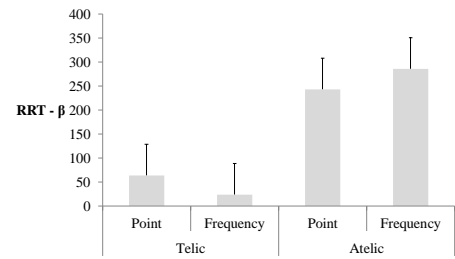


Figure 4. Total Residual Reading Time in the Predicate Comparing Point and Frequency Adverbs (*last year / every year*) within Predicate Types (*climbed a mountain / admired a mountain*)

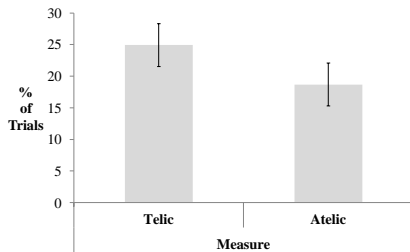


Figure 5. Percentage of Trials with a Regression out Measure Adverbs (*for several years*) Comparing Telic and Atelic Predicates (*climbed a mountain / admired a mountain*)

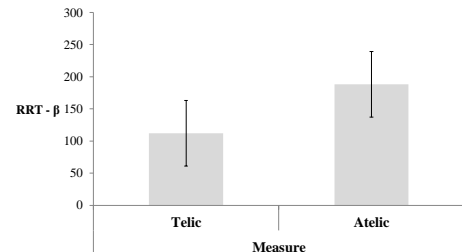


Figure 6. Total Residual Reading Time in the Predicate Comparing Telic and Atelic Predicates (*climbed a mountain / admired a mountain*) for Measure Adverbs (*for several years*)