Prepositions, Scales and Telicity: a Case Study

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1. Introduction: Spanish *hasta* vs. Brazilian Portuguese *até*

This paper is a study in comparative semantics. Although it focuses on a very specific aspect of the semantics of two prepositions in Brazilian Portuguese (BP) and Spanish, it leads to more general conclusions about the way telicity is obtained in natural languages. The prepositions under scrutiny are BP *até* (shown in (1)a) and Spanish *hasta* (shown in (1)b). In the sentences below these prepositions are inserted in goal PP constructions, that is, constructions formed by an activity verb followed by a directional preposition:

(1) a. O João andou **até** a vila. (BP)
'John walked to the village'

b. Juan caminó **hasta** la villa. (Spanish)
'John walked to the village'

Besides their phonological resemblance, both prepositions bring similar semantic contributions to the sentences in which they are inserted. Roughly, the sentences in (1) mean that there is a walking event by John and that John is at the village by the end of it. A contrast between these two prepositions is revealed when *in*-adverbials are added to these sentences:

(2) a. O João andou até a vila em uma hora. (BP)
The John walked to the village in one hour
'John walked to the village in an hour'

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b. * Juan caminó hasta la villa en una hora. (Spanish)
John walked to the village in one hour
'John walked to the village in an hour'

The contrast above shows that BP *até* can combine with activity verbs and yield telic predicates while Spanish *hasta* can't.[1] Interestingly, this contrast does not extend to other prepositions in BP and Spanish. Other prepositions in these two languages behave like *hasta*. Observe other goal PP constructions in BP and Spanish:

(3) a. A Maria nadou debaixo da ponte (*em uma hora). (BP)
The Mary swam under of-the bridge (in one hour)
'Mary swam under the bridge (in an hour)'

b. O Pedro engatinhou debaixo da cerca (*em uma hora). (BP)
The Peter crawled under of-the fence (in one hour)
'Peter crawled under the fence (in an hour)'

c. Juan nadó debajo del puente (*en una hora). (Spanish)
John swam under of-the bridge (in one hour)
'John swam under the bridge (in an hour)'

d. Maria gateó debajo de la valla (*en una hora) (Spanish)
Mary crawled behind of the fence (in an hour)
'Mary crawled behind he fence (in an hour)'

The goal of this study is to account for the aspectual difference in (2) while still preserving the similarity observed in (1). In order to do so, in section 2 I present the scalarity property that is present in the meaning of *hasta* and *até*. In section 3, I discuss how telicity is obtained for one preposition and not for the other. Section 4 is the conclusion.

2. The Scalarity Property of *hasta* and *até*

When inserted in goal PP constructions, as shown above, the complements of *hasta* and *até* correspond to DPs denoting location (*the village* in the examples above). Besides combining with DPs denoting

1. Aske (1989) notes that while Spanish *hasta* does not yield telic predicates in goal PP constructions, English *to* does. Beck (2002) and Beck and Snyder (2001) suggest that in English goal PP constructions are interpreted as a type of resultative construction. This would be the reason why in English such constructions are telic.

locations, *hasta* and *até* can also have as their complements DPs denoting degrees of a scale. Observe the sentences below:

(4) a. A temperatura subiu até 90^0C. (BP)
The temperature rose up-to 90^0C
'The temperature rose up-to 90^0C'

b. La temperatura subió hasta (los) 90^0C. (Spanish)
The temperature rose up-to 90^0C.
'The temperature rose up-to 90^0C'

(5) a. O João cresceu até 2 m. (BP)
The John grew up-to 2m
'John grew up-to 2m'

b. Juan creció hasta 2m. (Spanish)
John grew up-to 2m
'John grew up-to 2m'

In these sentences, *hasta* and *até* take the phrases *2 meters* and *90 degrees Celsius* as arguments. These complements are degrees of scales. Following Kennedy (1997), I take a scale to be a pair $<S, \geq_\delta>$ comprised of a set of objects and an asymmetric ordering relation along some dimension δ. That is, a scale is a representation of measurement.

As an illustration, consider the gradable adjective *tall*. This adjective maps its argument onto an abstract representation of measurement, which is referred to as 'degree'. According to Kennedy (1997), degrees can be formalized as points or intervals totally ordered along some dimension (in the case of *tall*, this dimension is *height*). The set of ordered degrees corresponds to a scale. The semantics for *tall* is provided below (taken from Kennedy 1997). In this semantics, *tall* denotes a relation between objects x and degrees of height d, such that the height of x is at least as great as d:

(6) $[\![[_A \text{ tall }]]\!] = \lambda d.\ \lambda x.\ \text{tall}(x) \geq d$

Returning to *até* and *hasta*, observe that the arguments these prepositions take in (4) and (5) correspond to degrees. In (5), for example, we have that John grew and reached degree 2 meters of the height scale. Intuitively, these prepositions are functions mapping an individual to a degree on a

scale. Based on these observations, a semantics for *hasta* and *até* is proposed below:[2]

(7) [[até/hasta $_{HEIGHT}$]] = λd. λx. λe. ∃e': e' ⊆ e & e' = RB (e) & HEIGHT (e') (x) = d

In this semantics, the function dubbed HEIGHT maps an individual to a degree on the height scale, at the endpoint of event e. As mentioned above, these prepositions can operate on different scales. As shown in example (4), *hasta* and *até* can also operate on the TEMPERATURE scale. In this case, we would replace the function HEIGHT by the function TEMPERATURE in the lexical entry provided above. This would give us a function that maps an individual to a degree on the temperature scale at the endpoint of an event e. Given that these prepositions can operate in different scales, a more general semantics for *hasta* and *até* is provided below, where SCALE can be replaced by any scale (i.e., height, temperature, weight, length, etc):

(8) [[até/hasta $_{SCALE}$]] = λd. λx. λe. ∃e': e' ⊆ e & e' = RB (e) & SCALE (e') (x) = d

This function takes degree d, individual x and event e and says that there is an event e', which is part of e and is the right boundary of e, such that x's position in the relevant scale at e' equals degree d of that scale. So, for sentence (5)a, for example, we have the following truth conditions:

(9) [[John grew até/hasta $_{HEIGHT}$ 2 meters]] = 1 iff
λe. grow (John) (e) & ∃e': e' ⊆ e & e' = RB (e) & HEIGHT (e') (John) = 2 meters

(5)a is true if and only if there is a growing event by John, and at the right boundary of this event, John's position in the height scale is equal to 2 meters.

I propose that the complements of *hasta* and *até* in goal PP constructions, as in (1) above, are also degrees on a scale. The motivation for such an analysis is the following. In goal PP constructions we have dislocation, as the verbs *walk*, *swim* and *crawl* in the sentences above indicate. Thus, there should be a path from where the dislocation started to

2. In this paper I follow Davidson (1967) and assume that verbal predicates come with an event argument. In addition, I will assume that this event argument is the outermost argument. For example, an intransitive verb like *run* has the following meaning:
(i) **[** run **]** = λx. λe. run (x) (e)

where it ended. It is possible then to define a function mapping each interval of the dislocation event to points in this path. For example, we can have a function mapping the beginning of the event to the beginning of the path or a function mapping the end of the event to the end of the path. What *hasta* and *até* do in these constructions is the following: they are functions mapping an individual to the end of a path at the endpoint of a dislocation event.

In order to illustrate this idea, imagine a scenario for the sentences in (1) in which John started walking in his house, and he went past a pet shop, a bakery, a gas station and arrived at the village. The hypothesis is that these points along the way can be analyzed as degrees linearly ordered along the dimension of space. According to Kennedy's definition of scale provided above, this is exactly what a scale is supposed to be. Let us call this scale a 'path' scale.[3]

Therefore, in goal PP constructions *até* and *hasta* also operate on scales. When we utter (1), for example, we are saying that John walked and he reached the degree *the village* of the path scale at the end of the walking event. More precisely:

(10) ⟦John walked até$_{PATH}$ the village⟧ = 1 iff
λe. walked (John) (e) & ∃e': e' ⊆ e & e' = RB (e) & PATH (e')(John) = the village

According to these truth conditions, (1)a is true if and only if there is a walking event e by John, and there is an event e', which is the right boundary of e, such that John's position in the path scale at e' is equal to the degree *the village*. If this analysis is on the right track, then the meaning of *até* and *hasta* is constant in that it always maps an individual to a degree on a scale at the endpoint of an event.

3. Telicity

The semantics proposed above for *até* and *hasta* does not differentiate these prepositions with respect to telicity. This section will address this

3. In Cresswell (1978), 'path' is a function from times to a spatial region. Following Cresswell, Beck (2002) suggests that the semantics of the preposition 'to' makes use of the concept of a path, and the notion of a path is taken to be progress through time. The way that the notion of a path is used here is somewhat different from these two works. I have introduced the notion of a 'path scale', which was defined as a set of points linearly ordered along the dimension of space. Additionally, in the lexical entry of *até* and *hasta*, I used the function PATH, which maps the right boundary of an event to an individual's position in the path scale.

issue. As discussed in section 1, PPs headed by *até* yield telic goal PP constructions. They can be modified by *in*-adverbials, which evinces that they are telic.

In order to assess whether the predicate in (1)a is in fact an accomplishment, I will take some of the tests discussed in Dowty (1979), and check how the BP predicate above fares with these tests. Dowty presents a test intended to differentiate activity verbs from accomplishment verbs. The test goes as follows: if *andar até a vila* (*walk to the village*) is an activity verb, then *o João andou até a vila por 10 minutos* (*John walked to the village for 10 minutes*) entails that at any time during these 10 minutes, *o João andou até a vila* (*John walked to the village*) was true. This is false, showing that the counterpart of *walk to the village* is not an activity in BP.

Now, if *andar até a vila* (*walk to the village*) is an accomplishment verb, then *o João andou até a vila por 10 minutos* (*John walked to the village for 10 minutes*) does not entail that *o João andou até a vila* (*John walked to the village*) was true during any time within these 10 minutes. This is true; an indication that *walk to the village* is an accomplishment in BP.

Accomplishment verbs are ambiguous when combined with *almost*, but activity verbs aren't. In the sentences below, we have that (11)a is ambiguous between a reading where nothing happened, and a reading where John started walking to the village, and almost got there. In (11)b, on the other hand, we do not have ambiguity: it only means that John in fact did not walk.

(11) a. O João quase andou até a vila.
'John almost walked to the village'

b. O João quase andou.
'John almost walked'

These tests show that the BP counterpart of *walk to the village* is actually an accomplishment predicate.

It is generally assumed that telic predicates differ from atelic predicates in that the former requires some time to be completed (Dowty 1979; Krifka 1998; Vendler 1957; among others). According to Vendler (1957), telic verbs have to reach a 'set terminal point', that is, a point without which the predicate cannot be said to have been completed. For example, the predicate 'build a house' has the terminal point at which the house has been completely built. Atelic predicates, on the other hand, do not have a definite endpoint. Another way to describe atelic predicates is to observe that they have the subinterval property, meaning that whenever they are true at a time

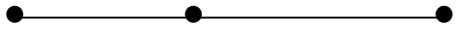
interval, they are true at any part of that interval (Dowty 1979; Krifka 1998).

In order to understand how telicity is obtained with the preposition *até*, I will start by discussing Dowty's (1979) analysis for *in*-adverbials. Dowty proposes that modifiability with *in*-adverbials depends on the verb being true at a unique subinterval of the measured interval. Below I provide the semantics of *in*, taken from Dowty (1979: 335):

(12) Where 'n' is an indexical constant 'now', 'in' translates into:[4]
$\lambda P_t \lambda P \lambda x [P_t\{n\} \wedge \omega t_1 [t_1 \subseteq n \wedge AT(t_1, P\{x\}) \wedge \varpi t_2 [[t_2 \subseteq n \wedge AT(t_2, P\{x\})] \rightarrow t_2 = t_1]]]$

Roughly, this formula says that proposition P is true at t_1 and that, for all t_2, if P is true at t_2, t_2 is equal to t_1. That is, this semantics for *in* requires that there be a unique subinterval where the proposition is true. This requirement is referred to as the "uniqueness" requirement of the semantics of *in*. As mentioned above, atelic predicates have the subinterval property, that is, when they are true at a time interval, they are true at any part of that interval. Therefore, they cannot be modified by *in*-adverbials. Telic predicates, on the other hand, do fulfill this requirement and can be modified by such adverbials.

A potential problem for the semantics of *até* provided above is that it does not guarantee uniqueness. Consider the truth conditions for the sentence in (1)a given in (10). In (10), we can have more than one walking event ending at the village. For example, imagine a scenario where John started walking at his house. He walked for 20 minutes and stopped at a newsstand. Then he continued walking and after 30 minutes he arrived at the village:



The walking event starting at John's house and ending at the village makes sentence (1)a true, but so does the walking from the newsstand to the village.[5] This seems to indicate that uniqueness is not satisfied. Krifka

4. The constant *n*, according to Dowty, denotes, at any index, the time coordinate of that index:
(i) At any index <*w*,*i*>, the denotation of *n* is *i*. (p. 333)
This constant *n* is a fully indexical constant.

5. Actually, there will be an infinite number of walking events that finish at the village. We could pick any point between John's house and the village as the starting point for the walking event and they would make the proposition true.

(1998), discussing constructions such as 'Mary walked from the university to the capitol', observes that although these constructions always contain the goal of the dislocation ('to the capitol' in this case), they only optionally include the source of the dislocation ('from the university'). Krifka (1998) claims that the source can be left implicit, in which case the context indicates it. If it is the case that the source is implicit in goal PP constructions, we can claim that these constructions do fulfill the uniqueness requirement of *in*-adverbials. In the scenario above, for each given source of dislocation there will be only one event ending at the village, satisfying the uniqueness requirement of *in*.

However, if the semantics given in (7) does yield telic predicates, we have to provide a new semantics for *hasta*, as this preposition is not telic. My hypothesis is that the reason why *hasta* is atelic is because it does not identify an endpoint to the event and therefore uniqueness is not satisfied. A new semantics for *hasta* is provided below:

(13) $[\![\text{hasta}_{\text{PATH}}]\!] = \lambda d.\ \lambda x.\ \lambda e.\ \exists e'\text{: } e' \subseteq e \ \&\ \text{PATH}\ (e')\ (x) = d$

According to this semantics, *hasta* takes degree d, individual x and event e and says that there is an event e', part of e, such that the position of x on the path scale at e' is equal to d. That is, we know that x passes by d, but we cannot identify d (or any other degree) as the endpoint to the event. This semantics guarantees that any event e where John walks and passes by the village will make sentence (1)b true.[6] The crucial point is that this semantics does not signal the endpoint of the event, and this makes the predicate atelic.

The semantics for *até*, repeated below, does mention the endpoint to the event, and so it guarantees uniqueness:

(14) $[\![\text{até}_{\text{PATH}}]\!] = \lambda d.\ \lambda x.\ \lambda e.\ \exists e'\text{: } e' \subseteq e \ \&\ e' = \text{RB}\ (e) \ \&\ \text{PATH}\ (e')(x) = d$

3.1. Scalarity and Telicity

In the discussion above we have seen that, according to Dowty (1979), telic predicates describe events that have a definite endpoint, as the predicate 'build a house'. We could ask ourselves if this is the only way to obtain telicity. Hay, Kennedy and Levin (1999) suggest that telicity can be brought about in another way. In what follows, I discuss their ideas.

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6 . When asked about sentence (1)b, my informants say that it is implicit in this sentence that John stopped at the village. That is, John walks and probably stopped at the village. In the analysis proposed here, this is not part of the semantics of *hasta*, but an implicature that can be cancelled.

Hay et al. (1999) analyze degree achievement verbs (DAs), like *lengthen, straighten* and *cool*, observing that these verbs exhibit the basic semantic characteristic that their affected argument undergoes a change in some property (for example, in the case of *lengthen the rope*, the argument *rope* undergoes a change in length). Hay et al. claim that when the degree to which this property changes can be interpreted as bounded, a telic interpretation of the predicate emerges, and conversely, when the degree of change is non-bounded, an atelic interpretation arises. Consider the two sentences below, taken from Hay et al. (1999):

(15) a. Kim lengthened the rope.
b. Kim lengthened the rope 5 inches.

Hay et al. observe that DAs introduce a measure of the amount to which the affected argument of the verb changes with respect to some gradable property. They call this measure the 'difference value'. Below I provide their paraphrases for the sentences above, with the difference values italicized:

(16) a. Kim caused the length of the rope to increase *by some amount*.
b. Kim caused the length of the rope to increase *by 5 inches*.

As these paraphrases show, in (16)a the difference value is an indefinite amount of change, providing no bound to the change. In (16)b, on the other hand, the difference value is definite and introduces a bounded measure of change. According to Hay et al.'s proposal, (16)a is predicted to be atelic, and (16)b is predicted to be telic. A classic test to verify whether a given predicate is telic or not is to check if that predicate is entailed by its progressive form: atelic predicates are entailed by their progressive forms, but telic predicates aren't. Below we can see that their predictions are confirmed since *lengthen the rope* is shown to be atelic, while *lengthen the rope 5 inches* is shown to be telic:

(17) a. Kim is lengthening the rope $\Rightarrow$ Kim has lengthened the rope.
b. Kim is lengthening the rope 5 in $\not\Rightarrow$ Kim has lengthened the rope 5 in

The relevant part of this analysis for our purposes is the claim that bounded amounts of change give rise to telic interpretations of predicates. Hay et al. proposed that it is the formal properties of the difference value that determine a predicate's telicity. Although we do not have 'difference value' in the case of goal PP constructions headed by *até*, I believe that a parallel

can be established between the means by which telicity is obtained in these two types of constructions.

The parallel can be made in the following way. In the case of DAs with definite difference values, like in *Kim lengthened the rope 5 inches*, we have telicity because we can identify the endpoint of the event. Once this endpoint is detected, the uniqueness requirement of *in* is fulfilled. The idea is that the endpoint to the lengthening event is made explicit by providing a bound on the length scale. For example, in sentence (15)b the event is over when the rope is 5 inches longer than it was before the lengthening event started. Therefore, there is a unique event of lengthening the rope 5 inches. In this way, this construction is telic because it has an identifiable endpoint, which provides the unique event that makes the proposition true. This is similar to what we proposed for *até*. To see this, consider the goal PP construction below and its truth conditions:

(18) a. O João nadou até a ponte.
John swam to the bridge.

b. λe. swam (John) (e) & $\exists$e': e' $\subseteq$ e & e' = RB (e) & PATH (e') (John) = the bridge

Based on the semantics we gave *até* in the previous section, this sentence is true if and only if there is a swimming event by John and at the right boundary of this event, John is at the degree *bridge* of the path scale. In this sentence, John swam up to the degree *bridge* of the path scale, but not further: the event is over when John reaches this degree of the path scale. Thus, constructions headed by *até* are similar to constructions like (15)b in that in both constructions telicity is brought about by the introduction of a bound in the relevant scale, which in turn identifies an endpoint to the event and consequently makes the predicate satisfy the uniqueness requirement.

On the other hand, when the difference value is indefinite, as in *Kim lengthened the rope*, there will not be an endpoint to the event, as Kim may keep lengthening the rope indefinitely. Because no endpoint to the event can be found, the predicate is atelic. Also, there will be more than one event of lengthening the rope that make the proposition true. Therefore, the uniqueness requirement is not fulfilled and the sentence cannot be modified by *in*-adverbials. This can be compared to the case of *hasta*, which also does not provide a bound on the scale and as a result does not give rise to telic predicates.

In summary, in the two cases considered in this section (i.e., goal PP constructions with *até* and *hasta* and DA verbs), telicity is brought about by the identification of an endpoint to the event, which is achieved through the introduction of a bound on a scale. However, it might not be sufficient to

provide only the endpoint to the event, as there might be many events ending at that point. The satisfaction of the requirement that there be a unique subinterval that makes the predicate true contributes to yield telicity.

4. Conclusion

I have investigated the semantics of two prepositions, Brazilian Portuguese *até* and Spanish *hasta*, showing how telicity is obtained for the former but not for the latter. It was noted that both prepositions operate on scales and that a small, but crucial difference in the semantics of these two lexical items is responsible for such aspectual difference.

This analysis brings additional support to the claim that telicity can be triggered by the scalar structure of some predicates and further suggests that this claim is more general than Hay et al. first proposed. Telicity can be triggered by the scalar structure not only of DA's; the scalar structure of *até* is also proven to yield telicity.

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