
Liminal *Until**

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5.1 Introduction

Temporal modifiers headed by *until* are known to behave differently when modifying telic and atelic predicates. As demonstrated in (1) and (2), with atelic predicates (states and activities) *until* is acceptable in both positive and negative clauses, while with telic predicates (accomplishments and achievements) it is only acceptable with negation. Based on this difference, two types of *until* have been recognized, at least descriptively (Klima 1964, Horn 1970, 1972, Heinämäki 1974, Karttunen 1974, Mittwoch 1977, Hitzeman 1991, Declerck 1995, Tovenä 1996, de Swart 1996, Giannakidou 2002, Condoravdi 2008, Israel 2011, Bassa-Vanrell 2017).

- (1) Durative *until*
 - a. It was (not) dark until she pulled the curtains.
 - b. They played until the bar closed down.

- (2) Punctual *until*
 - a. Mary didn't get home until noon.
 - b. *Mary got home until noon.

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A prominent approach, one that Lauri Karttunen argued for in Karttunen (1974), assumes two distinct lexical items, durative *until* (*until^D*) and punctual *until* (*until^P*), with different semantic properties. Durative *until* — and on approaches that do not recognize lexical ambiguity, *until* in general — has a selectional restriction for atelic predicates, usually modeled in terms of divisive reference.¹ Proponents of the lexical ambiguity approach may differ on how they derive the contrast with telic and atelic predicates, but all agree on two points. The first point is that punctual *until* is a negative polarity item. This explains the contrast in (2), on the assumption that negation scopes over the temporal modifier. In (2a) *until^P* appears in the scope of negation and is, therefore, licensed. (2b) is unacceptable because it contravenes some requirement on either construal of *until*. On the one hand, punctual *until* remains unlicensed in the absence of negation, and on the other, the selectional restriction of durative *until* for an atelic predicate is not satisfied. The second point is that the semantic hallmark of sentences with punctual *until* are the implications in (3) (see Condoravdi 2008 for more extensive discussion).

- (3) Implicational profile of punctual *until*:
- a. **Actualization:** (2a) implies that Mary got home.
 - b. **Temporal location:** (2a) implies that Mary got home at noon.

A key contrast between punctual and durative *until*, which any analysis must derive, is in their inferential profiles. While any implication of cessation that arises with durative *until* is cancellable, the actualization implication of punctual *until* is not. (4) exemplifies the contrast.

- (4) a. The lake was warm until early September, and, alarmingly, it stayed warm until December.
- b. The lake didn't get warm until early August, #and, alarmingly, it didn't get warm even then.

Analyses that reduce punctual *until* to durative *until*, such as Heinämäki (1974) and Mittwoch (1977), attribute the pattern in (1) and (2) to the independently required selectional restriction of *until*. The contrast in (2) is explained by assuming that the temporal modifier scopes over negation, which produces a derived stative predicate and thus satisfies the selectional restriction of the temporal modifier.

¹A predicate *P* has divisive reference relative to a given argument position iff its denotation in any model is closed under the subpart relation relative to that argument position. For predicates over temporal intervals, divisive reference is the subinterval property.

In avoiding lexical ambiguity, such approaches are ostensibly more parsimonious, but they face the challenge of deriving the actualization implication in (2a), and hence of explaining the contrast in inferential behavior seen in (4). The fact that the actualization implication of punctual *until* is conventional whereas the cessation implication of durative *until* is pragmatic constitutes a strong argument in favor of positing ambiguity.

This contribution presents new data that complicate the empirical picture, casting doubt on the view that punctual *until* is polarity sensitive, and revealing that its implicational behavior is significantly more complicated than has been realized in the literature. We maintain the hypothesis that *until* is lexically ambiguous between (i) a durative adverbial that can give rise to cancellable implicatures of cessation and (ii) a frame adverbial that cannot occur with simple, non-quantified sentences headed by telic predicates and that gives rise to non-cancellable inferences. We show that this frame adverbial is not polarity sensitive, and that the non-cancellable inference it gives rise to is more general than the actualization inference found with telic predicates under negation. We demonstrate that existing analyses do not derive the non-cancellable inferences observed in the relevant cases, but argue that Karttunen's basic insight, namely that these inferences are contextual entailments arising from the interaction between what sentences with the frame adverbial *until* presuppose and what they assert, is correct. Specifically, we propose, following Condoravdi (2008), that the non-durative, frame adverbial *until* describes the temporal location of a presupposed transition within a contextually familiar interval. We, therefore, name this adverbial *liminal until*. We provide an informal but precise characterization of the transition, and point out the challenges of formalizing our characterization within a compositional framework. Punctual *until* turns out to be a special case of liminal *until*.

5.2 Punctual and Durative *until*

Karttunen (1974) introduces his analysis of punctual *until* this way:

The basic idea is this: there are different ways of drawing inferences from utterances. Some of the inferences we feel entitled to are based on knowing the logical form of the sentence that was spoken, some of them are presuppositional inferences based on the knowledge of the kind of situation in which we would be entitled to say such a thing, and finally there are inferences that arise from the interplay of these two kinds. I propose that the inference from [(2a) to (3b)] is of this third type and that the inference from [(2a) to Mary didn't get home before noon] is a matter of logical form. (p. 292–293)

He proposes that the truth-conditional temporal meaning of punctual *until* is the same as that of *before*. Punctual *until* has, in addition, presuppositional content that is responsible for the actualization inference, and ultimately for the inference of temporal location, which makes *until time t* appear synonymous with *at time t*. Specifically, sentences of the form ‘A *Until^P* T’ presuppose $(A \text{ AT } T) \vee (A \text{ BEFORE } T)$ and assert $A \text{ BEFORE } T$. With negation, the assertion is $\text{NOT } (A \text{ BEFORE } T)$, which taken together with the presupposition, entails $A \text{ AT } T$.

Condoravdi (2008) follows the main idea of Karttunen’s analysis but recasts both the presuppositional and the truth-conditional content of *until^P*. She proposes an analysis in which a modifier [*until^P* α], where α denotes time t , presupposes a transition within a contextually salient interval I , between a maximal initial subinterval, I_{NEG} , in which the eventuality description modified by *until^P* α is not instantiated and a minimal final subinterval, I_{POS} , in which it is, and uncertainty about when the transition occurred. α is associated with a set of alternatives, Alt_{α} , including α itself. The alternatives denote disjoint subintervals of I , which are epistemic alternatives for when the phase transition from I_{NEG} to I_{POS} might have occurred.² For example, the modifier *until noon* in (2a) presupposes that a contextually familiar interval I is divisible into a maximal interval I_{NEG} within which she didn’t arrive, and a minimal interval I_{POS} in which she did. Since the time of the transition is not settled, in different possibilities I_{NEG} extends up to, and I_{POS} starts at, different times that are elements of Alt_{noon} . The assertive contribution of punctual *until* is that the modified eventuality description, in this case **she arrive**, is instantiated in the interval $[\text{lb}(I), t)$ which stretches from the left boundary of I up to, but not including, t (forming a convex interval with t). In (2a), where negation has to scope over *until*, the assertion is that it is not the case that **she arrive** is instantiated within $[\text{lb}(I), t)$. The non-cancellable inference, that she arrived at noon or later, arises, as in Karttunen’s analysis, as an entailment of the assertion given the presupposition. Since it is presupposed that she arrived within an interval stretching from $\text{lb}(I)$ to one of the times in Alt_{noon} , and given the assertion that she did not arrive within $[\text{lb}(I), \text{noon})$ it follows that, if the sentence is true, she arrived at noon or later.³

Condoravdi’s (2008) analysis of durative *until* is that, like punctual *until*, [*until^D* α], where α denotes time t , delivers an interval that stretches from the left boundary of a contextual interval I up to t . Durative *until* requires an atelic predicate and it asserts that this pred-

²This is a (generalized) reconstruction of Karttunen’s disjunctive presupposition.

³The inference that she arrived at noon and not later is argued to be a pragmatic scalar inference, see Condoravdi (2008) for discussion.

icate is true of the interval $[lb(I), t)$. This means that both punctual and durative *until* expand the time that is given by their complement backwards but differ in the kind of modifier they produce. Punctual *until* forms a frame modifier, while durative *until* forms a durative modifier. Durative *until* can scope over and under negation, yielding the throughout-not and the not-throughout readings, respectively. For durative *until* any further implications about the predicate not holding of a bigger interval, one that extends past the time specified by its complement, arise pragmatically, hence the contrast in (4).

The assumption that durative and punctual *until* are two different lexical items is not uncontroversial, but there are good arguments for making it in addition to the contrast in (4) (see Condoravdi (2008) for elaboration of, and extensive arguments against, the alternatives). One familiar argument is that various languages draw a lexical distinction between punctual and durative *until*. A more indirect argument is that analyses like Karttunen's and Condoravdi's, in which punctual *until*, but not its durative counterpart, is associated with a presupposition of change within a temporal interval, naturally relate this item to a family of polarity sensitive, scalar items that serve as its counterparts in other languages, such as German *erst* (Löbner (1989), see Condoravdi (2008) for discussion). We point out here another argument, namely that, in English, punctual and durative *until* can be distinguished by their interaction with the scalar particles *only* and *even*. While durative *until*, which is not inherently scalar, can be modified by both particles, as in (5a) and (6a), punctual *until*, which is inherently scalar, cannot be modified by either.

- (5) a. She stayed only until noon.
 b. She didn't arrive (#only) until noon.
- (6) a. She stayed even until after they closed for the night.
 b. She didn't arrive (#even) until after they closed for the night.

On the type of analysis of punctual *until* described above, this contrast is natural and anticipated. Since durative *until* only contributes information about the duration of an event, it can naturally be contrasted with potential longer durations (in the case of *only*) or shorter ones (in the case of *even*). Punctual *until*, on the other hand, contributes information about which of a set of alternative times is the earliest time at which a presupposed transition occurs. The kind of scalar information that *even* and *only* would supply is already lexically encoded by punctual *until*. Since there cannot be more than one earliest time in a set of times (one time cannot be more or less earliest than another),

there is no way to build more scalarity on top of the lexically encoded one for *only* and *even* to operate on.

An issue raised by Condoravdi (2008) but left unresolved is why (2a) does not have a reading without the actualization implication. Such a reading should be available on a construal with durative *until* scoping over negation. One potential line of explanation is that *until^D* selects for predicates with a property other than divisive reference, which would differentiate between negated atelic and negated telic predicates. Another potential line of explanation exploits the truth-conditional equivalence of *until^D* and *until^P* in this configuration and attributes the unavailability of *until^D* to the principle of Maximize Presupposition (Heim 1991), construed in such a way so that competition is between logical forms.

5.3 *Until without Negation*

This section presents a host of cases in which an *until*-phrase modifies a predicate in the absence of negation, giving rise to non-cancelable inferences similar to — though, not identical to — those found with punctual *until*, but not found with durative *until*.

The attested example in (7a) and that in (7b) involve a telic verb with an indefinite plural subject with a cardinality specification. The sentential predicate is arguably also telic, as seen by the contrasts in (8). This implies that the *until* seen here is not a durative *until*, which, like *for*, would be incompatible with such a clausal predicate.

- (7) a. Hundreds died until the epidemic ran its course.⁴
 b. Dozens of solicitors came by my house until I put up the ‘no soliciting’ sign.
- (8) a. Hundreds died in just a few minutes.
 b. # Hundreds died for a few hours.
 c. Dozens of solicitors came by my house in a short time.
 d. # Dozens of solicitors came by my house for a long time.

(7a) and (7b) imply that there was a steady stream of deaths or visits of solicitors to my house before the time specified by the temporal clause. In addition, (7a) gives rise to the inference that after the epidemic ran its course, the rate of epidemic-induced deaths decreased. Similarly, (7b) gives rise to the inference that once the ‘no soliciting’ sign was put up, visits from solicitors stopped or at least decreased. In both cases, the inference is not cancellable. Admittedly, in the case

⁴Sheldon H. Harris, *Factories of Death: Japanese biological warfare and the American coverup*, London: Routledge, 1994, p. 97

of (7a) there is strong pragmatic pressure for this inference. But the same kind of inference can be observed when the content of the temporal clause is independent from that of the main clause, as in (9), where government intervention could have been ineffectual, in which case the rate of deaths would have continued unchanged, or it could have increased the number of deaths just as well as decreased them.

(9) Hundreds died until the government intervened.

The examples in (10) involve the upward entailing determiner *many* on a cardinal reading. The inference in (10a) is that once the conference started, the number of people I managed to talk to dropped, in (10b) that once the course requirements were made public registration dropped.

- (10) a. I managed to talk to many people until the conference started.
 b. Many students registered for the class until I posted the course requirements.

In (11) the subject NP features the quantifier *more and more*, which expresses, roughly, that the cardinality of the intersection of its restrictor and scope sets increases over time. The non-cancellable inference here is that the increase in registration ended once the course requirements were posted.

- (11) More and more people registered for the class until I posted the course requirements.

The same kind of inference of change can be observed when the main clause features a downward entailing expression, except in the opposite direction. In (12), the subject NP contains the downward entailing determiner *few*. The inference in (12a) is that once Hungary opened the border, the number of people who managed to leave increased. In (12b), it is that once the course was advertised the number of registrations increased. The type of inference seen with (12a) and (12b) shows up even in (12c) and (12d), where it is pragmatically less plausible. (12d) suggests, for example, that discouraging the students from taking the class had the opposite effect.

- (12) a. Few people managed to leave until Hungary opened its border.
 b. Few students registered for the class until I advertised the course.
 c. Few people managed to leave until Hungary closed its border.
 d. Few students registered for the class until I started discouraging them from taking it.

The non-cancellability of the inferences with these instances of *until* can be observed by considering the contrast between *until* and other frame adverbials with similar meanings. The same inferences that arise with *until* arise with *before*, but with *before* they are clearly cancellable, as shown by (13) and (14).

- (13) a. I managed to contact many people before the conference started, and many more later.
 b. #I managed to contact many people until the conference started, and many more later.
- (14) a. Few people managed to leave before Hungary closed its border and no one afterwards.
 b. #Few people managed to leave until Hungary closed its border and no one afterwards.

(15) shows a similar contrast between *until* clauses in the relevant (non-negated) context and the temporal modifier *over the course of the summer*.

- (15) a. #Many people registered until early registration was over, and many more afterward.
 b. Many people registered over the course of the summer, and many more afterwards.

5.4 Liminal *until*

The descriptive generalization emerging from the previous section is that liminal *until* is, like punctual *until*, a non-durative frame adverbial which, unlike its durative counterpart, gives rise to uncancellable inferences. Liminal *until*, however, differs from punctual *until* in two respects. First, it is not polarity sensitive. Second, the inference it gives rise to is not always **actualization**, but a more general inference of transition. For example, (12a) above does not give rise to the inference that few people managed to leave Hungary overall. Rather, liminal *until* can be said to give rise to an inference of a transition, a change in polarity, within the contextual interval, with respect to the matrix sentence radical. Something that was the case up to the time specified by the *until* phrase is no longer the case afterwards, or else something that was not the case becomes the case. This section discusses the implications of these findings for the analysis of *until*.

The emergent description of liminal *until* raises two interrelated problems. The first is how to characterize and derive the general transition inference it gives rise to, relating it to that of punctual *until*,

which, ideally, would come out to be a special case. The second is explicating the particular transitions that are inferred in the cases that do not feature negation. This latter problem is especially acute in the cases featuring upward monotone quantifiers, in which the inferred transition seems to be the opposite of actualization of a property of eventualities expressed by the matrix sentence radical. For example, if it was true that dozens of solicitors came by my place until just before I put up a ‘no soliciting’ sign, then it remains equally true within any larger interval ending at any later point that dozens of solicitors came by my house, even if solicitors stopped coming after the sign went up.

Extending existing analyses devised only for the case of punctual *until* to the more general liminal *until* is, therefore, not straightforward. Analyses that rely crucially on the presence of negation are clearly non-starters, since none of the cases discussed above feature negation. Analyses that only recognize a durative *until* face the same problem here as they do in the case of negation. Even when the matrix clauses feature atelic predicates, positing that the predicate in examples like (12a), repeated here as (16), is in the scope of durative *until* provides no way of explaining the key property such examples share with sentences featuring punctual *until*, namely that the inference it gives rise to, that the number of people who managed to leave Hungary *after* the border opened increased, is indefeasible.⁵

(16) Few people managed to leave until Hungary opened its border.

Karttunen’s (1974) analysis discussed above also cannot be easily extended to cover liminal *until*, since the presupposition and assertion he proposes will not yield the desired inference. Applying Karttunen’s analysis, one would say that this sentence presupposes that few people managed to leave Hungary either before or when it opened its border. The assertion would be that few people managed to leave before Hungary opened its borders. This assertion, however, does not in any way lead to any indefeasible inference about how many, if any, people managed to leave after the border was opened.

Applying Condoravdi’s (2008) analysis to (16) would yield the presupposition that there is a transition within a contextually supplied interval *I*, containing the time of Hungary opening its border. The transition is with respect to the property expressed by the clausal predicate

⁵Given the atelicity of the clausal predicate in (16), the question arises what excludes a construal with durative *until* in this case. This is the same kind of question as the one raised at the end of section 5.2, namely why (2a) does not have a reading without the actualization implication. Whatever explanation is the proper one for the original case would also apply to liminal *until*.

and based on the truth-conditional content the time of the transition is implied to be no earlier than the opening of the border. The presupposed transition is further specified to be from a maximal initial subinterval I_{NEG} of I not satisfying the property corresponding to the matrix clause, to a minimal final subinterval I_{POS} satisfying it. This presupposition, however, is contradicted by the asserted content. Assuming that the property of intervals expressed by the matrix sentence is the property of containing few events of people leaving Hungary, the presupposed transition ends up being from an interval in which there are many events of leaving (that is, not few), to one in which there are few. However, according to the asserted content, the first phase of the interval, the subinterval of I that ends just before the opening of the border, is an interval in which few departures occurred.

We contend that what is needed to allow Condoravdi's analysis to capture liminal *until* is a generalization of the nature of the presupposition. Liminal *until* presupposes that the interval extending from a contextual left boundary to the time mentioned in the temporal clause contrasts with all of its relevant superintervals with respect to the instantiation of a property associated with the matrix clause. Relaxing the requirement that $I_{\text{NEG}} \prec I_{\text{POS}}$, allowing instead the two phases to occur in either order, the assertive content of (16) would determine that the interval stretching from $lb(I)$ to a time just before Hungary opens its borders, $[lb(I), t_{\text{open}})$, is an improper subinterval of I_{POS} ($[lb(I), t_{\text{open}}) \subseteq I_{\text{POS}}$) and scalar reasoning determines that $[lb(I), t_{\text{open}})$ is identical to I_{POS} . If the interval $[lb(I), t_{\text{open}})$ is the maximal interval within which only few people managed to leave, then this implies that more people left within the interval $[t_{\text{open}}, rb(I)]$,⁶ that is after Hungary opened its border. The analysis can capitalize on the fact that the truth of a sentence with a downward monotone quantifier is not persistent over superintervals.

Intuitively speaking, (16) communicates that the opening of the Hungarian border marked a change in the number of people leaving and presupposes that, within the contextually relevant interval starting at some left boundary l_B , there is a change in the number of events of leaving Hungary, and that this change happens within an interval ending in one of the alternative times to the time t_{open} at which Hungary opens its borders (including t_{open} itself). The assertion is that the number of events of leaving Hungary within the interval ending just before t_{open} is low. Given the presupposition, this leads to the inference that within some interval beginning in l_B and ending at the time t_{open}

⁶ $rb(I)$ is the right boundary of I .

at which Hungary opened its borders, or perhaps later, the number of events of leaving Hungary is not low, and hence that it has increased, which is the desired inference.

Under these assumptions, punctual *until* is indeed just a special case of liminal *until*, the special case that arises when the interval extending from a contextual left boundary to the time mentioned in the temporal clause is asserted to not instantiate the property of intervals expressed by the matrix clause. With a telic predicate and no quantifiers, as in the classic cases considered in the literature and exemplified by (2), the temporal ordering between I_{NEG} and I_{POS} has to be $I_{\text{NEG}} \prec I_{\text{POS}}$. On the ordering $I_{\text{POS}} \prec I_{\text{NEG}}$, the asserted and the presuppositional content of the sentence would be in conflict, just like we saw above for (16) in the case where $I_{\text{NEG}} \prec I_{\text{POS}}$. On this view then, the apparent polarity sensitivity of punctual *until* is due to the fact that only under negation are its asserted and presuppositional contents compatible. Whether a language has liminal or only punctual *until* depends on how specific the presuppositional content of its *until* is. If the presupposition requires that $I_{\text{NEG}} \prec I_{\text{POS}}$, then the language has only punctual *until*. If the presupposition is more general, requiring only that a transition occur, thus allowing for either temporal ordering, the language has the more general liminal *until*.⁷

The cases that remain problematic are the ones involving upward entailing cardinals, such as (7b), repeated in (17).

- (17) Dozens of solicitors came by my house until I put up the ‘no soliciting’ sign.

Specifically, what needs to be explicated is what property of intervals features in the presupposed contrast in these cases and how it is to be extracted from the matrix clause. Taking this property to simply be instantiation of the property of eventualities encoded by the matrix sentence radical would yield the wrong results. The reason is that the analysis proposed would then generate the inference that, within an interval ending at the time when I put up the sign or later, it is false that dozens of solicitor came by my house. This, however, will be false in any context in which (17) is true, since by the time the sign was put up, the dozens of visits have already occurred, and this remains true throughout any longer interval.

What seems to be required here is a way to extract from the matrix sentence, **dozens of solicitors come by my house**, a property that can be said to hold within an interval ending just before the sign was put

⁷It may well be that what we observe in English is a change in progress, where *until*'s presuppositional content has been generalized.

up, but not persisting through longer intervals. Intuitively formulated, the required property of intervals is the property of containing regular visits by solicitors at a certain rate, a rate that, over a period of the same length as the interval stretching from l_B to the time at which the sign was put up, yields dozens of visits. Presumably, this is the same kind of property of intervals as features in assertions in the progressive, such as (18).

- (18) Dozens of people are visiting the museum these days (but it might not last).

Given such a property, the analysis would yield the desired results. For (17), for example, the inference would be that the interval stretching from l_B up to but not including the time at which the sign was put up contrasts with all of its alternative superintervals in showing such a rate of visits. Putting up the sign generates a drop in the rate, making it the case that for all intervals that extend beyond the time at which the sign was put up, the overall rate of visits is one that does not generate dozens of visits for an interval of the same length as the period from l_B up to the hanging of the sign.

We leave the puzzle of how to extract such a property in a general way that works for all cases, and within a compositional framework, as a present to Lauri and a prospect for future work.

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