

COMPARATIVE PATHS TO AN OPTIMAL INTERPRETATION*

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Abstract

In this paper we discuss a particular type of comparatives, that we call reflexive comparatives. These reflexive comparatives have the property that they compare an object with itself, but with respect to different temporal, spatial or scalar indices. We argue that this property can be viewed as the optimal outcome of a conflict between two general constraints on the arguments of a semantic relation. A semantics of reflexive comparatives is proposed which is based on paths in scalar and other domains.

1 Reflexive comparatives

In this paper we want to draw attention to a type of comparatives that has not received much attention in the literature. We call these comparatives *reflexive* for reasons that will become clear in the analysis that we will provide of this type. The sentence in (1a) below was uttered by the tennis player Lleyton Hewitt in an interview at the end of May 2004. Hewitt means that in the course of the tournament the matches become more difficult, i.e. each match is more difficult than the previous one (the universal quantifier gets a ‘consecutive’ interpretation). Discourse comparatives do not come with a *than*-clause. Usually the compared element can be recovered from the context. Yet, the examples in (1) find their interpretation independent of context. In this interpretation there is no comparison between two different objects, but a temporal or spatial change or development. Here are some (more) examples:

- (1) a. Every match doesn’t get *easier*.
- b. Elk jaar worden de eindexamens *gemakkelijker*.
 Each year get the final exams easier
 ‘The final exams get easier each year’
- c. Die lockere Stadt schloss sich *enger und enger* um ihn, sie saugte ihn in
 sich hinein. Der Lärm wuchs, *höher* schienen sich die Häuser zu
 wachsen, *grauer* wurden ihre Fassaden, *eiliger* liefen die Menschen.
- d. Wolves get *bigger* as you go north from here.
- e. The crack gets *wider* at the north gate.
- f. The *higher* his stakes, the *lower* his expectations.
- g. Nowadays, *more* goods are carried *faster*.

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The kind of comparatives that have received most attention in the literature are those that have an explicit *than*-clause or *than*-phrase, as in (2a) below. The *than*-phrase can also be strongly reduced, as in (2b). In this example, the *than*-phrase does not contain an overt item of comparison, although it does provide the reference point for the comparison. However, it is quite common for a comparative to occur without a *than*-clause or *than*-phrase. With such a *discourse comparative*, as in (2c), the hearer has to recover from the preceding discourse or the situation that the match of this year is compared to, for example, the one of last year. The reflexive comparatives present a fourth type, in which the match is not compared to an explicitly or contextually provided object of comparison, but is described as developing in a particular way (2d).

- (2) a. This year's match was easier than last year's match (was). (explicit)
 b. The match was easier than last year. (reduced)
 c. This match was easier. (discourse)
 d. The match gets easier every year. (reflexive)

Such reflexive comparatives distinguish themselves from the other comparatives in a number of respects. The *than*-clause or *than*-phrase that is explicit in (2a), present in reduced form in (2b) and can be added in (2c), is impossible in (2d) and in other reflexive comparatives. In example (1d), originating from Carlson (1977), it is impossible to add a *than*-phrase without changing the meaning:

- (3) Wolves get bigger than ??? as you go north from here.

There is nothing that we could add to make explicit that the size of wolves correlates with latitude. Another feature of reflexives is that reduplication of the adjective is possible, as is shown in (1c) above. This is not possible with the explicit, reduced or discourse comparatives:

- (4) a. * This year's match was easier and easier than last year's match.
 b. * The match was easier and easier than last year.
 c. * This match was easier and easier.
 d. The match gets easier and easier every year.

Notice furthermore that universal quantification of the subject pertains to a temporal sequence in the case of reflexive comparatives only:

- (5) a. Every match was easier than last year's matches.
 b. Every match was easier than last year.
 c. Every match was easier.
 d. Every match gets easier.

In (5a), (5b) and (5c) all the matches of one particular year are compared with matches in the preceding year. There are just two years. In (5d) however, there is an indefinite sequence of years over which the matches develop in easiness. More in general, in reflexive comparatives the comparative morpheme always indicates a scalar progression that correlates with time (1a) and (1b), space (1c), (1d), (1e), or another scale (1f), (1g). Finally, the subject of the comparative often refers to stages or parts of

an object. As Carlson already observed, the intended reading of (1d) is not that a wolf grows in size when we put it in our car and drive north with it, but that spatial parts ('stages') of the wolf population differ in size. Example (1e), a variation on a sentence from Gawron (2004), describes a crack in a city wall. The parts along the length of this crack differ in width.

So comparatives have a special use with the properties that we just described. The question is how this interpretation arises. Our hypothesis is that the reflexive interpretation of the examples in (1) is the optimal interpretation that we get as the result of a *compromise* between two general constraints: DOAP (Don't Overlook Anaphoric Possibilities) and Principle B. This compromise involves spatial, temporal and scalar indices on the arguments of the comparative relation and determines the special interpretive properties that we find.

We will first discuss the two constraints that we assume in our account and the Optimality-Theoretic interaction between them in a range of examples (section 2). In section 3 we will show how these constraints account for the reflexive use of comparatives. Section 4 discusses the nature of the indices that we argue to play a crucial role in the interpretation of reflexive comparatives. Finally, in section 5, we turn to the resulting semantics of comparatives based on paths in scalar and other domains.

2 Constraints on anaphoric elements

The claim of Optimality-Theoretic Semantics is that anaphoric relations are determined through the interaction of a small set of general constraints (Hendriks and de Hoop 2001). In this section we will show how three constraints determine the interpretation of discourse comparatives. One of the basic constraints in this interaction is *Don't Overlook Anaphoric Possibilities* (DOAP) (Williams, 1997):

- (6) Opportunities to anaphorize text must be seized.

We can see this constraint at work in the interpretation of the following example:

- (7) Jane smokes more than Jacky, but Robert drinks more.

The comparative *more* is a discourse comparative. Robert's drinking is compared to something else that we need to complete our interpretation of the sentence. DOAP says that our interpretation has to be anaphoric. If we represent the interpretation informally in the form of an explicit *than*-clause, then DOAP rules in those interpretations in which the *than*-clause refers to someone who is already mentioned in the previous sentence, but it rules out referring to someone who is not already mentioned:

- (8) ✓ Jane smokes more than Jacky, but Robert drinks more [*than Jacky*]
* Jane smokes more than Jacky, but Robert drinks more [*than Bill*]

In (8) there would have been another way to fill in the missing information, namely by saying that Robert drinks more than Jane. This interpretation is ruled out by the constraint Parallelism:

- (9) As the antecedent of an anaphoric expression, choose a (logically, structurally or thematically) parallel element from the preceding clause.

The missing *than*-phrase of the second conjunct of (7) is parallel to the explicit *than*-phrase of the first conjunct. Therefore Parallelism rules out that Robert in (7) is interpreted as drinking more than Jane:

- (10) ✓ Jane smokes more than Jacky, but Robert drinks more [*than Jacky*]
* Jane smokes more than Jacky, but Robert drinks more [*than Jane*]

Both interpretations satisfy DOAP, but the first interpretation is parallel, the second isn't and therefore violates Parallelism.

There is a third principle at work in the interpretation of discourse comparatives, Principle B:

- (11) If two arguments of the same semantic relation are not marked as being identical, interpret them as being distinct.

This well-known principle rules out that a pronoun in object position can take the subject of the same sentence as its antecedent, unless that pronoun is a reflexive:

- (12) ✓ Jacky loves herself
* Jacky loves her [*her = Jacky*]

Principle B is also relevant for the interpretation of the discourse comparative in the following sentence:

- (13) Jane smokes more than Jacky, but Jacky drinks more.

DOAP wants the object of *more* to be either Jane or Jacky, not someone from outside the sentence. Parallelism requires that the anaphor and the antecedent are parallel, i.e. that Jacky is the object of *more* in both clauses. However, this is what Principle B rules out. The two arguments of the relation *drink more* cannot both be Jacky. There is a conflict between Principle B and Parallelism.

In Optimality Theory a conflict between constraints is resolved by constraint ranking. A lower constraint can be violated to allow satisfaction of a higher constraint. In OT Semantics the ranking is as follows:

- (14) Principle B >> Parallelism

Principle B is maintained at the expense of Parallelism. This leads to the following interpretation of (13):

- (15) ✓ Jane smokes more than Jacky, but Jacky drinks more [*than Jane*]
* Jane smokes more than Jacky, but Jacky drinks more [*than Jacky*]

Even DOAP has to give way to Principle B (i.e. Principle B >> DOAP). We can see that in the following example:

(16) Today's match was just as difficult.

Even though DOAP requires that the missing object of *just as difficult* be retrieved from the same sentence, this is not the way we can construe the sentence, because that construal is ruled out by Principle B:

- (17) ✓ Today's match was just as difficult [*as yesterday's match*]
* Today's match was just as difficult [*as today's match*]

We have to find the interpretation in a non-anaphoric way, outside the sentence, violating DOAP, but satisfying the higher-ranked Principle B. The ranking of the three constraints is as follows:

(18) Principle B >> Parallelism, DOAP

Notice that Parallelism and DOAP are not ranked with respect to each other, because they do not conflict.

3 Reflexive comparatives as an optimal interpretive solution

How do these constraints conspire to give us the optimal interpretation for a reflexive comparative, like the one in (19)?

(19) Every match gets more difficult.

Because this sentence is not embedded in a coordinate construction in which the first conjunct provides the explicit context, which may or may not be parallel to the second conjunct, the constraint Parallelism is not relevant here. Therefore, the constraints we can focus on are DOAP and Principle B. Consider the following examples:

- (20) * Every match gets more difficult [*than the 2002 Wimbledon final*] (*DOAP)
* Every match gets more difficult [*than itself*] (*Principle B)

DOAP rules out that the object of *more difficult* is identified with an object outside the sentence, as in the first interpretation in (20). This seems right for reflexive comparatives: they never take on the kind of interpretation that discourse comparatives allow. Principle B rules out that the object of the comparative is found within the sentence, i.e. that it is the subject. This seems correct too.

However, if neither of these interpretations is allowed, then the question is what interpretation *is* allowed. What interpretation can satisfy DOAP and still avoid a violation of Principle B? In other words, how can reflexive comparatives be reflexive in interpretation (i.e. refer back to the subject) and at the same time keep the object and the subject of the comparative sentence distinct?

Our answer is that the reflexive interpretation of the comparative satisfies both constraints because it adds 'intensional' indices to the arguments of the comparative and

by doing so, it allows for a compromise interpretation. The (informal) compromise interpretation of sentence (19) is as follows:

(21) Every match_n gets more difficult than match_{n-1}

The indices n and $n-1$ here index the match for the year in which it occurs: match_n is the match in year n , match_{n-1} is the match in the preceding year. (21) says that every match in year n is more difficult than the same match the year before. This seems a reasonable, although informal and partial, account of what is going on in this reflexive interpretation. It also makes clear why reflexive comparatives satisfy both DOAP and Principle B. In the interpretation of a reflexive comparative

(22) X_n gets A-er than X_{n-1}

the two arguments X_n and X_{n-1} have the kind of anaphoric dependency that DOAP requires, because the anaphoric opportunity for interpreting the missing object is clearly seized. On the other hand, X_n and X_{n-1} are distinct for Principle B because they carry different indices. DOAP and Principle B are sensitive to slightly different types of anaphoric identities and this is a situation where we can exploit this divergence.

4 The role and nature of indices

The indices play an important role in deriving the interpretation of reflexive comparatives. The indices can be drawn from different semantic domains, but they always seem to come from an interval of ordered values. We already saw an example where the indices come from a discrete temporal sequence:

(23) Every match_n doesn't get easier [*than match_{n-1}*]

In this case the sequence is used to distinguish different matches in the Roland Garros tennis tournament. The indices can also play a more continuous role:

(24) Joey_t got older [*than Joey_{t-1}*]

While matches are played every other day or so, people get older in a continuous fashion. The indices t and $t-1$ are taken from a continuous representation of time. In the following example, the indices come from another continuous domain, space:

(25) Wolves_s get bigger [*than wolves_{s-1}*] as you go north from here

The temporal axis is one-dimensional and the ordering is provided by the flow of time. This is different in the spatial domain, which is why we need a clause like *as you go north from here* to give us more information about the spatial subdomain and the direction that is used for the indexation of the arguments of *bigger*. This clause gives a one-dimensional subspace together with an ordering of that dimension. A one-dimensional stretch of space is also the domain of indices for the following example,

but this time it is the length of the crack that gives us this dimension and the adverbial *at the north gate* that further specifies the ordering of the indices:

(26) The crack_p gets wider [*than crack_{p-1}*] at the north gate

The domain from which indices are drawn can also be scalar:

(27) The higher his stakes_h [*than his stakes_{h-1}*], the lower his expectations_k [*than his expectations_{k-1}*]

This is an instance of a so-called comparative conditional, a somewhat idiomatic construction in which two reflexively comparative clauses are asyndetically combined (see, e.g., Beck, 1997). There are many intricate aspects of this construction that we cannot go into here. What is important at this point is that two scales are correlated with each other in the sense that the degrees of one scale (the height of stakes) form the indices for making a reflexive comparison on the other scale (the ‘lowness’ of expectations). Because the two clauses are both based on reflexive comparatives, it is likely that one clause provides the domain for the other clause.

Perhaps even more complex are so-called multiple head comparatives (Corver, 1990; von Stechow, 1984) such as (1g), repeated below:

(28) Nowadays, more goods are carried faster.

As is the case for reflexive comparatives in general, these comparatives are characterized by the unavailability of an explicit *than*-clause or *than*-phrase (Hendriks, 1994). If we assume that each comparative morpheme introduces its own scale, multiple head comparatives introduce at least two scales which are correlated with each other. In (1g), the first scale expresses amounts of goods being carried and the second scale the speed by which these goods are carried. Although we will not go into the details of the construction, the two instances of comparison may be as follows:

(29) Nowadays, [more goods_a [*than goods_{a-1}*]]_s are carried faster [*than goods_{s-1}*]

Comparative conditionals express two independent instances of comparison and hence introduce two independent scales, which are directly correlated. In contrast, multiple head comparatives seem to express two dependent instances of comparison, as can be seen from the informal representation in (29). We may speculate that the two scales introduced in this construction are only indirectly correlated with each other in the sense that each scale separately correlates with the same third, in this case temporal, scale. The independence of this temporal scale might prevent the interpretation of this construction from getting stuck in a spiral of infinite regress.

Another question is what it means to use an index on the argument of a comparison. What do we mean by *match_n*, for example? We can see the nouns as a kind of individual concepts (in the Montegovian sense), namely as functions that give you a referent for a particular time or world index. In (23), for example, *match_n* and *match_{n-1}* give instantiations of the predicate *match* at different indices. In (24) the temporal indices yield different stages (in the Carlsonian sense) of the individual Joey: *Joey_t* is the temporal slice of Joey at time *t* and *Joey_{n-1}* is a temporal slice of that same

individual at an earlier moment of time. In the same way we can get spatial stages of kinds, as in example (25), where the indexation of the bare kind-denoting plural *wolves* gives us a spatial partition of the kind along a segment of the axis of latitude. In (26) the spatial indices give us cross-sections of the crack along its major dimension.

Three factors play an important role in determining the kind of interpretation that a reflexive comparative receives: lexical semantics, world knowledge and adverbial modifiers. Take the noun *eindexamen* ‘final exam’ in the Dutch example (1b):

- (30) Elk jaar worden de eindexamens_j gemakkelijker [*dan eindexamens_{j-1}*]
Each year get the final exams easier [than final exams]
‘The final exams get easier each year’

We know that an exam is an event that occurs only once and when it occurs it is either easy or difficult, but it doesn’t get easier while we are doing the exam. This means that we are not comparing stages of individual exams, but different exams (or instances of an event type). This interpretation is strengthened by the adverbial *elk jaar* ‘each year’.

The progression in the German example (1c), repeated here, is not temporal, but spatial:

- (31) Die lockere Stadt schloss sich *enger und enger* um ihn, sie saugte ihn in sich hinein. Der Lärm wuchs, *höher* schienen sich die Häuser zu wachsen, *grauer* wurden ihre Fassaden, *eiliger* liefen die Menschen.

The character from whose perspective the story is told is not standing at a particular place while around him the houses are growing, changing colour, moving closer. He is moving from one part of town to another, with different features. The indices are not temporal, but they are spatial, determined by the path that the character is following. The temporal construal is ruled out because of what we know about towns: fixed configurations of houses and streets that cannot suddenly change over time. Within a town the heights, distances and colours of houses are different and therefore the spatial dimension can give us a domain for comparison on which to build the kind of reflexive comparatives that we see in (31).

We also have knowledge about kinds. The bare plural *wolves* in (25) refers to a kind of animal with members of different sizes geographically distributed. It makes sense to imagine a mapping from spatial positions to different wolves and to compare those wolves on a scale of size. It does not make sense to imagine a mapping from spatial positions to a particular wolf, showing its variation in size.

Our knowledge of the shape of objects and object parts is illustrated in (26). A crack is an object with a major axis (its length) and minor axes (its width and its depth). The width of a crack can show variation. Cracks form slowly (unless there is an earthquake), so that the spatial construal of (26) is much more likely than the temporal one.

5 Comparative paths

We started this paper with a distinction between different types of comparatives:

- (32) a. X is easier than Y.
 b. X is easier.
 c. X gets easier.

In the first two comparative constructions two entities X and Y are compared on a scale of easiness. The difference between the first two constructions is that (32a) makes the reference object of the comparison explicit, whereas (32b) does not. Our reflexive comparative in (32c) does not involve two different entities, but one entity X being positioned with respect to itself at two different indices i and j, i.e. as *changing*. This distinction between a relation between two entities or a change of one entity can be schematically illustrated as follows:

- (33) X is easier (than Y)
 ... ----Y-----X-----> (relation on a scale)
- X gets easier
 ... ----X_i-----X_j-----> (change on a scale)

This fundamental distinction is also seen in the spatial domain. Take the adverb *east*. This adverb can be used to describe where one object is with respect to another object (34a), but it can also describe where something is going (34b):

- (34) a. The balloon is east of the house.
 b. The balloon is going east.

The first example concerns a relation, the second a change:

- (35) X is east (of Y)
 ... ----Y-----X-----> (relative position in a spatial dimension)
- X goes east
 ... ----X_i-----X_j-----> (change of position in a spatial dimension)

The spatial dimension could be the west-east axis.

In order to better understand the semantics of reflexive comparatives we can draw on the semantics of space and more specifically on the notion of path (see Zwarts 2004 and references cited there). For our purposes a path can be understood in an intuitive way as a directed stretch of space, the way something is moving or extending through space. Let us assume for concreteness sake that a path is a function from a finite sequence of *indices* to spatial positions. If [i,j] is the interval of indices, then the initial position of a path **p** can be denoted as **p**(i), the endpoint as **p**(j).

A directional adverb like *east* in (34b) can be interpreted as a set of paths going east. As a rough definition we might take:

- (36) $[[\text{east}_{dir}]] = \{ \mathbf{p}: \mathbf{p}(j) \text{ is east of } \mathbf{p}(i) \}$

In the context of a sentence, a path functions as the trajectory of the theme of the sentence, the object that moves along the path. Moving along a path implies being at subsequent positions of the path at subsequent moments of time. This means that we identify the indices of the path as temporal indices and the positions corresponding to those indices as locations of a moving theme. We can formalize this in terms of a structure-preserving mapping f from a time interval to the indices of the path. A theme traverses a path \mathbf{p} over a temporal interval \mathbf{t} if and only if at every $t \in \mathbf{t}$, this theme is located at $\mathbf{p}(f(t))$. The balloon in (34b) is going east if there is a path \mathbf{p} in the set in (36) that forms the sequence of positions occupied by the balloon over an interval \mathbf{t} . This implies that the balloon is going east if its final position is east of its initial position. In other words, a change of position of an object is defined in terms of how two positions of that object relate to each other.

In the same way as we have spatial paths, we can talk about scalar or comparative paths, the kind of changes that objects undergo with respect to an underlying scalar domain. Reflexive comparatives, like *easier* in (32c) denote such scalar paths:

(37) $\llbracket \text{easier} \rrbracket = \{ \mathbf{p}: \mathbf{p}(j) > \mathbf{p}(i) \text{ on the scale of easiness} \}$

Easier denotes the set of paths going towards the open end of the scale of easiness. Like a spatial path, a scalar path is a sequence of points, but this time the points are degrees on a scale. Notice that again the path is defined in terms of an underlying relation between degrees. When an entity traverses the scalar path over an interval \mathbf{t} , then at the end of the interval it is easier than at the beginning. This captures the reflexive relation on which our analysis of comparatives is based.

Not all reflexive comparatives involve a temporal change, as we saw. Sentence (1e), here repeated as (38), has two readings:

(38) The crack gets wider at the north gate.

In the temporal reading the width of the crack changes over time at one particular point, namely at the north gate. In the non-temporal reading the width of the crack increases along the its major dimension. Both readings involve reflexive comparatives and hence comparative paths:

(39) $\llbracket \text{wider} \rrbracket = \{ \mathbf{p}: \mathbf{p}(j) > \mathbf{p}(i) \text{ on the scale of width} \}$

What differs is how the indices of the path are embedded. In the temporal reading, f maps moments of time to the indices of the path, but in the non-temporal reading f takes positions along the major dimension of the crack as its domain. We line up the length of the crack with a path \mathbf{p} from (39) in such a way that one end of the crack corresponds to i and the other end to j and hence one end of the crack is wider than the otherend.

More examples could be added, but the general idea is clear. The scales that underlie the interpretation of comparatives allow for scalar relations (X is A-er (than Y)) and scalar paths (X gets A-er). Every comparative path involves a comparison, and hence a relation, between its starting point and its end point, defined with respect to some (temporal, spatial, scalar) interval.

6 Conclusion

We have shown that a particular type of comparatives, that we called reflexive comparatives, can be understood as the optimal outcome of a conflict between two general constraints on the arguments of a semantic relation. This outcome allows an object to be compared with itself, but with respect to different temporal, spatial or scalar indices. Reflexive comparison is the basis of the definition of a particular kind of comparative scalar paths that show a strong analogy with the kind of paths that underlie the interpretation of directional expressions.

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