

Negating Comparative Quantifiers

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November 2016

Abstract: In this paper, I discuss various ways to negate comparative quantifiers. I show how to account for them in the framework of the syntax and semantics of negation presented in Collins and Postal (2014).

Keywords: comparatives, degree quantifiers, degree variables, negation, NEG raising.

1. Introduction

Consider the following ways to negate a comparative subject quantifier. The paradigm in (1) involves *more* and the paradigm in (2) involves *fewer*:

- (1) a. More than seven boys were there.
b. Not more than seven boys were there.
c. No more than seven boys were there.
d. Not any more than seven boys were there.
- (2) a. Fewer than seven boys were there.
b. Not fewer than seven boys were there.
c. No fewer than seven boys were there.
d. Not any fewer than seven boys were there.

In (1a), [more than seven boys] denotes a quantifier of type $\langle 1 \rangle$. The puzzle this paper attempts to solve is that although their syntactic structures are distinct, (1b,c,d) all have the same truth conditions. Accounting for the various negation strategies in (1) and (2) will require a theory of the internal syntax of comparatives. In this paper, I focus on (1), leaving (2) to future work.

The analysis that I propose in this paper is that *not* in (1b) negates the phrase headed by the comparative quantifier *-er*, whereas *no* in (1c) negates an existential quantifier over degrees.

(1d) is a NEG raised version of (1c). I will show that even though NEG modifies different constituents in (1b) vs. (1c,d), these syntactic representations result in the same truth conditions.

In section 2, I present the background assumptions from Collins and Postal 2014 (henceforth, CP2014). In section 3, I discuss the background assumptions on the semantics of comparatives. In section 4, I show how comparatives in predicate position are negated. In section 5, I discuss the constituent structure of the subject in (1a). In section 6, I address the issue of the scope of the *-er* morpheme in (1a). In section 7, I account for the various negation strategies in (1). Section 8 is the conclusion.

2. Collins and Postal 2014

In the framework of CP2014, negation (represented syntactically as NEG) modifies predicates, which are defined as having a semantic value whose semantic type ends in *t* (*t* is the type of truth values T/F). By this definition, $\langle t \rangle$, $\langle e, t \rangle$, $\langle e, \langle e, t \rangle \rangle$, $\langle \langle e, t \rangle, t \rangle$, $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ are all predicate types. For example, if *P* is true of *x*, then [not *P*] is not true of *x*. More generally:

- (3) NEG takes *X* with semantic value $\lambda P_1 \dots \lambda P_n [\dots]$
and returns *Y* with semantic value $\lambda P_1 \dots \lambda P_n \neg [\dots]$

As CP2014 (p. 25) note: “This rule is actually a schema for an infinite number of semantically different NEG_s. There will be a distinct semantic value for NEG for each different semantic type: $\lambda P_1 \dots \lambda P_n [\dots]$. For propositional variables *p* (no predicate abstraction), the negation is simply $\neg p$.”

For example, CP2014 analyze negative existential quantifiers in the following way:

- (4) a. no person = [[NEG <some>] person]

In this example, NEG modifies the covert <some>, where <...> indicates a covert occurrence. Now consider:

- (5) a. I saw no person.

- b. I didn't see any person.

In the framework of CP2014, these sentences have the following representations:

- (6) a. I saw [[NEG₁ <some>] person]
 b. I did NEG₁ see [[<NEG₁> <some>] person]

In (6b) *any person* is a negative quantificational DP whose NEG has raised to the post-aux position. CP2014 assume NEG₁ in (6b) is interpreted in its in-situ position. Examples (6a,b) have the same truth conditions because they both involve a negative quantificational DP object.

The analysis in CP2014 requires the following spell out rules for *some*:

- (7) The *some/any* Mapping
 a. *some* → *any*, in the context [<NEG> __] (NEG unpronounced)
 b. *some* → null, in the context [NEG __] (NEG pronounced)
 c. *some* → *some*, otherwise

(7a) means that if NEG raises away from *some*, *some* is spelled out as *any*. (7b) means that if non-raised NEG modifies *some*, *some* is covert.

CP2014 assume that *no* and *not* are two forms of negation governed by the following condition:

- (8) The NEG Mapping
 a. NEG → *no* in the context [_D __ [_D <some>]]
 b. NEG → *not*, otherwise

(8a) means that if NEG modifies *some*, then NEG is realized as *no*. Otherwise, NEG is realized as *not*.

One goal of this paper is to show how the forms in (1) can be analyzed in the framework of the semantic interpretation rule (3) and the morphosyntactic realization rules (7) and (8).

3. Comparatives

Consider a simple comparative such as (9):

- (9) I am taller than John is.

Following Beck 2011: 1346, I will assume the following analysis of the semantics of *-er* (for discussion of alternatives, see Beck 2011, Kennedy 2008, Schwarzschild 2008, Klein 1991:684):

- (10) $\llbracket \text{-er} \rrbracket = \lambda D1. \lambda D2. \max(D2) > \max(D1)$

Given (10), the interpretation of (9) is given below:

- (11) $\max(\lambda d. \text{I am } d\text{-tall}) > \max(\lambda d. \text{John is } d\text{-tall})$
'My height is greater than John's height.'

It is also possible to express difference degrees in a comparative construction:

- (12) I am two feet taller than John is.

In this case, I assume that *-er* has a difference degree variable (see Beck 2011: 1347) (I leave out $d > 0$ in later presentations for brevity sake):

- (13) $\llbracket \text{-er}_{\text{diff}} \rrbracket = \lambda D1. \lambda d: d > 0. \lambda D2. \max(D2) \geq \max(D1) + d$

This formula can be paraphrased as follows: the maximum degree satisfying D1 is greater than or equal to the sum of d and the maximum degree satisfying D2. As an example, consider (12), which has the semantic value in (14):

- (14) $\max(\lambda d. \text{I am } d\text{-tall}) \geq \max(\lambda d. \text{John is } d\text{-tall}) + 2\text{ft}$
'My height is greater than or equal to John's height plus 2 feet.'

Given (13), it would be possible to analyze examples like (9) with a null syntactically present difference degree variable, so that all comparative constructions would have a difference degree variable. Here <degree> is a noun phrase that denotes a set of degrees. Both <some> and <degree> are covert.

- (15) I am [<some> <degree>] taller than John is.
‘There is some degree *d* such that I am *d*-taller than John is.’
‘I am taller than John to some degree.’
‘I am somewhat taller than John.’

I will not adopt representations like (15). Rather, I will assume that when no difference degree expression is present, the semantic value of *-er* is as in (10). That will simplify the discussion below.

4. Predicate Adjectives

In this section, I show that a pattern similar to that in (1) exists for comparative constructions in predicate position. Consider (16):

- (16) a. I am taller than John is.
b. I am not taller than John is.
c. I am no taller than John is.
d. I am not any taller than John is.

All three negative sentences (16b,c,d) have the same truth conditions, but they have different syntactic structures.

Consider first (16b), which can simply be analyzed as sentential negation of (16a). I do not take a stand here on the analysis of sentential negation. In PP/Minimalism, sentential negation heads a clausal NEGP. In Collins, Postal and Yevudey (2015), sentential negation is taken to occur when NEG syntactically modifies a covert event quantifier DP. Under either assumption, (16b) can be represented as follows, where *not* is outside of the AdjP:

(17) I am not [taller than John is]

Assuming that the quantificational expression headed by *-er* needs to occupy a scope position, the LF representation of (17) is as follows:

(18) I am not [[-er than John is]₂ [t₂ tall]]

In this representation, the *-er* expression takes syntactic scope lower than negation. I will not discuss several important syntactic issues here. For example, how are *-er* and *tall* merged in (18)? Also, how does the *than*-clause come to occupy a post-adjectival position? These questions ultimately bear on the right analysis of comparatives.

The truth conditions of (18) can be given as follows:

(19) $\neg[\max(\lambda d. \text{I am } d\text{-tall}) > \max(\lambda d. \text{John is } d\text{-tall})]$

‘It is not the case that my height is greater than John’s height.’

An alternative analysis made possible in the framework of CP2014 is that *not* modifies the quantificational expression headed by *-er*: [not [-er than John is]]. I will not illustrate this analysis here but it yields the same truth conditions as (19).

Consider now (16c), in which there is negative quantification over the difference degree variable, illustrated below:

(20) [I am [[NEG <some>] <degree>] taller than John is]

As in CP2014 and (8) above, I assume that when NEG modifies a null <some>, NEG is realized as *no*. When NEG modifies *some* (and does not undergo raising), *some* is covert (see (7) above).

The LF representation of (16c) showing quantificational expressions in scope positions is given below:

- (21) [[NEG <some>] <degree>]₁ [t₁ [-er_{diff} than John is]]₂ [I am [t₂ tall]]
 ‘There is no degree d such that my height surpasses John’s height by d.’
 ‘There is no degree d such that I am d-taller than John is.’
 ‘My height is less than or equal to John’s height.’

(18) and (21) are logically equivalent.

Lastly, (16d) can be analyzed as (22), where NEG has raised to a post-Aux position:

- (22) I am NEG₁ [[<NEG₁> any] <degree>] taller than John is]
 ‘There is no degree d such that I am d-taller than John is.’

Only the in-situ NEG₁ (modifying <some>) is interpreted. The raised NEG₁ is not. Therefore, the interpretation is the same as (20). Furthermore, when <NEG₁> raises away, *some* is realized as *any* (see (7) above).

As in CP2014, I assume that NEG raises away from the scope position of [[<NEG₁> any] <degree>]. With this assumption, the LF for (22) is as follows.

- (23) I am NEG₁ [[[<NEG₁> <some>] <degree>]₂ [t₂ [-er_{diff} than John is]]₃ [t₃ tall]]

The scope position of [[<NEG₁> any] <degree>] is lower than the raised NEG, but higher than the scope position of the *-er* phrase. I do not show the underlying position of subject of the clause.

So it is clear that (16b,c,d) have the same truth conditions. However, they have quite different syntactic structures. In (16b), NEG is sentential negation. In (16c), NEG modifies the covert <some> of a silent difference degree quantifier DP. (16d) is the NEG raised version of (16c).

5. Constituent Structure

Consider the two possible constituent structures in (1a):

- (24) a. [[more than seven] boys] were there.

b. [more [than [seven boys]]] were there.

I will assume that the correct constituent structure is (24a), based on analogy with:

(25) Many boys were there.

That is, *many* in (25) plays the same role as *more than seven* in (24a). I claim that *many* is a vague cardinality predicate modifying *boys*, and that there is a covert existential quantifier quantifying over sets of boys. Instead of appeal to quantification over sets, I could have used mereological sums, the difference is not relevant here.

(26) [<some> [many boys]] were there.

‘There is some set *g* of boys whose cardinality is greater than *n* such that the members of *g* were there’

Evidence for this analysis of *many* is that it can be used as a predicate:

(27) The boys are many in number.

Also, one can replace <some> in (26) by *the* (giving support for the analysis in (26)):

(28) The many boys that I know are there.

I adopt these assumptions to the case of *more than seven*, which I analyze as the comparative form of *many* (more = many-er):

(29) more than seven boys = [<some> [-er [than seven]] many] boys]]

In this representation [-er [than seven]] is a quantificational expression, with the quantifier *-er*. The restriction is [than seven]. The nuclear scope of [-er [than seven]] is the clause

(as will be shown in the next section). I leave out a representation of the syntactic operation whereby *many* is combined with *-er*.

The presence of <some> in (29) captures the fact that the subject represents an existential quantifier, as shown by the possibility of occurring in the existential *there*-construction:

(30) There were more than seven boys there.

Also, the <some> can be replaced by an overt *the* (parallel to (28)):

(31) The more than seven boys that I know were there.

6. The Scope of *-er*

Consider now the scope of *-er* in (29). The question is whether it takes matrix scope or DP internal scope. These possibilities are illustrated in (33):

- (32) a. [-er than seven]_i [<some> [[t_i many] boys]] were there].
b. [[<some> [-er than seven] [t_i many boys]] were there.

The first scope would correspond to the interpretation: The maximum degree *d* such that [some set of *d*-many boys was there] is greater than seven. The second scope would correspond to the interpretation: There is some set *g* of more than seven boys such that *g* was there. Both scope orders yield the same truth conditions in this case.

However, I will assume that only the matrix scope position is possible. This assumption will be crucial at several points below.

7. Strategies of Negation

Consider first (1a), repeated below in (33):

(33) More than seven boys were there.

The logical form of this sentence is:

(34) [[-er than seven]₁ [<some> [[t₁ many] boys]]₂ [t₂ were there]]

Applying (10), the truth conditions are as follows:

(35) $\max(\lambda d.[\text{some } [d\text{-many boys}] \text{ were there}]) > 7$
 ‘The number of boys who where there is greater than seven.’

Now consider (1b), repeated below as (36).

(36) Not more than seven boys were there.

I propose that the NEG modifies the quantifier phrase headed by the comparative *-er* morpheme. In this case, there is no difference degree quantifier:

(37) [<some> [NEG [-er than seven]] many boys] were there.

The LF representation is given below:

(38) [NEG [-er than seven]]₁ [<some> [t₁ many boys]]₂ [t₂ were there]

The truth conditions are given below:

(39) $\neg[\max(\lambda d.[\text{some } [d\text{-many boys}] \text{ were there}]) > 7]$
 ‘The maximum degree d such that [some set of d-many boys were there] is not greater than seven.’
 ‘The number of boys who were there is not greater than seven.’

Now, consider first (1c), repeated below:

(40) No more than seven boys were there.

I propose that in (40), NEG modifies *some* (the existential quantifier over degrees), just as in the predicate adjective case in (16c) above:

- (41) [$\langle \text{some} \rangle$ [[NEG $\langle \text{some} \rangle$] $\langle \text{degree} \rangle$] more than seven] boys] were there.

In this structure, NEG is spelled out as *no*, since it directly modifies $\langle \text{some} \rangle$ (see (7) above).

As noted above, I assume that *-er* takes sentential scope, and furthermore that [[NEG $\langle \text{some}_2 \rangle$] $\langle \text{degree} \rangle$] appears in scope position.

- (42) [[[NEG $\langle \text{some} \rangle$] $\langle \text{degree} \rangle$]₁ [_{t₁} -er_{diff} than seven]₂ [$\langle \text{some} \rangle$ [_{t₂} many] boys]] were there].

This yields the right interpretation:

- (43) $\neg \exists d'. \max(\lambda d. [\text{some } [d\text{-many boys}] \text{ were there}]) \geq 7 + d'$

‘There is no degree *d*’ such that the number of boys who were there is greater than or equal to seven plus *d*’.

‘The number of boys who were there is not greater than seven.’

Consider lastly (1d) and its relation to (1c). The difference seems similar to the one seen in (16c) and (16d), which I analyzed in terms of NEG raising. I propose a similar NEG Raising analysis of (1d):

- (44) [$\langle \text{some}_1 \rangle$ [[NEG₂ [$\langle \text{NEG}_2 \rangle$ $\langle \text{some}_2 \rangle$] $\langle \text{degree} \rangle$]] more than seven] boys] were there.

Since NEG₂ raises away from $\langle \text{some}_2 \rangle$, $\langle \text{some}_2 \rangle$ is realized as *any* (see (7)). And since the raised NEG₂ is interpreted in its in-situ position (following CP2014), the truth conditions are identical to that of (42).

This pattern of string vacuous NEG raising is also seen in the following example:

- (45) a. No person that I know was there.
 b. Not anybody that I know was there.

I assume that in (45b) as well, NEG raises away from the D of the negative quantifier DP:

- (46) [NEG₁ [[<NEG₁> <some>] person]] was there.

I cannot presently specify the conditions under which such string vacuous NEG raising is possible.

8. Conclusion

Adopting the basic syntactic and semantic assumptions concerning negation in Collins and Postal 2014, I have accounted for the patterns of negation found with comparatives both in predicative and attributive position.

The next step in this research will be to look at sentences like (2), involving *fewer* instead of *more*.

Acknowledgements: I would like to thank Dylan Bumford and Paul Postal for valuable comments on an earlier draft of this paper.

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