

# Meaning and Structure

## The Syntax of Relative and Comparative Clauses

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### 1 Introduction

#### 1.1 Two analyses of modifier clauses

Two different analyses have been proposed for relative clauses (1a) and comparative clauses (1b): the “Raising Analysis” in (2) and the “Matching Analysis” in (3).

- (1)
- Kim saw every film that I saw.
  - Kim saw more films than I saw.

(2) *The Matching Analysis*

- Kim saw [<sub>DP</sub> every film [<sub>CP</sub> ~~that~~ ~~film<sub>i</sub>~~ that I saw *t<sub>i</sub>*]]
- Kim saw [<sub>DP</sub> more films [<sub>CP</sub> ~~that~~ ~~film<sub>i</sub>~~ than I saw *t<sub>i</sub>*]]

(3) *The Raising Analysis*

- Kim saw [<sub>DP</sub> every [<sub>CP</sub> film<sub>i</sub> that I saw *t<sub>i</sub>*]]
- Kim saw [<sub>DP</sub> more [<sub>CP</sub> films<sub>i</sub> than I saw *t<sub>i</sub>*]]

The crucial difference between the two approaches is that in the Matching Analysis, there are two instances of the “head” of the relative/comparative clause—an external occurrence and an internal occurrence—and in the Raising Analysis, there is only one instance of the head—the internal one, which appears in an external position in the surface form.

This raises a number of questions:

- Raising vs. matching
  - Are both types of subordinate clauses derived in the same way (Chomsky 1965, Rivero 1980, Kayne 1994, Lechner 1999) or are there differences both between and within the two classes (Carlson 1977, Grosu & Landman 1998, Sauerland 1998)?
  - Are multiple analyses possible (Sauerland 1998)?
- Syntax—semantics interface
  - What syntactic and semantic factors determine the relation between the external head and the corresponding clause-internal position?
  - Does the syntax of these constructions correlate with their meanings?

The goal of today’s class is to look at a range of syntactic and semantic facts (some old, some new) to see if we can isolate some crucial differences between the constructions, and to use these differences as a basis for some (initial) answers to the previous questions. We will see that the facts suggest a strong connection between the meaning of a particular modifier clause, as expressed in the following two generalizations:

- Generalization S (cf. Grosu and Landman 1998)
  - Abstraction over sorted objects involves raising (degree relatives, restrictive relatives).
  - Abstraction over unsorted objects involves matching (comparatives, “measure” relatives).
- Generalization P
  - Constructions that involve one instance of head predication involve raising.
  - Constructions that involve two instances of head predication involve matching.

#### 1.2 Terminology

The four constructions under consideration:

- (4)
- Comparatives*  
Kim wrote more PAPERS than Lee read ~~papers~~.
  - Measure Relatives*  
Kim didn’t read the NUMBER OF PAPERS that Lee read ~~number of papers~~.
  - Degree Relatives*  
I could insulate my house with the PAPERS Kim has written papers on this topic.
  - Restrictive Relatives*  
Kim wrote the PAPER that Lee read ~~paper~~.

- (5) ... HEAD [<sub>COMPARATIVE/RELATIVE CLAUSE</sub> ... ~~correlate~~ ... ] ...

**NB:** I am not using “head” in an X-bar sense, but rather descriptively to refer to the element that licenses/corresponds to the gap in the clausal constituent.

### 2 Comparative and relative clauses compared

#### 2.1 Deletion

Deletion of the correlate is in general obligatory for all of these constructions.

- (6)
- \* There are more stars in the sky than the eye can see stars.
  - \* I counted the same number of stars that you counted stars.
  - \* It is inconceivable that anyone could count all the stars that there are stars.
  - \* I can see every star that you can see (a) star.

In comparatives, however, a contrastively focused correlate can remain (Chomsky 1977).

- (7)
- A: This desk is higher than that one is wide.  
B: What is more, this desk is higher than that one is HIGH.

- b. Watching the Cubs on his satellite dish has been almost as difficult for Beck as watching Beck close games has been difficult for the CUBS. (*Chicago Tribune*, 6.8.99)
- This is (marginally) possible in measure relatives as well (pace Grosu and Landman 1998).
- (8) a. ? We need to catalogue the (same) number of stars that they catalogued planets. We also need to catalogue (at least) the same number of stars that they catalogued STARS.  
 b. ? We need to catalogue the (same) number of stars in Quadrant 47 that we catalogued (stars) in QUADRANT 46.

The correlate can never be overt in degree relatives and restrictive *that*-relatives, regardless of the focus/prosodic structure.

- (9) \* We'll never be able to catalogue the stars in Quadrant 47 that there are (stars) in QUADRANT 46.  
 (10) \* I can not only see every star that you can see (a) planet, I can see every star that you can see (a) STAR.

It's worth observing, however, there is a class of restrictive *which*-relatives that permit an overt correlate. (These seem to be associated with a particular register/dialect.)

- (11) a. Between his ribs and on each side of his spine he is supplied with a remarkable involved Cretan labyrinth of vermicell-like vessels, which vessels, when he quits the surface, are completely distended with oxygenated blood. (*Moby-Dick*, Modern Library Edition, p. 537)  
 b. THE DECK — FIRST NIGHT WATCH: Carpenter standing before his vice-bench, and by the light of two lanterns busily filing the ivory joint for the leg, which joint is firmly fixed in the vice. (*Moby-Dick*, p. 674)  
 c. We're in the money. The breakage TA is in, now all we're waiting for is the "extra" ESL TA, which decision is being handed down tomorrow. The end is in sight. (Gregory Ward email to CK, 25 May, 2000)

## 2.2 Subdeletion

Comparatives and measure relatives (esp. with *same*) permit "subdeletion."

- (12) a. [Michael Jordan] has more scoring titles than Dennis Rodman has tattoos. (*Chicago Tribune*, 7.17.98)  
 b. I hate to trust you to him, a man with as many sins as he has hairs. (Sterling Bruce: 1997, *The Artificial Kid*, Hardwired, San Francisco, p. 164)
- (13) a. In all, the Bears got rid of 19 players, including third-down back Ronnie Harmon and linebacker Short'e Peoples, meaning the Bears have the same number of guys with apostrophes in their names as [that] they have sacks in the preseason. (*Chicago Tribune*, 8.25.98)  
 b. ? The recipe requires you to add the (same) amount of water that you have already added flour.

Degree relatives and restrictive relatives do not.

- (14) a. \* The Bears cut the (same) guys with apostrophes in their names as/that they had sacks in the preseason.  
 b. \* Gregory gave every student that there was (a) final project an A.  
 c. \* Gregory gave the students that there were final projects As.  
 (15) a. \* Gregory allowed every student that he was advising (a) Linguistics major to enroll in "Language and Sexuality".  
 b. \* Gregory gave an A to the (same) students in his class that Judith gave Bs to sophomores.

**NB:** It is important to keep in mind that these sentences are (in principle) semantically coherent. We could imagine assigning (15a), for example, the interpretation in (16).

- (16) a.  $Var[student(x) \wedge la-major(x) \wedge advising(G, x)][allow(G, x, enroll-in(x, L \& S))]$   
 b. Gregory allowed every student that he was advising who was a Linguistics major to enroll in "Language and Sexuality".

## 2.3 Parasitic gaps and VP-deletion

All of the constructions license parasitic gaps (with varying degrees of acceptability).

- (17) a. Hillary threw away more books than she kept without reading.  
 b. That's a lot of money that you can make without ever paying taxes on. (Uttered by CK in a discussion about Roth IRAs.)  
 c. You can enjoy a fine retirement on the money you'll make without paying taxes on.  
 d. These are the books that Hillary threw away without reading.

However, VP-deletion bleeds parasitic gaps in comparatives (Kennedy and Merchant 2000, Kennedy 1999b, 2000).

- (18) a. CogSci recruited fewer students than Psych recruited without giving fellowships to.  
 b. \* CogSci recruited fewer students than Psych did without giving fellowships to.  
 (19) a. I made more money than you made without paying taxes on.  
 b. \* I made more money than you did without paying taxes on.

This also seems to be true of measure relatives.

- (20) a. CogSci can't even recruit the number of students that Psych recruits without giving fellowships to.  
 b. \* We can't even recruit the number of students that Psych does without giving fellowships to.  
 (21) a. If you want to make the amount of money that I make without paying taxes on, then you should get a Roth IRA.

- b. \*If you want to make the amount of money that I do without paying taxes on, then you should get a Roth IRA.

VP-deletion does not alter the acceptability of parasitic gaps in degree relatives, however.

- (22) a. CogSci can't even recruit the students that Psych recruits without giving fellowships to.  
 b. CogSci can't even recruit the students that Psych does without giving fellowships to.
- (23) a. If you want to make the money that I make without paying taxes on, then you should get a Roth IRA.  
 b. If you want to make the money that I do without paying taxes on, then you should get a Roth IRA.

Ditto for restrictive relatives:

- (24) a. CogSci recruited every student that Psych couldn't recruit without giving a big fellowship to.  
 b. CogSci recruited every student that Psych couldn't without giving a big fellowship to.
- (25) a. Hillary wanted to buy the same car that I wanted to buy after seeing advertised in the paper.  
 b. Hillary wanted to buy the same car that I did after seeing advertised in the paper.

#### 2.4 Sloppy Identity

Comparatives permit sloppy readings of head-contained pronouns, if the constituent that contains the correlate is elided (Bach, Bresnan and Wasow 1974).

- (26) a. John encountered more criticisms of his work than Bill encountered/did.  
 b. *the number of criticisms of John's work that John encountered the number of criticisms of Bill's work that Bill encountered*
- (27) a. John rewrote more of his thesis than Bill rewrote/did.  
 b. *the amount of John's thesis that John rewrote the amount of Bill's thesis that Bill rewrote*
- (28) a. John drank more of his wine than Bill drank/did.  
 b. *the amount of John's wine that John drank the amount of Bill's wine that Bill drank*

Measure relatives appear to behave in exactly the same way.

- (29) a. John didn't have to respond to the number of attacks on his work that Bill had to respond to/did.  
 b. *the number of attacks on John's work that John had to respond to ≠ the number of attacks on Bill's work that Bill had to respond to*

- (30) a. John rewrote the same parts of his thesis that Bill had to rewrite/did.  
 b. *the parts of John's thesis that John had to rewrite correspond to the parts of Bill's thesis that Bill had to rewrite*

- (31) a. John drank the (same) amount of his wine that Bill drank/did.  
 b. *the amount of John's wine that John drank = the amount of Bill's wine that Bill drank*

Degree relatives strongly resist a sloppy reading of a head-contained pronoun, however, regardless of whether the base position of the correlate is in an ellipsis site.

- (32) a. John didn't expect to encounter the criticisms of his work that he did.  
 b. John didn't expect to encounter the criticisms of his work that Bill expected him to encounter.

- (33) a. John didn't expect to encounter the criticisms of his work that Bill encountered/did.  
 b. \**John didn't expect that the number of criticisms of his work that he would encounter would equal the number of criticisms of Bill's work that Bill encountered*

- (34) a. It would have taken weeks for John to drink the wine of his that Bill drank/did that night.  
 b. \**it would have taken weeks for John to drink the amount N of his wine such that Bill drank N-much of Bill's wine that night*

**An exception:** (33) can have a sloppy reading if it receives a 'type of/kind' interpretation:

- (35) John expected to encounter the (same) type of criticisms of his work that Bill had (encountered).

Finally, a sloppy reading is impossible with restrictive relatives.

- (36) a. John, a Republican, read a damning exposee of his candidate that Bill, a Democrat, read/did too.

- b. \* $\exists x[\textit{exposee-of}(x, J)\ \wedge\ \textit{candidate}(B)\ \wedge\ \textit{read}(B, x)]$   
 (37) a. John lives with two relatives of his that Bill lives with/does.  
 b.  $\textit{Two}[\textit{relatives-of}(x, J)\ \wedge\ \textit{relatives-of}(x, B)\ \wedge\ \textit{live-with}(x, B)]$   
 (38) demonstrates that "narrow scope" sloppy readings are impossible, though such interpretations of the correlate are otherwise possible, as shown by (38) (Bhatt 1999).

- (38) a. John read every review of his book that you thought Bill read/did.  
 b. \* $\forall x[\textit{review}(x, J)\ \wedge\ \textit{thought}(you, [\textit{review}(x, B)\ \textit{book}]\ \wedge\ \textit{read}(B, x))]$   
 (39) a. This is the first book that John said he read.  
 b. *This is the first book such that John said that he read it.*

c. *This is the book such that John said it was the first book he read.*

**Exceptions:** If the head can be assigned a functional or ‘kind’ reading, then a sloppy reading is possible.

(40) a. John lives with the relative of his that Bill lives with. (✓/sloppy)  
 b. John lives with two relatives of his that Bill lives with. (\*sloppy)

(41) a. John made every addition to his wine collection that Bill made/did.  
 b. The Linguistics Department made two changes to its grad program that the Psych Department made/did.

The semantic similarity between these exceptions and measure relatives suggests that the former may be related to the latter.

### 2.5 Summary

Table 1 summarizes the observations made so far.

	DEL	SUBDEL	PG+VPD	SLOPPY
<i>Comparatives</i>	always except focus	✓	*	✓
<i>Measure Relatives</i>	always except focus	✓	*	✓
<i>Degree Relatives</i>	always	*	✓	*
<i>Restrictive Relatives</i>	always	*	✓	*

Table 1: *Comparative and relative clauses compared*

## 3 Discussion

### 3.1 Raising vs. Matching

What are the predictions of “vanilla” raising and matching analyses with respect to these phenomena?

#### 3.1.1 Raising

**SYNTAX:** The head is derived from a clause internal position: *head = correlate*.

**SEMANTICS:** The head is interpreted once, presumably either internally or externally, depending on whether it is reconstructed: *one instance of “head-based predication”*.

(42) a.  $[_{DP} D^0 [_{CP} HEAD_x \dots t_x \dots ]]$   
 b.  $\lambda Q.D_x[head(x) \wedge P(x)][Q(x)]$

This strict interpretation of the raising analysis, in which the head and the correlate are literally the same expression, makes very clear predictions:<sup>1</sup>

- **DELETION:** Should be obligatory if only one copy of a chain is pronounced.
- **SUBDELETION:** Should be impossible if chain copies must be identical.

<sup>1</sup>I assume the structural analysis of raising relatives in Bianchi 1999, in which the raised head is in the specifier of a CP complement of D.

- **PARASITIC GAPS:** Should be well-formed regardless of whether the base position of the head is contained in an elided phrase, since head-raising involves overt  $\bar{A}$ -movement.
- **SLOPPY IDENTITTY:** Should be impossible, since there is only one semantic occurrence of the head.

The match between these predictions and our observations suggests that a raising analysis is correct for degree and restrictive relatives, as many people have claimed.

#### 3.1.2 Matching

**SYNTAX:** The head originates in a position external to the clause; the correlate is an “internal” head: *head  $\neq$  correlate*.

**SEMANTICS:** The head and correlate are each interpreted once: *two instances of head-based predication*.

(43) a.  $[_{DP} D^0 EXT-HEAD_x [_{CP} ~~INT-HEAD_y~~ \dots t_x \dots ]]$   
 b.  $\lambda Q.D_x[ext-head(x) \wedge [int-head(x) \wedge P(x)]]Q(x)]$

(44) a.  $[_{DP} D^0 EXT-HEAD_x [_{CP} ~~INT-HEAD_y~~ \dots t_x \dots ]]$   
 b.  $\lambda Q.D_{(x,y)}[ext-head(x) \wedge Q(x)][int-head(y) \wedge P(y)]$

The predictions of the matching analysis are fairly clear, though there are some questions:

- **DELETION:** If the external and internal heads are independent, non-deletion should be an option. *Why is deletion obligatory in the normal case, though?*
- **SUBDELETION:** If the internal and external heads are independent, subdeletion should at least be possible.
- **PARASITIC GAPS:** If matching also involves  $\bar{A}$ -movement of the internal head, then we would expect parasitic gaps to be OK. *But the analysis at least allows for the possibility that the internal head does not move....*
- **SLOPPY IDENTITTY:** If both the internal and external head are interpreted, then sloppy identity is in principle possible. *Why is the sloppy reading so much easier to get in cases of ellipsis?*

These predictions clearly point in the direction of a matching analysis for comparatives and measure relatives. To resolve the open questions, however, we need to look at a specific implementation of the matching analysis.

#### 3.2 Comparatives

Comparatives involve movement of the internal head to SpecCP (Kennedy 1999b, 2000).

In comparative deletion, movement is overt and the internal head is deleted under identity with the external head (cf. Sauerland’s (1998) and Cresti’s (1999) analyses of RCs).

(45) a. Michael has more scoring titles than Dennis has.  
 b. Michael has more scoring titles than  $[_{CP} \overline{scoring\ titles}]$  Dennis has  $t_j$ .

In subdeletion, movement of the internal head is covert.

- (46) a. Michael has more scoring titles than Dennis has.  
 b. Michael has more scoring titles than [cp Dennis has [pr tattoos]]. (PF)  
 c. Michael has more scoring titles than [cp [pr tattoos] Dennis has t]. (LF)

Assuming the semantics for degree morphology in (47) (where  $D_{[-C]}^0$  is the (null) head of the correlate), (45a) and (46a) are assigned the interpretations in (48a) and (48b).

- (47) a.  $D_{[-C]}^0 = \lambda P \lambda Q \text{MAX}_X n \exists X [[\text{MANY}(X) \geq n] \wedge P(X) \wedge Q(X)]$   
 b.  $\text{more} = \lambda P \lambda m \lambda Q \exists Y [[\text{MANY}(Y) > m] \wedge P(Y) \wedge Q(Y)]$
- (48) a.  $\exists Y [[\text{MANY}(Y) > \text{MAX}_X n \exists X [[\text{MANY}(X) \geq n] \wedge \text{scoring-titles}(X) \wedge \text{have}(D, X)]] \wedge \text{scoring-titles}(Y) \wedge \text{have}(M, Y)]$   
 b.  $\exists Y [[\text{MANY}(Y) > \text{MAX}_X n \exists X [[\text{MANY}(X) \geq n] \wedge \text{tattoos}(X) \wedge \text{have}(D, X)]] \wedge \text{scoring-titles}(Y) \wedge \text{have}(M, Y)]$

The relation between movement, identity and deletion (move and delete only if the internal and external heads are identical) is established through an optimality metric, by appealing to a notion of representational economy. The grammatical structure is the one that is generated by the computational system, converges, and best satisfies the principles of optimality (Chomsky 1995; cf. Prince and Smolensky 1993 and other work in Optimality Theory).

- (49) *Underlying assumptions*  
 a. Movement = copy + delete  
 b. Deletions must be recoverable (Chomsky 1965, Hankamer 1979, Fiengo and Lasnik 1972)

- (50) *New hypothesis*  
 Economy of Representation  $\gg$  Economy of Derivation

In other words, it's better to minimize the amount of work that the interfaces have to do (in particular, the PF-interface) than it is to minimize the amount of work that the computational component has to do. (See Kennedy (1999, 2000) for an implementation of this idea in the framework of Optimality Theory.)

The result is that syntactic operations that are normally marked (such as movement) are allowed if they result in a "smaller" interface representation (through deletion, for example).

### 3.2.1 Deletion

In English, movement is a mechanism for deleting a DP — in fact, it is the only such mechanism for deleting (only) a DP (cf. traditional transformational accounts of CD such as Lees 1961, Chomsky 1965, Bresnan 1973, 1975, and Carlson 1977).

This means that in structures with an external head, when the internal and external heads are identical, movement and deletion of both copies is optimal because it minimizes the PF-representation.

- (51) Michael has more scoring titles than ...  
 a. \* [cp [pr scoring titles] Dennis has [pr scoring titles]]

- b. \* [cp [pr scoring titles] Dennis has [~~pr scoring titles~~]]  
 c. \* [cp [~~pr scoring titles~~] Dennis has [pr scoring titles]]  
 d.  $\vee$  [cp [~~pr scoring titles~~] Dennis has [~~pr scoring titles~~]]

All things being equal, deletions that do not violate recoverability must occur. More generally, we end up with the following very simple analysis of the syntax of matching structures:

- Matching is  $\bar{A}$ -movement in which all copies of an  $\bar{A}$ -chain are deleted.

### 3.2.2 Subdeletion

When the internal and external heads are non-identical, as in subdeletion, there is no way to minimize the PF-representation via movement. This means that constraints on derivational economy take over and rule out (overt) movement.

- (52) Michael has more scoring titles than ...  
 a.  $\vee$  [cp Dennis has [pr tattoos]]  
 b. \* [cp [pr tattoos] Dennis has [~~pr tattoos~~]]  
 c. \* [cp [~~pr tattoos~~] Dennis has [pr tattoos]]  
 d. \* [cp [pr tattoos] Dennis has [pr tattoos]]

The internal head should remain in the representation (in its base position) whenever deletion would be non-recoverable.

This explains the fact that contrastive focus permits retention of the internal head: deletion would eliminate the focus information.

- (53) A: This desk is higher than that one is wide.  
 B: What's more, this desk is higher than that one is HIGH.

### 3.2.3 Parasitic Gaps

If the internal head could be eliminated from the representation without moving it, then this should be optimal. In particular, when the internal head is contained in a larger phrase targeted by ellipsis, it should not move, resulting in a *Hidden Subdeletion* structure:

- (54) Dennis has more tattoos than Michael does.  
 (55) Dennis has more tattoos than ...  
 a. \* [cp [~~pr tattoos~~] Michael does [~~pr have~~] [~~pr tattoos~~]]  
 b.  $\vee$  [cp Michael does [~~pr have~~] [~~pr tattoos~~]]

The bottom line is that overt movement of the internal head occurs only if it is the optimal means of achieving deletion.

This explains the fact that VP-deletion bleeds parasitic gaps: ellipsis forces the internal head to remain in situ, so it does not license a parasitic gap.

- (56) a. CogSci recruited fewer students than [cp [~~pr students~~] Psych recruited t without giving fellowships to PG].  
 b. \* CogSci recruited fewer students than [cp Psych did [~~pr recruit~~] [~~pr students~~]] without giving fellowships to PG.

### 3.2.4 Sloppy Identity

Because the head and correlate each contribute to the interpretation of the sentence, sloppy identity is in principle possible. *Why is it is easier to get in cases of ellipsis?*

1. Comparative deletion structures have alternative analyses in which the internal head is a pronominal expression (Kennedy and Merchant 1999).
2. Deletion of the internal head in matching structures requires identity of indices (cf. Sauerland 1998).
3. Ellipsis licenses a “hidden subdeletion” analysis of matching structures in which the internal head remains in situ (see above).

1. “Missing-CP” comparatives do not permit expletive subjects:

- (57) a. The Mars missions turned out to be more expensive than (\*it) was originally predicted.  
 b. The films were more violent than (\*it) was necessary.

The putative sources for the ungrammatical sentences in (57) in an ellipsis analysis are perfectly well-formed, as are examples in which the gap is in a case position.

- (58) a. The Mars missions turned out to be more expensive than it was originally predicted that they would be.  
 b. The films were more violent than it was necessary for them to be.
- (59) a. The Mars missions turned out to be more expensive than anyone predicted.  
 b. The films were more violent than we expected.

The conclusion is that the missing constituent in examples like (57) is a (null) pronominal element that must be assigned case (Kennedy and Merchant 1999).

- (60) a. The Mars missions turned out to be more expensive than [<sub>CP</sub> *pro* [<sub>IP</sub> *t* was originally predicted *t*]]  
 b. The films were more violent than [<sub>CP</sub> *pro* [<sub>IP</sub> *t* was necessary *t*]]

2. By hypothesis, (61b) is not a possible analysis of (61a).

- (61) a. John read more reviews of his book than Bill read.  
 b. John<sub>i</sub> read more reviews of his<sub>i</sub> book than [~~reviews of his~~ book Bill<sub>j</sub> read *t*]

However, if a null pronoun is available in comparatives in general (the null hypothesis), (61a) should have a possible analysis as in (62).

- (62) John<sub>i</sub> read more reviews of his<sub>i</sub> book than [<sub>CP</sub> *pro* Bill<sub>j</sub> read *t*]

This structure should marginally permit a sloppy reading, assuming that *pro* can have a “paycheck” interpretation. As shown by (63)–(64), the acceptability of the sloppy reading tracks the acceptability of paycheck readings: it’s better in habitual/generic contexts:

- (63) a. Stan takes more pictures of his children than Jerome takes.

- b. Sue publishes more of her manuscripts than Jen publishes.

- (64) a. Stan carries Julio’s picture of his children in his wallet; Jerome carries it in his vest.

- b. Sue dies her hair blue; Jen dies it red.

3. As we have already seen, ellipsis forces the internal head to remain in situ. (65a) should therefore be assigned a “hidden subdeletion” structure as in (65b) or (65c).

- (65) a. John read more reviews of his book than Bill did.  
 b. John<sub>i</sub> read more reviews of his<sub>i</sub> book than Bill<sub>j</sub> did [~~read reviews of his~~ book]<sub>i</sub>  
 c. John<sub>i</sub> read more reviews of his<sub>i</sub> book than Bill<sub>j</sub> did [~~read reviews of his~~ book]<sub>i</sub>

Since the internal head is eliminated by VP-deletion, rather than “chain deletion”, it should be subject only to the standard identity constraints on ellipsis, which permit index variation. As a result, both (65b) and (65c) are possible analyses of (65a).

#### The Bottom Line

An internal head is a necessary condition for sloppy identity, but the actual availability of sloppy readings is controlled by other factors.

#### 4 Raising vs. matching revisited

If the analysis of comparatives presented above generalizes to all cases of matching, then we can draw the following conclusions:

1. Comparatives and measure relatives involve matching.
2. Degree relatives and restrictive relatives involve raising.

*Why should this be so?*

In principle, we could get the semantics right with either sort of structure (though subdeletion would always require some sort of matching structure).

The answer has to do with the sorts of objects that the various clausal constituents abstract over/denote.

##### 4.1 Semantic heads and syntactic heads

We can begin with a fairly well-established characterization of the difference between degree relatives and comparatives:

- (66) a. DEGREE RELATIVES: properties of degrees of sort *NP* (G & L 1998)  
 b. COMPARATIVES: properties of degrees (von Stechow 1984, Heim 1985, Klein 1991, Gawron 1995, Rullmann 1995, Kennedy 1999a, to appear, etc.)

These differences reflect the way that the clauses combine with nominal/degree morphology:

- Degree relatives are restrictions on quantifiers, which denote relations between sets of sorted objects.

- Comparative clauses are arguments of degree morphemes, which denote relations between unsorted degrees.

That comparative morphology does not impose a sortal restriction is seen by its cross-categorical generality.

Can a corresponding generalization be made about restrictive and measure relatives?

- (67)
- RESTRICTIVE RELATIVES: properties of individuals of sort *NP*
  - MEASURE RELATIVES: properties of amounts/degrees/kinds

Again, we see a difference in the way the clauses combine with nominal morphology:

- Restrictive relatives are restrictions on quantifiers.
- Measure relatives provide restrictions on number/measure/kind terms, which do not have any inherent sortal restrictions.

*Syntax-semantics mapping relations in relative and comparative clauses*

- Degree relatives and restrictive relatives have only one head because that's all that's needed for restricted quantification.
- Comparative clauses and measure relatives combine with expressions that are looking for unsorted degrees (kinds, . . .); since degrees are degrees of *something*, we need at least one head per degree to provide the sortal information. (See Cresswell 1977 and Grosu and Landman 1998 for relevant discussion.)

#### 4.2 Are multiple analyses possible?

Can restrictive relatives have either a raising or matching analysis? The data we have seen so far point towards a raising analysis, but:

- *which*-relatives: Matching with obligatory movement of the internal head, presumably driven by the *wh*-criterion (therefore no hidden subdeletion).
- Sauerland 1998: A matching analysis of restrictive relatives is the default (though both analyses are possible), and it is required in contexts that would trigger Condition C violations under reconstruction of the head.

- (68) Sue threw away the picture of John<sub>i</sub> that he<sub>j</sub> didn't like.

- (69)
- Sue threw away the picture of John<sub>i</sub> [<sub>CP</sub> ~~picture of him<sub>j</sub>~~ that he<sub>j</sub> didn't like ~~picture of him<sub>j</sub>~~]
  - \* Sue threw away the [<sub>CP</sub> picture of John<sub>i</sub> that he<sub>j</sub> didn't like ~~picture of John<sub>j</sub>~~]

If (68) involves matching, then we would expect to find an interaction with parasitic gaps and VP-deletion.

- (70)
- I want you to photocopy any article about Sue that John photocopies after reading.
  - I want you to photocopy any article about Sue that John does after reading.

- (71)
- I want you to photocopy any article about John<sub>i</sub> that he<sub>j</sub> photocopies after reading.
  - I want you to photocopy any article about John<sub>i</sub> that he<sub>j</sub> does after reading.

- (72)
- I want you to photocopy more articles about John<sub>i</sub> than he<sub>j</sub> photocopies after reading.
  - \* I want you to photocopy more articles about John<sub>i</sub> than he<sub>j</sub> does after reading.

## 5 Conclusion

The data I have looked at in this paper lead to the following (no doubt idealized) picture:

- one semantic sortal ⇔ one syntactic sortal
- two semantic sortals ⇔ two syntactic sortals

Comparative and relative clauses are not the same, but their differences may follow from a very basic semantic difference in their sortal/predicational properties.

This would be interesting if it were true, since it would indicate a very tight fit between the syntax and semantics of these constructions.

The next step is to see how this picture fits with e.g. reconstruction/binding theory phenomena in relative and comparative clauses, and to branch out to other related constructions: free relatives, correlatives, etc.

#### The Minimalist Moral

The amount of structure that a particular construction makes use of is the *minimal* amount that it requires in order to get the meaning right.

## References

- Ackema, Peter and Ad Neeleman: 1998, 'Optimal Questions', *Natural Language and Linguistic Theory* **16**, 443–490.
- Andrews, Avery: 1985, *Studies in the Syntax of Relative and Comparative Clauses*, Garland, New York.
- Bach, Emmon, Thomas Wasow and Joan Bresnan: 1974, "Slippy Identity": An Unnecessary and Inefficient Criterion for Deletion Rules', *Linguistic Inquiry* **5.4**, 609–614.
- Bhatt, Rajesh: 1999, 'Adjectival Modifiers and the Raising Analysis of Relative Clauses', *Proceedings of NELS 30*, GSLA Publications, Amherst.
- Bianchi, Valentina: 2000, 'The Raising Analysis of Relative Clauses: A Reply to Borsley', *Linguistic Inquiry* **31.1**, 123–140.
- Bresnan, Joan: 1975, 'Comparative Deletion and Constraints on Transformations', *Linguistic Analysis* **1.1**, 25–74.
- Bresnan, Joan: 1973, 'Syntax of the Comparative Clause Construction in English', *Linguistic Inquiry* **4**, 275–343.
- Carlson, Greg: 1977, 'Amount Relatives', *Language* **53.3**, 521–542.
- Chomsky, Noam: 1977, 'On *wh*-movement', In Peter Culicover et al. (eds.), *Formal Syntax*, Academic Press, New York.
- Chomsky, Noam: 1965, *Aspects of the Theory of Syntax*, MIT Press, Cambridge.
- Cresswell, M.J.: 1976, 'The Semantics of Degree', in B. Parlee (ed.), *Montague Grammar*, Academic Press, New York, pp. 261–292.
- Gresti, Diana: 1999, 'Ellipsis and Reconstruction in Relative Clauses', in *Proceedings of NELS 30*, GSLA Publications, Amherst.

- Flengo, Robert and Howard Lasnik: 1972, 'On Nonrecoverable Deletion in Syntax', *Linguistic Inquiry* **3**, 4, 528.
- Gawron, Jean-Mark: 1995, 'Comparatives, Superlatives, and Resolution', *Linguistics & Philosophy* **18**, 333–380.
- Grimshaw, Jane: 1997, 'Projection, Heads and Optimality', *Linguistic Inquiry* **28**, 373–422.
- Grosu, Alexander and Fred Landman: 1998, 'Strange Relatives of the Third Kind', *Natural Language Semantics* **6**, 125–170.
- Hankamer, Jorge: 1979, *Constraints on Deletion in Syntax*, Garland, New York. (1971 doctoral dissertation, Yale University.)
- Helm, Irene: 1985, 'Notes on Comparatives and Related Matters', unpublished ms., University of Texas, Austin.
- Hendriks, Petra: 1995, *Comparatives in Categorical Grammar*, doctoral dissertation, University of Groningen.
- Izvorski, Roumyana: 1995, 'A Solution to the Subcomparative Paradox', in Camacho, J., L. Coulier and M. Watanabe (eds.) *The Proceedings of WCCFL XIV*, CSLI Publications, Stanford.
- Kayne, Richard: 1994, *The Antisymmetry of Syntax*, MIT Press, Cambridge.
- Kennedy, Christopher: 2000, 'Comparative Deletion and Optimality in Syntax', unpublished ms., Northwestern University. (Available at <http://www.ling.nwu.edu/kennedy>.)
- Kennedy, Christopher: 1999a, *Projecting the Adjective: The Syntax and Semantics of Gradability and Comparison*, Garland, New York.
- Kennedy, Christopher: 1999b, 'Comparative (Sub-) Deletion and Ranked, Violable Constraints in Syntax', in *The Proceedings of NELS 30*, GSLA Publications, Amherst.
- Kennedy, Christopher: to appear, 'Polar Opposition and the Ontology of "Degrees"', *Linguistics & Philosophy*.
- Kennedy, Christopher and Jason Merchant: 2000, 'Attributive Comparative Deletion', *Natural Language and Linguistic Theory* **18**, 1.
- Kennedy, Christopher and Jason Merchant: 1999, 'Case and Identity in Comparative Deletion', paper presented at the Annual Meeting of the Linguistics Society of America.
- Klein, Ewan: 1991, 'Comparatives', in von Stechow, A. and D. Wunderlich (eds.), *Semantik: Ein Internationales Handbuch der Zeitgenössischen Forschung*, Walter de Gruyter, Berlin.
- Lechner, Winfried: 1999, *Comparatives and DP Structure*, doctoral dissertation, University of Massachusetts, Amherst.
- Lees, Robert: 1961, 'Grammatical Analysis of the English Comparative Construction', *Word* **17**, 2, 171–185.
- Prince, Alan and Paul Smolensky: 1993, 'Optimality Theory: Constraint Interaction in Generative Grammar', *RutCCS Technical Report #1*, Rutgers Center for Cognitive Science, Rutgers University. [To appear MIT Press, Cambridge.]
- Rivero, María-Luisa: 1981, 'Wh-movement in Comparatives in Spanish', In *Cressey, William and Donna Jo Napoli* (eds.), *Linguistic Symposium on Romance Languages 9*, Georgetown University Press, Washington.
- Rullmann, Hotze: 1995, *Maximality in the Semantics of WH-Constructions*, doctoral dissertation, University of Massachusetts at Amherst.
- Sauerland, Uli: 1998, *The Meaning of Chains*, doctoral dissertation, Massachusetts Institute of Technology.
- von Stechow, Armin: 1984, 'Comparing Semantic Theories of Comparison', *Journal of Semantics* **3**, 1–77.