An Overview of the Syntax and Semantics of the Adjectival Projection in English

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1 Gradable adjectives and comparatives

A defining characteristic of gradable adjectives like *all, old, abstract, fast, scary, dangerous*, etc., is that they may co-occur with degree morphemes such as *more/-er, less, as, too, enough*, and so in complex syntactic constructions which fall under the general label "comparatives":

(1) Benny is taller than his sister.
(2) Carmen is as old as Mike.
(3) Your new proposals are less abstract than the previous ones.
(4) The implications of the election were too scary to ignore.
(5) This train is fast enough to get us to San Jose before noon.

Overview
- Use comparatives as an empirical base for determining the structure and interpretation of constructions in which gradable adjectives appear.
- Provide a compositional semantics for this syntactic analysis.

Criteria for evaluation
- A syntactic analysis should support a compositional semantics.
- A semantic analysis should be consistent with the syntactic distribution of meaningful elements.

2 Extended projection

2.1 Projecting the adjective
- The extended projection of A is headed by a degree morpheme (Abney 1987, Corver 1990).

The extended projection of A

\[
\begin{array}{c}
\text{Spec} \\
\text{Deg} \\
\text{Deg} \\
\text{Spec} \\
\end{array}
\]

\[
\begin{array}{c}
\text{DegP} \\
\text{Deg} \\
\text{AP} \\
\text{A'} \\
\text{(Comp)} \\
\end{array}
\]

\[
\text{Deg} \in \{\text{abs, er/more, less, as, too, enough, so, how, that}\}
\]

2.2 Absolutes
- DegP is headed by (null) abs morpheme.
- Measure phrases are generated in SpecDegP.

(7) Benny is tall.
(8) Benny is 4 feet tall.

\[
\begin{array}{c}
\text{IP} \\
\text{DP} \\
\text{VP} \\
\text{Ben} \\
\text{y} \\
\text{is} \\
\text{4 feet} \\
\end{array}
\]

\[
\begin{array}{c}
\text{Deg} \\
\text{Deg} \\
\text{AP} \\
\text{A'} \\
\text{ABS} \\
\end{array}
\]

2.3 Comparatives
- DegP is headed by comparative morpheme (*more/-er, less, as*).
- The *than/as* constituent is a selected adjunct.

(10) *The Brothers Karamazov* is longer than *The Idiot.*
(11)  
```
(11)  
  IP
  ├── DP
  │   └── VP
  │       └── The BK
  │       └── is
  │           └── DegP
  │               └── Deg
  │                   └── PP
  │                       └── than The Idiot
  │
  └── Deg
   └── AP
       └── long
```

2.4 Too and enough
- DegP is headed by \( \{ \text{too, enough} \} \).
- The comparative clause is a selected adjunct.

(12) Pug is too stinky to go to the Ritz.
(13) Ubu is beautiful enough to win the prize.

(14)  
```
(14)  
  IP
  ├── DP
  │   └── VP
  │       └── Pug
  │           └── V
  │               └── is
  │                   └── DegP
  │                       └── Deg
  │                           └── CP
  │                               └── to go to the Ritz
  │
  └── Deg
   └── AP
       └── too
       └── A
           └── stinky
```

Extraction facts support the analysis of the comparative clause as an adjunct:

(15) Who did Audrey leave to see?
(16) *When did Audrey leave to see her boss?
(17) Who was Audrey angry enough to criticize?
(18) *How obnoxiously was Audrey angry enough to criticize her boss?

(19) Which car was Tim too scared to drive?
(20) *How quickly was Tim too scared to drive the Fiat?

2.5 Differential comparatives

(21) Benny is at least six inches taller than his sister.
(22) The Idiot is shorter than The Brothers Karamazov by at least 100 pages.

(23)  
```
(23)  
  IP
  ├── DP
  │   └── VP
  │       └── Pug
  │           └── V
  │               └── is
  │                   └── DegP
  │                       └── Deg
  │                           └── PP
  │                               └── 6 inches
taller
```

(24)  
```
(24)  
  IP
  ├── DP
  │   └── VP
  │       └── Pug
  │           └── V
  │               └── is
  │                   └── DegP
  │                       └── Deg
  │                           └── PP
  │                               └── by at least 100 pages
longer
```

- The difference phrase may be another DegP (Bresnan 1973, Jackendoff 1977):

(25) Dole isn't as much more conservative than Clinton as Buchanan is.
(26) This paper is too much shorter than the required length for it to be accepted.
(27) Maverick's is more too dangerous for a novice surfer than Steamer Lane is.
(28) Arnold's dissertation is more less understandable than it should be than mine is.

(29)  
```
(29)  
  IP
  ├── DP
  │   └── VP
  │       └── Pug
  │           └── V
  │               └── is
  │                   └── DegP
  │                       └── Deg
  │                           └── PP
  │                               └── as much
more
```

NB: The clausal constituent in complex comparatives like (25-28) must be extraposed.
2.6 *Summary*

The schema provided by extended projection generates structures which adequately characterize comparative constructions.

How does this approach compare to traditional analyses of the syntax of comparatives?

3 The specifier analysis of DegP

3.1 The specifier analysis


(30) Benny is 4 feet/\textup{\textbar} tall,

(31) \[ \text{IP} \quad \text{VP} \]

\[ \text{Benny} \quad \text{V} \quad \text{AP} \]

\[ \text{is} \quad \text{DegP} \quad \text{A'} \]

\[ \text{4 feet/\textbar} \quad \text{tall} \]

Comparative clauses are generated as complements of a Deg\textsubscript{0} and extraposed.

(32) Benny is taller than his sister.
(33) Benny is as tall as Patrick.
(34) Benny is too tall to be a jockey.

3.2 *Comparison*

The EP analysis and the Spec analysis differ in terms of:

i) extraposition of the *than* constituent

ii) constituent structure

3.2.1 Extrapolation, extraction, and P-stranding

Wh-movement out of an extraposed PP cannot strand a preposition:

(36) I bought a picture of Mel Torme yesterday.
(37) I bought a picture of Mel Torme yesterday.
(38) Who did you buy a picture of yesterday?
(39) *Who did you buy a picture yesterday of?*

But *than* may be stranded (Hankamer 1973) unless obviously extraposed (Corver 1990):

(40) a. Who does Dan seem taller than to you?
   b. *Who does Dan seem taller to you than?

• These facts are unexpected on the traditional account, because comparatives *always* involve extraposition of the constituent headed by *than*.

If differential comparatives require extraposition of the *than/as* constituent, stranding of the head should be ungrammatical;

(41) a. Bush is as much more conservative than Clinton as Buchanan,
   b. *Who is Bush as much more conservative than Clinton as?*
(42) a. Maverick's is more too dangerous for a novice surfer than Steamer Lane,
   b. *What is Maverick's more too dangerous for a novice surfer than?*

3.2.2 Constituent structure 1: Coordination and differential comparatives

A difference phrase cannot be extracted:

(43) a. ??How much is your van longer than your car?
   b. How much longer than your van is your car?

(45) is an accurate (and grammatical) description of the situation represented by (44).

(44) line A: 

line B: 

line C: 

(45) Line A is 1 cm longer than line B and shorter than line C.
(46) The rug is a foot wider than the table and longer than the desk.
Max is 6 inches too short to be an astronaut and too tall to be a jockey.

In the EP analysis, the sequence (Deg A PP) is a constituent.

The EP structure

\[
\begin{align*}
& \text{DP} \\
& \text{Deg} \quad \text{Deg}' \\
& \text{longer than line B} \\
& \text{shorter than line C}
\end{align*}
\]

In the Spec Analysis, the sequence (Deg A PP) is not a constituent exclusive of the differential phrase, because this phrase is generated in SpecDegP (Bresnan 1973).

The Spec structure

\[
\begin{align*}
& \text{AP} \\
& \text{DegP} \\
& \text{AP} \\
& \text{DegP} \\
& \text{DP} \quad \text{Deg} \quad \text{Deg}' \\
& \text{longer than line B} \\
& \text{shorter than line C}
\end{align*}
\]

"Across the board" movement of the differential phrase could generate (45), but (43a) shows that such movement is disallowed.

3.2.3 Constituent structure 2: Right Node Raising

The postposed modifiers in (50-51) can be interpreted as modifying the subject of the first clause only with a RNR intonational pattern,

(50) In the January 12 issue of The New York Review of Books, two books were reviewed and an article appeared [which discussed the situation in Chechnya].

(51) A record will soon be released and a CD-ROM is in production [from MegaWaz Recordz new superstars Mõtomõuth].

(52) \[
\begin{align*}
& \text{XP} \\
& \text{and} \\
& \text{XP} \\
& \text{YP}
\end{align*}
\]

(53-54) do not require a RNR intonational pattern:

(53) Your latest draft is more interesting and more refined than the earlier versions.

(54) Mel is too young and too inexperienced to be working in a place like this.

This is expected in the EP analysis because (Deg AP) is a constituent. In the Spec analysis, (53-54) are structurally parallel to (50-51), and so should require RNR intonation.

3.3 Summary

The EP analysis provides a more adequate explanation of the phrase structure of comparative constructions.

4 The interpretation of the adjectival projection

Does an EP syntax support a compositional semantics for comparatives?


Relations between measures and measures

(55) *Benny is taller than his sister* is true iff Benny's tallness exceeds that of his sister.

(56) *Benny is 4 feet tall* is true iff Benny's tallness is at least as great as 4 feet.

(57) *Benny is taller than his sister* is true iff Benny's tallness exceeds that of his sister.

Relations between measures and propositions

(58) The implications of the election were too scary to ignore is true iff the scarciness of the implications of the election made it impossible to ignore them.

(59) This train is fast enough to get us to San Jose before noon is true iff the fastness of the train makes it possible to get us to San Jose before noon.

4.1 Adjectives are measure functions

Proposal: Gradable adjectives denote functions from individuals to degrees.

(60) \[\|\text{tail(benny)}\| - \text{the extent of Benny's tallness}\]

- Every gradable adjective is associated with a scale.
This ontology, coupled with a spatial definition of adjectival polarity, supports an explanation of a number of semantic properties ofgradable adjectives, including:

**Monotonicity properties** (Kennedy to appear b; cf. Seuren 1978, Ladusaw 1979, Sanchez-Valencia 1996)

(62) It is dangerous to break that subject at all.
(63) It's dangerous to break that subject at all.
(64) It is closer to own a car in San Francisco, —> <——
It's closer to own a car built in the former Yugoslavia in San Francisco.
(65) It's smart to own a car in Los Angeles, —> <——
It's smart to own a car build in the former Yugoslavia in Los Angeles.

**Crosspolar anomaly** (Kennedy 1997)

(66) #Mike is taller than Carmen is short.
(67) #Carmen is shorter than Mike is tall.
(68) #San Francisco Bay is shallower than Monterey Bay is deep.
(69) #Maureen is even less exciting than Maurice is dull.

### 4.2 A semantics for degree morphology


(70) ||`[\text{Deg}]`|| = λGd[|X ∈ G(x)|](d)]
(71) ||`[\text{Abs}]`|| = λGd[|X ∈ G(x)| ≥ d] (where dN may be a contextually supplied “standard”)
(72) ||`[\text{More/less}]`|| = λGd[|X ∈ G(x)| > d]
(73) ||`[\text{Less}]`|| = λGd[|X ∈ G(x)| ≤ d]
(74) ||`[\text{As}]`|| = λGd[|X ∈ G(x)| ≥ d]

Too, enough, and so denote modalized relations between extents and propositions (cf., von Stechow 1984a, Molmann 1992).

(75) ||`[\text{Too}]`|| = λGpλx[∀x[G(x) ≥ G(x)] → ϕx]
(76) ||`[\text{够}]`|| = λGpλx[∀x[G(x) ≥ G(x)] → ϕx]

### 4.3 Absolute constructions

(77) Benny is tall,

(78) IP: λx[|tail(x)| ≥ dN][benny]

\[\begin{array}{c}
\text{IP} \\
\text{DP} \\
\text{VP} \\
\text{Benny} \\
\text{V} \\
\text{Deg} \\
\text{AP} \\
\text{is} \\
\text{Deg} \\
\text{AP} \\
\text{tail} \\
\end{array}\]

(79) a. tail(benny) ≥ dN
b. Benny’s tallness is at least as great as a contextually determined standard of height,

(80) a. Benny is 4 feet tall,
    b. tail(benny) ≥ 4 feet
c. Benny’s tallness at least as great as 4 feet.

#### 4.4 Comparatives

(81) a. *The Brothers Karamazov* is longer than *The Idiot* is,
   b. *The Brothers Karamazov* is longer than [Op, *The Idiot* is [d-long]]

(82) IP: λx[|long(x)| > d][The Idiot is d-long][BK]

\[\begin{array}{c}
\text{IP} \\
\text{DP} \\
\text{VP} \\
\text{BK} \\
\text{V} \\
\text{Deg} \\
\text{AP} \\
\text{is} \\
\text{AP} \\
\text{Deg} \\
\text{Deg} \\
\text{PP} \\
\text{Deg: λx[long(x)| > d][The Idiot is d-long]} \\
\text{long} \\
\end{array}\]

We will discuss the syntax and interpretation of the comparative clause in more detail in the coming days.

#### 4.5 Summary

Given the assumption that adjectives denote measure functions, we can provide a straightforward compositional interpretation for the extended adjectival projection.
5 Comparison with previous semantic analyses

5.1 The relational analysis

Gradable adjectives have an extra "degree" argument whose function is to introduce the standard expression (Cresswell 1976).

\[ \text{tall}(benny, d \text{ feet}) \] iff \[ \text{tall}(benny) \geq d \text{ feet} \], where \( \text{tall} \) is a function from individuals to degrees.


(85) Benny is taller than his sister.
(86) Benny is \( [\text{AD} \text{deg} \text{er than his sister}] \text{ tall}] \)
(87) \( \exists e (e > \max(\lambda x . \text{tall}(\text{benny's sister}, e))) \text{ tall}(\text{benny}, e) \)
(88) \( \text{Benny is taller than his sister} \) is true iff for some extent \( e \) such that \( e \) exceeds the (maximal) extent to which Benny's sister is tall, Benny is at least as tall as \( e \).

5.2 Comparison

The semantic analysis I have proposed for an EP syntax and the relational account differ in the semantic type of the comparative construction:
- In the analysis developed here, \( \text{DegP} \) is interpreted as a comparative predicate.
- In the relational account, \( \text{DegP} \) is interpreted as a comparative quantifier.

Quantifiers/arguments show scope ambiguities; predicates do not.

5.2.1 Universal quantification

An indefinite NP in the scope of a universal quantifier is ambiguous:

(89) Every pug wants to meet an exiled member of the Royal Family.
(90) For every pug \( p \), there is an exiled member of the Royal Family that \( p \) wants to meet.
(91) There is an exiled member of the Royal Family that every pug wants to meet.

A comparative is not:

(92) Every dog is less beautiful than Pug.
(93) For every dog \( d \), there is an extent of beauty which is exceed by the extent to which Pug is beautiful, and \( d \) is that beautiful.
(94) *There is an extent of beauty less than the extent to which Pug is beautiful, and every dog is that beautiful.

(95) Domain: \{Pug, Mort, Magus, Mole\} 

\begin{align*}
\text{BEAUTY: } & \text{Mort} \quad \text{Magus} \quad \text{Mole} \quad \text{Pug} \\
\end{align*}

The "comparative quantifier" interpretations

(96) \( \forall y < x . \text{beautiful}(\text{Pug}, y) \) \( \forall y . \text{beautiful}(\text{Pug}, y) \) \( (x, y) \) \( (–107) \)
(97) \( \exists y < x . \text{beautiful}(\text{Pug}, y) \) \( \forall y . \text{beautiful}(\text{Pug}, y) \) \( (x, y) \) \( (–108) \)

The "comparative predicate" interpretation

(98) \( \forall y . \text{beautiful}(\text{Pug}, y) \) \( \forall y . \text{beautiful}(\text{Pug}) \)
(99) For every dog \( d \), d's beauty is exceeded by Pug's.

5.2.2 Negation

An indefinite NP in the scope of negation is ambiguous:

(100) Kim didn't see a friend of mine at the dog show.
(101) It's not the case that there is a friend of mine who Kim saw at the show.
(102) There is a friend of mine such that Kim didn't see him.

A comparative is not:

(103) Kim's car isn't more powerful than a Fiat.
(104) It is not the case that there is an extent of power greater than the extent to which a Fiat is powerful, and Kim's car is that powerful.
(105) *There is an extent of power greater than the extent to which a Fiat is powerful, and Kim's car is not that powerful.

(119) is true in the context in (120), because it is false that Kim's car is \( e \) powerful.

(106) power: a Fiat, Kim's car 

\begin{align*}
\text{ e } \end{align*}

The comparative quantifier interpretations

(107) \( \neg \forall x > y . \text{powerful}(\text{Fiat}, x) \) \( \text{powerful}(\text{Kim's car}, x) \) \( (–104) \)
(108) \( \exists x > y . \text{powerful}(\text{Fiat}, x) \) \( \neg \text{powerful}(\text{Kim's car}, x) \) \( (–105) \)

The comparative predicate interpretation

(109) \( \neg \text{dangerous}(\text{Kim's car}) > \text{dangerous}(\text{a Fiat}) \)
(110) It's not the case that Kim's car's dangerousness exceeds a Fiat's.
5.2.3 Comparatives with less

Exchanges like (111) indicate the need for an at least as interpretation of the absolute, with the "maximality" effect explained as a scalar implicature.

(111) A: You have to be at least 5 feet tall to be an astronaut,  
B: I'm 5 feet tall; in fact, I'm over 5 feet tall.

This presents a problem for a quantificational analysis of less comparatives.

(112) Huey is less beautiful than Pug.

(113) \( \exists y < \alpha \text{beautiful}(Pug, x)[\text{beautiful}(Huey, y)] \)

In the context in (114), (113) is true, because \( e < \alpha \text{beautiful}(Pug, z) \) and \( \text{beautiful}(Huey, e) \).

(114) \[ \text{beauty}; \quad \text{Pug} \quad \text{Huey} \quad \text{e} \]

The maximality of less comparatives is not due to scalar implicature: (115) is a contradiction (cf. (116)).

(115) #Huey is less beautiful than Pug, but it would be more accurate to say that he's more beautiful than Pug.

(116) Some dogs left, but it would be more accurate to say that every dog left.

The comparative predicate interpretation

(117) \( \text{beautiful}(Huey) < \text{beautiful}(Pug) \)

(118) The extent to which Huey is beautiful is exceeded by the extent to which Pug is beautiful.

5.4 Summary

- A quantificational analysis of comparatives must stipulate that the comparative operator always takes narrow scope; the semantic analysis of EP structures builds the comparison into the semantics of the predicate, and so entails "narrow scope".
- A quantificational account must assume an exactly interpretation of the absolute for comparatives with less (cf. Rulffmann 1995) to derive maximality; maximality is derived in the EP analysis by analyzing adjectives as functions from individuals to degrees.

6 Conclusion

The syntactic characteristics of comparatives support the position that adjectives, like other lexical projections, project extended functional structure (Abney 1987, Corver 1990, Grimshaw 1991).

Gradable adjectives are measure functions; they denote functions from objects to degrees.

6.1 Results

An extended projection analysis of AP/DegP can be provided with a straightforward compositional semantic interpretation which:

- reflects our intuitions about the meaning of gradable adjectives,
- satisfies the criterion of a coherent syntax-semantics interface, and
- derives the restricted scopal behavior of comparatives.

6.2 Questions

1. What are the consequences of the EP analysis for the structure and interpretation of the comparative clause?
   - subdeletion
   - comparative deletion
   - scope

2. Does the EP analysis provide insights on cross-linguistic variation in comparatives (see e.g. Greenberg's (1963) observation about the correlation between headedness and the order of adjective, degree morpheme, and "standard marker")?

3. How does the analysis of adjectives as measure functions interact with the lexical semantic analysis of degradable nouns and verbs?
   - the width of the table/the table's width, Benny's tallness, ...
   - dry, cool, widen, narrow, soften, solidify, beautiful, ...

References

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