1 Introduction

The big questions:

- What is the division of labor between lexical and functional elements?
  - Is meaning projected from lexical items?
  - Is meaning constructed by functional elements?

In particular for adjectives:

- Scale structure, open or closed, is projected from gradable adjectives.
- Functional structure must match the scale structure of the adjective to map it to a property of individuals.

The puzzle:

- Some gradable adjectives can shift between relative (open) and absolute (closed) interpretations.
- Functional elements seem to shift the interpretations of gradable adjectives.

Roadmap:

- Introduce the scale structure of gradable adjectives
- Note the puzzle of scalar variability

* I would like to thank Marcin Morzycki for his guidance and helpful comments and suggestions for navigating the treacherous waters of adjectival meaning.
Review Kennedy’s (2007) analysis of scale structure

Attempt a multiple pos analysis of scale structure

Sever scale structure from the adjective

Conclude

2 Adjectives and Scale Structure

Gradable adjectives denote measure functions from individuals to degrees, type \(\langle e, d \rangle\) (Kennedy 1997).¹ ²

2.1 The Positive Form

To derive a property of individuals, adjectives must combine with some kind of degree morphology, including comparative morphemes, intensifiers, and sufficiency morphemes.

- In the positive form, adjectives lack overt degree morphology.
- To derive a property of individuals, adjectives combine with a covert pos morpheme, which
  - Introduces a standard of comparison, here \(\text{stnd}(g)\), and
  - A relation between the measured degree of the individual and the standard, here \(R\) (Kennedy 1997).

¹ Concerning the semantic framework and notation, I assume the basic compositional system of Heim & Kratzer (1998). Semantic types and variables are as follows:

  - Semantic types: individuals, \(e\), degrees, \(d\), and truth values, \(t\)
  - Variables: individuals, \(x,y,z,\ldots\), degrees, \(d,d',d'',\ldots\)

I also assume, along with Kennedy (1997, 2007) and others, that gradable adjectives denote measure functions, type \(\langle e, d \rangle\), unlike Kennedy & McNally (2005) where adjectives are assumed to denote a relation between an individual and a degree, type \(\langle e, \langle d, t \rangle \rangle\). The variables \(g,g',g'',\ldots\) will be uses for measure functions.

² It is also common to have gradable adjectives denote a relation between individuals and degrees, type \(\langle e, \langle d, t \rangle \rangle\). Since both the measure function analysis and the relational analysis assume that degrees construct scales which have the structure given in Section 2.2, nothing in this talk hinges on this choice. Denotations originally given in a relational analysis will be translated into the measure function approach.
(1) \[ \left[ \text{pos} \right] = \lambda g \lambda x [R(g(x))(\text{stnd}(g))] \]

- Determining the relation, \( R \), and the standard, \( \text{stnd}(g) \), for the \( \text{pos} \) morpheme depends on scale structure.

### 2.2 Scale Structure

Degrees are defined to be intervals on a scale, which is defined as a triple, \( \langle S, R, \Delta \rangle \) (Kennedy & McNally 2005):

- \( S \) is a set of degrees
  - Totally open (no minimum/maximum)
  - Lower closed (minimum only)
  - Upper closed (maximum only)
  - Totally closed (both minimum/maximum)

- \( R \) is an ordering on \( S \)
  - Increasing (\( \succ \)) for ‘positive’ adjectives (\emph{warm})
  - Decreasing (\( \prec \)) for ‘negative’ adjectives (\emph{cool})

- \( \Delta \) represents the dimension of measurement
  - temperature, width, depth, linear extent, temporal extent, etc.

The scale structure of an adjective affects its distribution and interpretation.³

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³ I will refer to adjectives as open/relative or closed/absolute depending on whether I am highlighting a distributional or interpretative observation. Note that open adjectives are relative adjectives, and closed adjectives are absolute adjectives.
2.2.1 Open/Closed Scales

The scale structure of an adjective is diagnosed by proportional modifiers (Kennedy & McNally 2005).4

- Modifiers like completely are acceptable with closed scale adjectives, as in (2a).5
- Modifiers like very are acceptable with open scale adjectives, as in (2b).


2.2.2 Relative/Absolute Interpretations

Selection of Standard The scale structure of an adjective affects the kind of standard the positive form takes (Kennedy & McNally 2005).

- Relative adjectives have a contextually determined standard, as in (3) and (4).

(3) a. The man is tall.
   b. The basketball player is tall.
(4) a. The watch was expensive.
   b. The moon landing was expensive.

4 The denotations for completely and very are given in (i). For completely, max returns the maximum point of the scale. For very, the comparison class is contextually specified as those objects that have the property \( g \) in the context.

(i) a. \[ \text{completely} = \lambda x. g(x) = \text{max}(g) \]
   b. \[ \text{very} = \lambda x. g(x) \geq \text{std}(g)c[x|\text{pos}(g)(x)(c)=1] \]

5 Kennedy & McNally (2005) and Kennedy (2007) notes that completely, along with totally, perfectly, and absolutely pick out maximum closures while slightly and partially pick out minimum closures.
• Absolute adjectives do not have a contextually determined standard:
  – Negative closed scale adjectives have a minimum standard which require their argument to possess a non-zero degree, as in (5), and
  – Positive closed scale adjectives have a maximum standard which require their argument to possess the maximum degree, as in (6).

Entailments

(5) a. The baby is awake.
b. The spot is visible.
c. The door is open.
d. The rod is bent.
(6) a. The glass is full.
b. The road is flat.
c. The door is closed.
d. The rod is straight.

Entailments The scale structure of an adjective affects its entailments in comparatives and negation (Kennedy & McNally 2005).

• Relative adjectives do not entail their antonyms in either comparatives, as in (7), or negation, as in (8).
  – The continuations are not contradictions.

(7) a. This door is larger than the window, but neither are large.
b. This table is more expensive than that chair, but neither are expensive.
(8) a. This door is not large, but it’s not small either.
b. This table is not expensive, but it’s not inexpensive either.

• Absolute adjectives entail their antonyms in comparatives, as in (9) and (10), and negation, as in (11) and (12).
  – The continuations are contradictions.
(9)  a. #The floor is wetter than the countertop, but neither is wet.
    b. #The rod is more bent than the stick, but neither is bent.

(10) a. #This glass is more full than that one, but both are full.
    b. #This line is more straight than that stick, but both are straight.

(11) a. #The gold is not impure, but there are some traces of lead in it.
    b. #The rod is not bent, though there is a small bend in the middle.

(12) a. #This glass is full, but it could be fuller.
    b. #That line is straight, but you could make is straighter.

**Sorities Paradox**  The scale structure of an adjective also interacts with the Sorities Paradox (Kennedy 2007).

- Relative adjectives give rise to the Sorities Paradox, as in (13).
  - The conclusion is judged to be false, although the premise and induction step seem true.

(13)  a.  P: A man who is 7 feet tall is tall.
      b.  I: Any man who is 1 inch shorter than a tall man is tall.
      c.  C: Therefore, any man who is 3 feet tall is tall.

- Absolute adjectives do not give rise to the Sorities Paradox, as in (14) and (15).
  - The induction step for both minimum (14) and maximum (15) standard adjectives is judged to be false, thus the conclusion does not go through.

(14)  a.  P: A rod that has 10 degrees of bend is bent.
      b.  I: Any rod that is 1 degree less bent than a bent rod is bent.
      c.  C: Therefore, any rod that has 0 degrees of bend is bent.

(15)  a.  P: A theater in which every seat is occupied is full.
      b.  I: Any theater with one fewer occupied seat than a full theater is full.
      c.  C: Therefore, any theater in which half of the seats are occupied is full.
3 A Case Study of *Dry*

The adjective *dry* exhibits a kind of scalar variability:

“When *dry* is used to describe a (more or less) permanent, stable property such as the average degree of moisture in the atmosphere, it has a relative interpretation. If, however, *dry* is used to describe a transient property like the amount of moisture on a surface, it has an absolute interpretation.”  

Kennedy & McNally (2005: pg. 370)

Proportional Modifiers diagnose open and closed scale *dry*, (16a) and (16b), respectively.

(16)  
a. This region of the country is **completely/very dry.**  
b. The glasses are **completely/very dry.**

Relative and absolute *dry* select different standards.

- Relative *dry* has a contextually determined standard, as in (17a).
- Absolute *dry* does not have a contextually determined standard, as in (17b).

(17)  
a. This region of the country is dry.  
b. The glasses are dry.

Relative and absolute *dry* generate different entailments in comparatives and negation.

- Relative *dry* does not entail non-dryness, as in (18a) and (19a).
- Absolute *dry* entails non-dryness, as in (18b) and (19b).

(18)  
a. This region of the country is drier than that one (though both are dry).  
b. The glasses are drier than the plates (#though both are dry).
Relative and absolute *dry* interact differently with the Sorites Paradox.

- For relative *dry*, the conclusion is judged to be false, although the premise and induction step seem true.
- For absolute *dry*, the induction step is judged to be false, thus the conclusion does not go through.

Question: How can we account for variable behavior in gradable adjectives?

- Accounts will depend on *pos*, which introduce the standard of comparison.⁶

### 4 Unified *pos* Analysis

Kennedy (2007) unifies the meanings of the *pos* morpheme, proposing that the standard it introduces is that the individual “stands out” relative to the scale.

(22) $\mathcal{[}pos\mathcal{]} = \lambda g \lambda x[\text{stand-out}(g(x))]$

The function *stand-out* is given in (23) (Kennedy 2004).

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[6] Kennedy (2007: pg. 31 n.) notes that the relative/absolute distinction cannot be encoded in the lexical entry of the adjective on the grounds that this would prevent absolute adjectives from participating in comparative constructions.
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(23) \( \text{stand-out}(g(x)) = \begin{cases} 
  g(x) = \max(g) & \text{if } \max(g) \text{ is defined}, \\
  g(x) \succ \min(g) & \text{if } \min(g) \text{ is defined}, \\
  g(x) \succeq \text{std}(g) & \text{otherwise.} 
\end{cases} \)

To ensure that adjectives with closed scales are linked to the minimum/maximum point of their scale, Kennedy (2007) proposes a principle of interpretative economy.\(^7\)

(24) **Interpretative Economy**
Maximize the contribution of the conventional meanings of the elements of a sentence to the computation of its truth conditions.

(25) a. \( \llbracket [\text{pos bent}] \rrbracket = \lambda x[\text{stand-out}(\text{bent}(x))] \\
      = \lambda x[\text{bent}(x) \succ \text{min}(\text{bent})] \)

b. \( \llbracket [\text{pos full}] \rrbracket = \lambda x[\text{stand-out}(\text{full}(x))] \\
      = \lambda x[\text{full}(x) = \max(\text{full})] \)

c. \( \llbracket [\text{pos tall}] \rrbracket = \lambda x[\text{stand-out}(\text{tall}(x))] \\
      = \lambda x[\text{tall}(x) \succeq \text{std}(\text{tall})] \)

4.1 Kennedy (2007) on Scalar Variability

On Kennedy’s (2007) analysis, scalar variability must derive from multiple lexical entries since \text{stand-out} is interpreted based on the scale structure of the adjective.

- Under the assumption that \text{dry} measures a closed scale, \text{stand-out} and Interpretative Economy predict only the absolutive interpretation.
- Under the assumption that \text{dry} measures an open scale, \text{stand-out} and Interpretative Economy predict only the relative interpretation.

(26) \( \llbracket [\text{pos dry}] \rrbracket = \lambda x[\text{stand-out}(\text{dry}(x))] \\
      = \lambda x[\text{dry}(x) = \max(\text{dry}(x))] \quad (\text{dry as closed scale}) \\
      = \lambda x[\text{dry}(x) \succeq \text{std}(\text{dry}(x))] \quad (\text{dry as open scale}) \)

Questions from Kennedy’s (2007) analysis:

\(^7\) Another option which could do away with interpretative economy would be to make use of the Elsewhere Condition which I give implicitly in (23).
• Can we unify the lexical entries for adjectives which demonstrate scalar variability?

• Do we need an Interpretative Economy condition?

A closer look at the stand-out function reveals that it actually encodes three possibilities for pos morphemes.

• Could a multiple pos analysis fare better?

5 Multiple pos Analysis

The idea: Split Kennedy’s (2007) pos morpheme into three functional items, one for each type of closure (trading an increase in functional morphemes for interpretative economy).

• Open scale adjectives, which have relative standards, require a pos which introduces a contextually determined standard, stnd, as in (27a).

• Closed scale adjectives, which have absolute standards, require a pos which picks out either the minimum point of the scale, min, as in (27b), or the maximum point of the scale, max, as in (27c).

(27) a. \([pos_{open}] = \lambda g \lambda x [g(x) \geq stnd(g)]\]
b. \([pos_{lower-closed}] = \lambda g \lambda x [g(x) \succ min(g)]\]
c. \([pos_{upper-closed}] = \lambda g \lambda x [g(x) = max(g)]\]

Examples of each of these are given in (28).

(28) a. \([[pos_{open} \text{ tall}] = \lambda x [\text{tall}(x) \geq stnd(\text{tall})]]\]
b. \([[pos_{lower-closed} \text{ bent}] = \lambda x [\text{bent}(x) \succ min(\text{bent})]]\]
c. \([[pos_{upper-closed} \text{ full}] = \lambda x [\text{full}(x) = max(\text{full})]]\]
5.1 **Multiple pos Analysis on Scalar Variability**

On the multiple pos analysis, scalar variability must still be a form of polysemy.

- Under the assumption that *dry* measures a closed scale, only \( \text{pos}^{\text{upper-closed}} \) can combine with *dry*, predicting only the absolutive interpretation.
- Under the assumption that *dry* measures an open scale, only \( \text{pos}^{\text{open}} \) can combine with *dry*, predicting only the relative interpretation.

\[
\begin{align*}
\text{(a)} & \quad \left[ [\text{pos}^{\text{upper-closed}} \ \text{dry}] \right] = \lambda x [\text{dry}(x) = \max(\text{dry})] & \text{(dry as closed scale)} \\
\text{(b)} & \quad \left[ [\text{pos}^{\text{open}} \ \text{dry}] \right] = \lambda x [\text{dry}(x) \succeq \text{stnd}(\text{dry})] & \text{(dry as open scale)}
\end{align*}
\]

Questions from the multiple pos analysis:

- Can we unify the lexical entries for adjectives which demonstrate scalar variability?

Note that under the multiple pos analysis, scale structure is implicitly a checking system.

- The pos morpheme must agree with the scalar property of adjective embedded in its projection.

6 **Severing Scale Structure Analysis**

To unify the lexical entry of adjectives which exhibit scalar variability, I maintain the three pos morphemes of the multiple pos analysis, but remove the requirement of agreeing with the scale.

- An adjective receives its scale structure from the pos morpheme it combines with.
  - Adjectives are still measure functions which map an individual to a degree on a scale.
  - Adjectives are oriented towards one end of the scale,
But adjectives do not project the content of this end into the grammar.

Traditionally “closed scale” adjectives have no grammatical requirement that they be interpreted at the maximum/minimum. 

Denotations for gradable adjectives are given in (30).

\[(30)\]
\[
a. \text{[tall]} = \lambda x [\text{tall}(x)] \text{ where tall: } f : H \subseteq U \rightarrow \langle D_{(0,\infty)}, \succ, \text{height} \rangle \\
b. \text{[bent]} = \lambda x [\text{bent}(x)] \text{ where bent: } f : B \subseteq U \rightarrow \langle D_{[0,\infty]}, \succ, \text{bend} \rangle \\
c. \text{[full]} = \lambda x [\text{full}(x)] \text{ where full: } f : S \subseteq U \rightarrow \langle D_{[0,1]}, \succ, \text{spatial extent} \rangle
\]

Examples of their positive forms are given in (31).

\[(31)\]
\[
a. \text{[[pos}_\text{open} \text{ tall]}} = \lambda x [\text{tall}(x) \succeq \text{stnd}(\text{tall})] \\
b. \text{[[pos}_\text{lower-closed} \text{ bent]}} = \lambda x [\text{bent}(x) \succ \text{min}(\text{bent})] \\
c. \text{[[pos}_\text{upper-closed} \text{ full]}} = \lambda x [\text{full}(x) = \text{max}(\text{full})]
\]

6.1 Some Q and A

• Q: Why do adjectives act in a restrictive way with degree morphology?

• A: If the underlying scale (i.e. concept) does not support the interpretation required by the pos morpheme, anomaly results.

• Q: Why are relative interpretations of “absolute” adjectives not always available?

• A: Three possibilities:
  
  – **Pragmatics**: Absolute interpretations are more informative than relative interpretations, and therefore have a pragmatic bias which blocks the relative interpretation.

  – **Semantics**: The structure of the scale itself limits the interpretation to absolute, i.e. a scale made of only two points, or a requirement that the adjective measure the bounded value.

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8 Indeed, these adjectives can combine with degree morphology and surface in comparatives, both which require non-minimum/non-maximum degrees from their associated scale.

9 This is very much in the spirit of Borer’s (2005a; 2005b) structuring sense analysis.
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– Psycholinguistics: The frequency of absolute interpretation weakens the availability of the relative interpretation, or absolute standards are available early in processing and bias interpretation (Frazier, Clifton & Stolterfoht 2008).

6.2 Severing Analysis on Scalar Variability

Consider the particular case of dry.

(32) a. $[\text{dry}] = \lambda x[\text{dry}(x)]$ where $\text{dry}: f : M \subseteq U \rightarrow (D_{[0,\infty)}, <, \text{moisture})$

- $\text{dry}$ with $\text{pos}_{\text{open}}$
  - $\text{pos}_{\text{open}}$ introduces $\text{stnd}$, selecting a relative standard.
  - The scale underlying $\text{dry}$ allows this relative meaning.

- $\text{dry}$ with $\text{pos}_{\text{upper-closed}}$
  - $\text{pos}_{\text{upper-closed}}$ introduces $\text{max}$, selecting a maximum absolute standard.
  - The scale underlying $\text{dry}$ allows this maximum absolute meaning.

- $\text{dry}$ with $\text{pos}_{\text{lower-closed}}$
  - $\text{pos}_{\text{lower-closed}}$ introduces $\text{min}$, selecting a minimum absolute standard.
  - The scale underlying $\text{dry}$ does not allow a minimum absolute meaning.
  - This conflicts with the meaning of $\text{dry}$, no amount of contextual support is able to remedy the conflict between the grammar’s requirements and the flexibility of $\text{dry}$, thus unacceptability results.

(33) a. $[[\text{pos}_{\text{open}} \text{ dry}]] = \lambda x[\text{dry}(x) \geq \text{stnd}(\text{dry})]$ (relative $\text{dry}$)
b. $[[\text{pos}_{\text{upper-closed}} \text{ dry}]] = \lambda x[\text{dry}(x) = \text{max}(\text{dry})]$ (max absolute $\text{dry}$)
c. $[[\text{pos}_{\text{lower-closed}} \text{ dry}]] = \lambda x[\text{dry}(x) > \text{min}(\text{dry})]$ (min absolute $\text{dry}$)
7 Conclusion

- By adopting a severing analysis of scale structure, we can avoid economy and redundancy.
- Adjectives are embedded in certain structural environments.
  - To the extent their meaning fits the environment’s scalar requirements, they are acceptable.
- This approach supports constructionist approaches where structure and general lexical meaning together create more specialized meanings.

References

A Note on Stage-level/Individual-level Predicates

This analysis also illuminates the relationship between the “permanent, stable” and “transient” interpretation and relative/absolute dry by linking the structural environment created by pos morphemes to the stage-level/individual-level behavior of adjectives as diagnosed by the availability of an existential interpretation of their subject (Husband 2010).

• Question: Is this related to the aspectual character of the stage-level/individual-level distinction?
  – Evidence from existential interpretation suggests this is so, (34–36).

(34) a. Regions are dry. (generic only)
    b. Glasses are dry. (existential possible)

(35) a. Three regions are dry. (proportional only)
    b. Three glasses are dry. (cardinal possible)

(36) a. #A region is dry.
    b. A glass is dry.

• The extent to which existential interpretation of the subject is licensed in a sentence is related to the extent to which the predicate can receive a closed scale interpretation.
  – Can be diagnosed by the acceptability of degree modifiers.

• What is important then, is not so much the particular lexical items themselves, but the particular structures they are embedded in.