Parameters of Comparison

1 Introduction

What is the relation between universal categories of meaning and specific linguistic forms?

A. **No Variation**

*Natural language includes an inventory of universal form-meaning correspondences.* There is a set of meanings that are associated with the same (possibly abstract) structures in all languages. Variation in this set arises from highly restricted ‘semantic parameters’.

B. **Transparent Mapping**

*Semantics transparently reflects surface syntax.* Languages may employ different grammatical strategies for expressing the same meaning (entailments). Some meanings may not be universally encoded in a special grammatical form.

In order to investigate this question, we need to identify some plausible candidates for universal meanings: quantification, nominal reference, (a)telicity, modality ... *comparison*

The ability to order objects along scalar dimensions is a basic feature of human cognition:

- All languages have lexical items that relate objects to scalar dimensions (often expressed by the grammatical category ‘adjective’, though not always).
- All languages have constructions that express orderings between objects relative to scalar dimensions: *Comparisons of superiority*

Research questions

How do different languages provide for the expression of comparison? To what extent are the structures and meanings employed universal, and to what extent do languages vary in the ways that they express comparison? Do differences in the expression of comparison correlate with other (linguistic or nonlinguistic) differences between languages (or their speakers)?

2 Variation in the expression of comparison

2.1 Semantic and syntactic preliminaries

Gradable predicates map objects onto representations of measurement (SCALES) formalized as sets of values (DEGREES) ordered relative to a dimension (*height, length, weight*, etc.).

Two variants: GPs denote functions from individuals to degrees (1a) (Bartsch and Vennemann 1972, 1973; Kennedy 1999) or relations between individuals and degrees (1b) (Cresswell 1977; von Stechow 1984; Heim 1985, 2000; Schwarzschild to appear; Kennedy and McNally 2005).

\[
\begin{align*}
\text{a. } & [tall] = \text{tall} \\
\text{b. } & [tall] = \lambda d \lambda x. \text{tall}(x) \geq d
\end{align*}
\]

The choice between these two approaches is significant, but not relevant for today’s talk, so I will assume the (1b). On either view, a gradable predicate does not directly denote a property of individuals, so we need to turn it into one in order to use it as a predicate or modifier. This is the job of degree morphology.
The positive form

(2) a. Kim is \textit{pos} tall (for a 3 year old/gymnast/jockey).
   b. \[ \text{[pos]} = \lambda g \lambda x. g(x) \triangleright \text{s}(g) \]

\text{s} is a context-sensitive function from gradable adjective denotations to degrees that returns the \textit{standard of comparison} for the adjective in the context of utterance.

The comparative form

(3) a. Kim is more tall than \textit{more} Lee is \textit{tall}.
   b. \[ \text{[more]} = \lambda g \lambda d \lambda x. g(x) \triangleright d \]

The \textit{than}-clause involves \textit{wh}-movement of a (null) degree quantifier plus deletion of redundant material. Semantically, it is a \textit{degree description}:

(4) \[ \text{[than} \textit{wh} \text{Lee is} \textit{tall}] = \max \{d \mid \text{tall(lee)} \triangleright d\} \]

2.2 The typology of comparison

We now have the following general template for comparison:

(5) \text{MORE} \quad \text{\textit{A} than} \quad \text{\textit{d}}
    \begin{align*}
    \text{C-MORPH} & \quad \text{G-PRED} \quad \text{S-MORPH} \quad \text{STANDARD} \\
    \lambda x. \text{\textit{m}}_A(x) & \triangleright d
    \end{align*}

Is this template universal, or do some languages adopt other strategies for expressing comparison? It turns out that this question is not so easy to answer, for two reasons:

- The only detailed typological work to date (Ultan 1972; Stassen 1985) is too superficial to address the ‘abstractness’ issue.
- There is not a clearly established set of criteria for the classification of a particular construction/form as a ‘comparative’.

Separative comparatives

The standard marker is a morpheme with a meaning roughly equivalent to ‘from’.

(6) a. Laysat al-nisa 'adafa \textit{min} al-rijali not the-women weak-COMP\textit{ from} the-men
   \textit{Women are not weaker than men.} \quad \text{ARABIC}
   b. Sadom-ete \textit{hati} mananga-i horse-from elephant big-pres-3sg
   \textit{The elephant is bigger than the horse.} \quad \text{MUNDARI}

Amharic, Carib, Guarani, Hindi, Japanese, Manchu, Quechua, Tibetan, Turkish....

Allative comparatives

The standard marker is a morpheme that typically introduces goal phrases (like ‘to’ or ‘for’).
(7) a. Jazo bras-ox wid-on
   he big-prt for-me
   He is bigger than me.  
   BRETON

   b. Ka’ icham hin s-sataj naj Pel
   more old I him-before he Pel
   I am older than Pel.  
   JACALTEC

Kanuri, Maasai, Nuer, Tarascan....

**Locative comparatives**

The standard marker is a morpheme with a meaning along the lines of ‘on’.

(8) a. Ragas-mo in luwa ti-hek
   surely-you more man on-me
   You are certainly more of a man than me.  
   SALINAN

   b. A ka gya ni ma
   he is big me on
   He is bigger than me.  
   MANDINKA

Cebuano, Chuckchee, Miwok, Navajo, Tamil....

**Than comparatives**

The standard of comparison is marked by a construction-specific morpheme.

(9) a. Istvan magasa-\textit{bb} mint Peter
   Istvan tall-COMP than Peter
   \textit{Istvan is taller than Peter.}  
   HUNGARIAN

   b. Enak daging karo iwak
   is-good meat than fish
   Meat is better than fish.  
   JAVANESE

Albanian, Basque, English, Finnish, Ilocano, Malagasy, Sranan, Toba Batak....

**Exceed comparatives**

The standard of comparison is the direct object of a special transitive verb meaning ‘exceed’ or ‘surpass’.

(10) a. To bi ni gau.
   He exceed you tall
   He is taller than you.  
   MANDARIN

   b. O tobi ju u
   he big exceed him
   He is bigger than him.  
   YORUBA

Cambodian, Fulani, Hausa, Igbo, Vietnamese, Swahili, Thai, Wolof....

**Conjoined comparatives**

Comparison is effected by an adversative coordination of two clauses, using either negation or antonymy.
11. Ua tele le Queen Mary, ua la’itiiti le Aquitania.
   is big the Queen Mary, is small the Aquitania
   The Queen Mary is bigger than the Aquitania.
   SAMOAN

Dakota, Miskito, Maori, Cayapo, Mangarayi, Sika...

12. 
apaqsek
tata’hkesew, nenah teh kan
   more he-is-strong, I and not.
   He is stronger than me.
   MENOMINI

Hixkaryana, Mixtec, Shipibo, Yavapai, Motu

Is this a real typology? In order to answer this, we need to have some basis for calling something a ‘comparative’.

- Stassen (1985): A construction in natural language counts as a comparative construction if that construction has the semantic function of assigning a graded (non-identical) position on a predicative scale to two (possibly complex) objects.

All of the following are English ‘comparatives’ according to this definition:

13. a. Kim is taller than Lee.
   b. Compared to Lee, Kim is tall.
   c. Kim exceeds Lee in height.
   d. Comparatively, Kim is tall and Lee is not.

It’s clear that all of these examples can express comparison, but are they all comparatives? To answer this question, we need:

- In-depth comparisons of a smaller number of languages, taking account of other potentially related points of variation (functional morphology inventories, grammatical categories, long-distance dependencies, etc.).
- Detailed examination of syntactic, semantic and pragmatic properties of ‘expressions of comparison’ both within and across languages and development of methods of identification and classification.

2.3 A case study: Japanese vs. English

Japanese comparatives differ from their English counterparts in a number of ways.

- No overt comparative morphology (true of 32 of 108 languages in Ultan’s survey).
- The standard marker *yori* also has a use meaning ‘from’ (one of Stassen’s ‘separative comparative’ languages).

   Japanese-TOP German YORI difficult
   ‘Japanese is more difficult than German.’

We could account for examples like (14) in terms of the analysis developed for English by assuming that Japanese has a null version of English *more*, and that the standard is an ellipsis structure. However, there are a number of reasons to believe that this would be wrong, however (Beck, Oda, and Sugisaki 2004).
Interpretive variability

Attributive comparatives that are structurally identical differ according to the nature of the comparative modifier (Ishii 1991):

(15) 

a. Taroo-wa [Hanako-ga katta yori] takusan(-no) kasa-o katta.  
Taroo-TOP [Hanako-NOM bought YORI many(-GEN) umbrella-ACC bought  
Taroo bought more umbrellas than Hanako bought.

b. ?*Taroo-wa [Hanako-ga katta yori] nagai kasa-o katta.  
Taroo-TOP [Hanako-NOM bought YORI long umbrella-ACC bought  
Taroo bought a longer umbrella than Hanako bought.

Or according to the nature of the predicate inside the comparative clause:

(16) 

a. ?*Taroo-wa [Hanako-ga katta yori] nagai kasa-o katta.  
Taroo-TOP [Hanako-NOM bought YORI long umbrella-ACC bought  
Taroo bought a longer umbrella than Hanako bought.

b. Taroo-wa [Hanako-ga tukutta yori] nagai kasa-o katta  
Taroo-TOP [Hanako-ACC made YORI long umbrella-ACC bought  
Taroo bought a longer umbrella than Hanako made.

The corresponding English examples are all fine:

(17) 

a. a longer umbrella than [Hanako bought ∅]

b. a longer umbrella than [Hanako made ∅]

c. more umbrellas than [Hanako bought ∅]

If comparative clauses are degree abstraction structures, no variability is expected:

(18) 

a. a longer umbrella than [wh₁ Hanako bought a₃ long umbrella]  
b. max{d | ∃x[bought(h)(x) ∧ long(x) ⪱ d ∧ umb(x)]}

Subdeletion

So-called ‘subdeletion’ constructions like (19) overtly manifest the structure hypothesized for all comparatives.

(19) 

a. The shelf is taller than wh₁ it is t₁ wide.  
b. tall(shelf) ≻ max{d | wide(shelf) ⪱ d}

Subdeletion constructions are impossible in Japanese:

(20) *Kono tana-wa [ano doa-ga hiroi yori] takai  
this shelf-TOP [that door-NOM wide YORI] tall  
This shelf is taller than that door is wide.

This is unexpected if the yori constituent is a degree abstraction structure.

Negative islands

Negative expressions are barred from the comparative clause in English:

(21) *Kim bought a more expensive book than nobody did.
This follows from the semantics of the comparative clause:

(22)  a. Kim bought a more expensive book than \([\text{wh} \text{ nobody did buy a } t \text{ expensive book}]\)
    b. \(\text{max}\{d \mid \text{nobody bought a } d\text{-expensive book}\}\)

In Japanese, comparatives that appear to be similar to (21) are acceptable:

(23) John-wa [dare-mo kawa-naka-tta no] yori takai hon-o katta
    *John bought a book that is more expensive than the book that nobody bought.*

However, the translation of (23), and the presence of NO, should be telling us that something else is going on here.

3 Parameters of comparison

3.1 Degree vs. individual comparison

As we have seen, the Japanese facts are unexpected given the assumption that the standard is a degree, and the comparative clause is a degree abstraction structure that denotes a definite description of a degree.

The facts follow if instead the standard in Japanese is an individual, and the comparative clause is a *relative clause* that denotes an individual or set of individuals.

Degree comparison

(24) is the comparative template based on English. Semantically, the standard has to be a degree in order to evaluate the ordering relation expressed by a comparative of superiority.

(24) \[
\begin{array}{l}
\text{MORE} \\
\text{C-MORPH} \\
\text{G-PRED} \\
\text{S-MORPH} \\
\text{D-STANDARD} \\
\end{array}
\begin{array}{l}
A \text{ than } D \\
\lambda x. m_A(x) \succ d \\
\end{array}
\]

Individual comparison

Syntactically, however, it could be an individual, because we can derive a degree by applying the measure function denoted by the gradable predicate to the individual introduced by the standard expression.

(25) \[
\begin{array}{l}
\text{MORE} \\
\text{C-MORPH} \\
\text{G-PRED} \\
\text{S-MORPH} \\
\text{I-STANDARD} \\
\end{array}
\begin{array}{l}
A \text{ than } Y \\
\lambda x. m_A(x) \succ m_A(y) \\
\end{array}
\]

Before we see whether this analysis makes sense, let’s see how it accounts for the data.

Negative islands

The YORI-clause is a regular relative clause, as the translation and nominalizer NO indicate.

(26) John-wa [dare-mo kawa-naka-tta no] yori takai hon-o katta
    *John bought a book that is more expensive than the book that nobody bought.*
Since there is no interaction with a maximality operator, there is no negative island effect.

Subdeletion
Adjectival subdeletion constructions necessarily involve degree standards:

(27) a. The shelf is taller than \([wh_t \text{ it is } t_w \text{ wide}]\)
   b. \(\text{tall}(\text{shelf}) \succ \max \{d \mid \text{wide}(\text{shelf}) \succeq d\}\)

If standards in Japanese are individuals these are correctly predicted to be bad. However, as shown by (28), superficially similar constructions with nominal comparatives are OK.

(28) Hanako-wa [Taroo-ga ronbun-o kaita (no)] yori takusan hon-o kaita
    Hanako-TOP [Taroo-NOM paper-ACC wrote (NO)] YORI many book-ACC wrote
    Hanako wrote more books than Taroo wrote papers.

These can be accommodated by analyzing the \(\text{yori}\)-phrase as an internally-headed relative:

(29) \(\text{many}(\{x \mid x \text{ is a book that Hanako wrote}\}) \succ \text{many}(\{y \mid y \text{ is a paper that Taroo wrote}\})\)

Interpretive variability: more umbrellas vs. a longer umbrella

(30) a. Taroo-wa [Hanako-ga katta] yori takusan(-no) kasa-o katta.
    Taroo-TOP [Hanako-NOM bought] YORI many(-GEN) umbrella-ACC bought
    Taroo bought more umbrellas than Hanako bought.
   b. ?*Taroo-wa [Hanako-ga katta] yori nagai kasa-o katta.
    Taroo-TOP [Hanako-NOM bought] YORI long umbrella-ACC bought
    Taroo bought a longer umbrella than Hanako bought.

Assume that the \(\text{yori}\)-constituent is a relative clause whose head has been deleted under identity with the external NP:

(31) a. \([S \text{ V } \text{NP}] \text{ yori } A \text{ NP}\)
    b. \(\lambda x. \text{m}_A(x) \succ \text{m}_A(\{y \mid y \text{ is an NP that } S \text{ Ved}\})\)

Assume further that such relative clauses denote (maximal) plural objects (cf. Beck et al. 2004). By hypothesis, they must combine with the gradable predicate to derive the standard degree.

No problem when the gradable predicate is \(\text{takusan} \text{ ‘many’}, \) which is a function from pluralities to their cardinalities (Hackl 2000):

(32) a. [Hanako-ga katta kasa] yori takusan
    [Hanako-NOM bought umbrella] YORI many
    more (umbrellas) than Hanako bought
   b. \(\text{many}(\{x \mid x \text{ is an umbrella that Hanako bought}\})\)

A problem when the predicate is \(\text{nagai} \text{ ‘long’}, \) which is a function from \(\text{atomic objects}\) to lengths.

(33) a. [Hanako-ga katta kasa] yori nagai
    [Hanako-NOM bought umbrella] YORI long
    (a) longer (umbrella) than Hanako bought
   b. \#long(\{x \mid x \text{ is an umbrella that Hanako bought}\})
Compare the long umbrellas with the many umbrellas: the former has only a distributive interpretation.

**Interpretive variability: make vs. buy**

(34) a. ?*Taroow-wa [Hanako-ga katta] yori nagai kasa-o katta.
    Taroow-top [Hanako-NOM bought] YORI long umbrella-ACC bought
    Taroow bought a longer umbrella than Hanako bought.

   b. Taroow-wa [Hanako-ga tukutta] yori nagai kasa-o katta
    Taroow-top [Hanako-ACC made] YORI long umbrella-ACC bought
    Taroow bought a longer umbrella than Hanako made.

When we change the embedded verb to tukutta ‘make’, the relative clause can denote the plurality of incremental objects that measure out an umbrella-making event.

(35) a. [Hanako-ga tukutta kasa] yori nagai
    [Hanako-NOM made umbrella] YORI long
    (a) longer (umbrella) than Hanako made

   b. long(\{x \mid x a THEME of umbrella-making by H\})

Such a plurality corresponds to one atomic object, so it can be measured by long.

The analysis predicts that the bad examples should be OK if context makes it clear that Hanako bought just one umbrella; this is correct (Beck et al. 2004). Likewise, the definiteness of NO also saves the bad examples:

(36) Taroow-wa [Hanako-ga katta no] yori nagai kasa-o katta.
    Taroow-top [Hanako-NOM bought NO] YORI long umbrella-ACC bought
    Taroow bought a longer umbrella than the one that Hanako bought.

The differences between English and Japanese follow from the hypothesis that English has *degree comparison* and Japanese has *individual comparison*.

- **Degree comparison**
  \[
  [A_{comp}] = \lambda d \lambda x.g(x) \succ d \quad (d, \langle e, t \rangle)
  \]

- **Individual comparison**
  \[
  [A_{comp}] = \lambda y \lambda x.g(x) \succ g(y) \quad (e, \langle e, t \rangle)
  \]

Is there additional evidence for this distinction?

**Phrasal and clausal comparatives**

In fact, English and similar languages must have both individual and degree comparison to account for the difference between ‘phrasal’ and ‘clausal’ comparatives (Hankamer 1973; Hoeksema 1984; Heim 1985; Kennedy 1999).

(37) a. Who are you faster than \(t\) (*is)?

   b. No one is taller than himself (*is).

**Fixed- and derived-case comparatives**

Likewise, we need this distinction to handle the distinction between ‘fixed case’ and ‘derived case’ comparatives in languages like Russian:
3.2 Interlude: The Beck/Oda/Sugisaki analysis

Beck et al. (2004) derive the differences between Japanese and English in terms of two ‘parameters’:

- **Compositional vs. contextual comparison**
  Is the standard degree an argument of the comparative or recovered from context?

- **The Degree Abstraction Parameter**
  A language {does, does not} have degree abstraction in the syntax.

English is [compositional, +DAP]; Japanese is [contextual, -DAP].

### Compositional vs. contextual comparison

In a contextual comparison language, the standard constituent provides a basis for figuring out the standard degree: it is a kind of ‘frame setter’. This is supposed to derive the variability effects, and indeed (39b) is bad.

(39) a. Compared to Lee, Kim is taller.
    b. ??Compared to the set of umbrellas that Hanako bought, Taroo bought a longer umbrella.

### The Degree Abstraction Parameter

The DAP is designed to rule out adjectival subdeletion: only languages that are +DAP allow it. (NB: This could play a role in the distinction between individual and degree comparison, though we would like to derive it from some other principle — more later.)

(40) Compared to how wide the door is, the shelf is taller.

### The expected typology

These parameters lead us to expect four language types, but in fact we get only two!

<table>
<thead>
<tr>
<th></th>
<th>COMPOSITIONAL</th>
<th>CONTEXTUAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ DAP</td>
<td>English</td>
<td>English!!</td>
</tr>
<tr>
<td>- DAP</td>
<td>Japanese!!</td>
<td>Japanese</td>
</tr>
</tbody>
</table>

The crucial factor is whether or not the standard clause can be a degree description (+DAP), but this is just individual vs. degree comparison!
3.3 Explicit vs. implicit comparison

Beck et al’s notion of ‘contextual’ comparison doesn’t do any real work for us, but it does suggest a more extreme — and highly plausible — point of potential variation between languages: implicit vs. explicit comparison (cf. Sapir 1944).

- Explicit comparison
  Establish an ordering between objects \( x \) and \( y \) with respect to gradable property \( g \) using special morphology whose conventional meaning has the consequence that the degree to which \( x \) is \( g \) exceeds the degree to which \( y \) is \( g \).

- Implicit comparison
  Establish an ordering between objects \( x \) and \( y \) with respect to gradable property \( g \) using the positive form by manipulating the context or delineation function in such a way that the positive form true of \( x \) and false of \( y \).

The intuition is that some languages might lack explicit comparison morphology (and perhaps degree morphology entirely), and so rely instead on the inherent context-sensitivity of the positive form to express comparison. Two features of the observed typological facts suggest this is not a crazy idea:

- The frequent absence of (overt) comparative morphology
- Conjoined comparative languages

A semantics for implicit comparison

To see what an implicit comparative language would look like, we need a semantics of implicit comparison. We can use the English compared to construction as a model:

(42) Kim is (pos) tall compared to Lee.

(43) a. \([\text{compared to } y]\([tall]\)) is true of \( x \) in a context \( c \) iff \([tall]\) is true of \( x \) in any context \( c' \) that is just like \( c \) except that the domain of discourse includes just \( x \) and \( y \).
b. \([tall]\) = \( \lambda x. \text{tall}(x) \succ s(tall) \)

Assuming that the standard always induces a non-trivial partitioning on the domain (Klein 1980), this entails that \( x \) is tall and \( y \) is not in \( c' \), which in turn entails of the actual context \( c \) that \( x \) is taller than \( y \).

Predictions

Assuming the strong position that implicit comparison arises in the absence of degree morphology:

- No degree abstraction (no subdeletion).
- Individual comparison (variability effects).

Japanese could be an implicit comparison language, but how can we tell?

Crisp judgments

Explicit comparison allows fine-grained distinctions in degree; implicit comparison does not.

(44) CONTEXT: Kim is 5’ 6” tall; Lee is 5’ 5 3/4” tall
  a. Kim is taller than Lee.
  b. ??Kim is tall compared to Lee.

The oddity of (44) follows from the semantics of the positive form (‘boundarylessness’).
Negative inferences
Implicit comparison generates a negative inference to the positive form; explicit comparison does not.

(45) CONTEXT: Kim is 7’ tall; Lee is 6’ 6” tall
   a. Kim is taller than Lee.
   b. ??Kim is tall compared to Lee.

Use of compared to implicates that the simple positive is false.

Minimum standard adjectives
An adjective like open is true of an object if it has some degree of positive aperature.

(46) a. This door is open more than that one.
    b. ??This door is open compared to that one.

This is related to the negative inferences effect.

Japanese: Crisp judgments

(47) CONTEXT: Kim is 5’ 6” tall; Lee is 5’ 5 3/4” tall
   a. Kim-wa Lee yori se-ga takai.
      Kim-NOM Lee YORI back-NOM tall
      Kim is taller than Lee.
   b. ??Kim-wa Lee-to kuraberu to se-ga takai.
      Kim-NOM Lee-WITH compare COMP back-NOM tall
      Kim is tall compared to Lee.

Japanese: Negative inferences

(48) CONTEXT: Kim is 7’ tall; Lee is 6’ 6” tall
   a. Kim-wa Lee yori se-ga takai.
      Kim-NOM Lee YORI back-NOM tall
      Kim is taller than Lee.
   b. ??Kim-wa Lee-to kuraberu to se-ga takai.
      Kim-NOM Lee-WITH compare COMP back-NOM tall
      Kim is tall compared to Lee.

Japanese: Minimum standard adjectives

(49) a. Kono mon yori ano mon-wa aite-iru.
     this gate YORI that gate-NOM open-RESULT
     That gate is open more than this one.
   b. ??Kono mon-ni kurabe-tara ano mon-wa aite-iru.
      this gate-DAT compare-COND that gate-NOM open-RESULT
      Compared to this gate, that one is open.
Summary
Both Japanese yori-constructions and English more than constructions involve the semantics of explicit comparison.

The differences between the two languages must therefore be due to the individual/degree comparison distinction, not to the explicit/implicit distinction.

4 Looking ahead

4.1 Explicit vs. implicit comparison
- This remains a plausible point of cross-linguistic variation in the expression of comparison.
- All languages have positive form gradable predicates; some languages may lack specialized morphology for explicit comparison.
- We now have some analytical tools for investigating whether this distinction is a real one.

4.2 Individual vs. degree comparison
- This appears to be a real point of cross-linguistic variation, but what is responsible for this distinction?
  - The Degree Abstraction Parameter, possibly itself due to differences in functional morphology inventories?
  - The syntax/semantics of the relevant morphology?
    * more vs. ∅
    * than vs. yori
    * more vs. yori
- We need to examine more languages of the relevant types in more detail!

4.3 Syntactic and semantic universals
- Clearly, if some languages have only implicit comparison the ‘No Variation’ hypothesis cannot be maintained.
- Even the individual/degree comparison distinction presents a potential challenge, depending on what underlies it:
  - UG may provide for both options, but some languages have only one for independent reasons (e.g., the DAP).
  - Languages may vary in the kinds of comparisons they permit: individuals only, or individuals and degrees.
- Alternatively, the insights we gain from studying comparatives in new languages may result in revisions to our ‘English-centric’ starting point that result in a universal characterization of the logical form of comparison.


