Comparisons of equality across languages

Degrees, manners, and kinds as grammatical primitives

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Introduction

- Being able to compare two objects (in the most general sense) and to assert whether they are (un)equal in some relevant dimension is most likely **a basic cognitive need** (Stassen, 1985; Langacker, 1987).
- We may distinguish three kinds of linguistic constructions that fulfil this basic cognitive need: comparisons of **superiority**, **inferiority**, and **equality**.

Types of comparison constructions

- Using English as an example:

(1) Comparisons of superiority:

a. Kim is taller than Tom (is). (gradable adjective)
b. Kim ran more than Tom (did). (verb)
c. Kim ran faster than Tom (did). (adverb)
d. Kim completed more courses than Tom (did). (nominal)

(2) Comparisons of inferiority:

a. Tom is less tall than Kim (is). (gradable adjective)
b. Tom ran less than Kim (did). (verb)
c. Tom ran less slowly (faster) than Kim (did). (adverb)
d. Kim completed fewer courses than Tom (did). (nominal)

Types of comparison constructions

- We focus in this talk on **comparisons of equality**, in particular comparisons of equality with **gradable adjectives** and **verbs**, as illustrated with English.

(3) Comparisons of equality:

a. **Kim is as tall as Tom (is).** **(gradable adjective)**
b. **Kim ran as Tom did/ran.** **(verb)**
c. Kim ran as slowly as Tom (did). (adverb)
d. Kim completed as many courses as Tom (did). (nominal)

Objectives

- Broad objectives:
  - Detail the **range of variation in the morphosyntax** of comparisons of equality with gradable adjectives and verbs across **English**, **German**, **(Belgian) Dutch**, and **Mandarin Chinese**.
  - Examine **the distribution of readings** of this construction (what it can or cannot mean) and how this corresponds to its morphosyntax in these languages.
  - Briefly **outline the formal ingredients for an adequate analysis** in each language, in particular, the need for (some subset of) **degrees**, **manners**, and **kinds** as semantic primitives in the grammar.

Morphosyntactic variation: Comparisons of inequality

- It is well known in the literature on comparisons of inequality (superiority and inferiority) that there is **significant cross-linguistic variation in their morphosyntax** (e.g., Beck et al. 2012).

(4) Kim is tall**er than** Tom (is). (comparative **-er** and **than**)

(5) Kim wa Tom **yori kasikoi**.
Kim TOP Tom YORI smart
Kim is smarter than Tom. (Japanese, bare adjective, **yori**)

(6) Kim na **lata**, to Tom na **kwadōgi**.
Kim TOP tall but Tom TOP short
Kim is taller than Tom.
(Motu, bare adjective antonym, conjunction)

Morphosyntactic variation: Comparisons of equality

- Similarly, comparisons of equality show both intra-language and inter-language morphosyntactic variation.
- Some basic terminology to discuss variation in comparisons of equality: parameter markers (PM) and standard markers (SM).

(7) Kim is ***as*** tall ***as*** Tom (is).
comparee copula PM parameter SM standard (copula)
(Haspelmath and Buchholz, 1998)

Morphosyntactic variation: English equatives

- Within English, comparisons of equality (henceforth **equatives**) vary morphosyntactically across syntactic categories, namely gradable adjectives and verbs.
- **Gradable adjectives are marked with a PM *as*, and the standard is also introduced by *as***. With verbs, **the verb is (or must be) unmarked in the absence of an adjective/adverb** (cf. *ran as much/as slowly as ...*), while the standard remains introduced by *as*.

(8) Kim is ***as*** tall ***as*** Tom (is).
comparee copula PM parameter SM standard (copula)

(9) Kim (****as***) ran ***as*** Tom ran/did.
comparee PM parameter SM standard parameter

A typological generalization

- In a survey of (mostly European) languages, Haspelmath and Buchholz (1998) observe that the English pattern between gradable adjectives and verbs seems to be a typological generalization.
- Languages typically **use a PM if the parameter is an adjective but not if it is a verb**. On the other hand, languages typically **use the same SM to mark the standard across both adjectival and verbal equatives**.
- In what follows, we **scrutinize this typological claim more carefully** by looking across German and Dutch (Germanic), as well as Mandarin Chinese.
- In particular, we **examine how the differing morphosyntax determines what the comparison construction can(not) mean**.

A difference in meaning in English

- Recall that English marks adjectives with PMs while PMs are absent with verbs, repeated below.

(10) Kim is ***as*** tall ***as*** Tom (is).
comparee copula PM parameter SM standard (copula)

(11) Kim (****as***) ran ***as*** Tom ran/did.
comparee PM parameter SM standard parameter

- Interestingly, Rett (2013) observes that the presence of a PM in English equatives corresponds to **degree readings**.

A difference in meaning in English

- Two ways to diagnose this: first, English equatives containing a PM are **compatible with gradable adjectives like *tall*** (which can have differing measures i.e., degrees), but are **clearly marked when replaced with a non-gradable adjective like *amphibian***.
- To the extent one can interpret equatives with non-gradable adjectives and PMs, a highly coerced reading is obtained.
- The relevant interpretation is one of **imposing a gradable scale (e.g., prototypicality) upon the non-gradable adjective**, i.e., imposing a scale that can express degrees (Rett, 2013).

Gradable versus non-gradable adjectives

(12) a. Sue is as tall as Bill, that is, they are both 1.70m tall.

b. # This frog is as amphibian as that lizard.
Possible interpretation: This frog is *as prototypical* an amphibian as that lizard.

Evaluativity

- A second property of degree interpretations is **evaluativity**, i.e., **whether or not the gradable adjective is interpreted as equal to or exceeding some contextual standard** (Rett, 2015).
- When an adjective is marked with a PM in equatives, it is interpreted as **non-evaluative (degree)**; lack of a PM on the other hand requires **evaluativity (non-degree)**.

Evaluativity and PMs

(13) a. Sue is ***as*** tall as Bill, but they are both short (only 1.55m tall).
(degree reading, non-evaluative)

b. Sue is tall ***like*** Bill, # but she is short (only 1.55m tall).
(no PM, property reading, evaluative)

Verbs with equatives in English

- Recall that **English does not mark verbal parameters with PMs** in equatives.
- This leads to the **expectation that English verbal equatives never have degree readings**.
- This is indeed borne out; crucially, even with verbs that intuitively describe a change in the degree of a property that an object holds (**degree achievement verbs**) (e.g., Kennedy and Levin, 2008), degree readings are still impossible.

Verbs with equatives in English

(14) Activity verbs

Kim (***as***) ran as Sue did/ran. (no PM)

a. That is, they both ran in circles around the field. (manner)

b. #That is, they both ran at 3km/h. (degree)

(15) Degree achievement verbs

Kim (***as***) cooled the pizza as Sue did. (no PM)

a. Namely, by blowing on it. (manner)

b. #Namely, by 10 degrees Celsius. (degree)

PMs correspond to degree readings in English

- The overall generalization in English: presence of a PM correlates with a degree reading, absence correlates to a property/manner reading and lack of degree readings.
- This effect is **cross-categorial** and **crosscuts both gradable adjective and verbal equatives**.

German PMs

- It is not difficult, however, to find exceptions to Haspelmath and Buchholz's typological generalization, even within Germanic.
- German uses **a demonstrative element *so*** (similar to English *so*) as a PM, with **a *wh*-word *wie*** 'how' as a SM, **in both adjectival and verbal comparisons of equality** (Anderson and Morzycki, 2015; Hohaus and Zimmermann, 2021).

(16) Nadine ist ***so*** groβ ***wie*** Anna.
Nadine is SO tall WIE Anna
Nadine is as tall as Anna. (gradable adjective)

(17) Johannes hat auch ***so*** getanzt ***wie*** Susanne.
John has also SO danced WIE Susan.
John danced as Susan did. (verb)

Exceptions: German

- The putative PM *so* in German is also used more generally **outside equative contexts**.
- For example, it can be used as **a pro-form anaphoric to contextually salient or linguistically expressed antecedents**. These antecedents can refer to **a measure of a scalar property (degree) or a property of an event (manner)** (Anderson and Morzycki, 2015).

(18) Ich bin ***so*** groβ.
I am SO tall
I am this tall.

(19) ***so*** getanzt
SO danced
danced like that

PMs do not enforce degree readings in German

- Generalization based on English: **PMs enforce degree readings, block property/manner readings**.
- German, on the other hand, **uniformly uses PMs for both gradable adjective and verbal equatives**.
- If the generalization based on English is right, this **should mean German equatives never have a property/manner reading**, regardless of whether they are built off adjectives or verbs.

German adjectival equatives have property readings

- This expectation is not borne out. Adjectival equatives can be interpreted as referring to **degrees or properties**.
- **The latter is best demonstrated with a non-gradable adjective** e.g., *x is as amphibian as y.*
- In English, such uses are either ungrammatical or have a highly coerced (degree) reading along some gradable scale of prototypicality as in (12-b) (Rett, 2013).

German adjectival equatives can have property readings

(20) Nadine ist ***so*** groß ***wie*** Anna.
Nadine is SO tall WIE Anna
Nadine is as tall as Anna. (degree)

(21) Freddie der Frosch ist ***so*** amphibisch ***wie*** Moritz der Molch.
Freddie the frog is SO amphibian WIE Moritz the newt
Fred the frog is **amphibian in the same way** Moritz the newt is;
they **share all relevant amphibian properties**. (property)
(Hohaus and Zimmermann, 2021, p. 100-101)

German verbal equatives

- German verbal equatives with *so* are **similarly ambiguous between a manner and degree reading**.
- **This is best illustrated with degree achievement verbs**, assuming a degree argument is available at some point in the semantic composition (e.g., Kennedy and Levin, 2008).
- Recall that English, which does not mark verbs in equatives with PMs, lack a degree reading and only has manner readings with these verbs.
- Taken together, these facts suggest **German PM *so* is not tied to degree readings** and can truly make referecne to either degrees or properties/manners.

German verbal equatives with degree achievements

(22) Wir haben die pizza ***so*** abgekühlt ***wie*** die lasagn.
we have the pizza SO cooled WIE the lasagne
We cooled the pizza as we cooled the lasagne.

a. Nämlich durch Pusten.
namely through blow
Namely through blowing on it.

b. Nämlich auf 21 grad raumtemperatur.
namely to 21 degrees room.temperature
Namely to 21 degrees.

(Hohaus and Zimmermann, 2021, p. 101-102)

PMs in German are ambiguous

- Unlike English PMs, **German PMs are genuinely ambiguous and can refer to degrees or properties/manners**.
- Again, this effect is **cross-categorial**, cross-cutting adjectival and verbal equatives.

Dutch PMs

- Similar to German, Dutch uses the related ***zo*** (again roughly English *so*) as a PM and the SM ***als*** in **both adjectival and verbal equatives** (e.g., Corver 1997, 2018).

(23) Jan is ***zo*** groot ***als*** Sue.
John is ZO tall ALS Sue
John is as tall as Sue. (gradable adjective)

(24) Nadine had ***zo*** gerend ***als*** Sigrid.
Nadine has ZO ran ALS Sigrid
Nadine ran as Sigrid ran. (verb)

Dutch PMs

- As in German, the PM ***zo*** is not restricted to equatives. It is also used generally as **an anaphoric pro-form**.

(25) Jan is 1.70m groot. Jane is ook ***zo*** groot.
John is 1.70m tall Jane is also ZO tall
John is 1.70m tall and Jane is 1.70m tall too.

(26) Jan gedroeg zich erg goed vandaag. Jane gedroeg zich
John behave himself very bad today Jane behave herself
ook ***zo***.
also ZO
John behaved badly today and Jane behaved so too.

Dutch adjectival equatives

- Dutch, while **always marking parameters with PMs like German**, exhibit **only degree readings with gradable adjectives just as in English**.
- Again, exclusive degree readings can be diagnosed through evaluativity; **Dutch adjectival equatives are never evaluative**.
- In addition, unlike German, non-gradable adjectives are incompatible or receive a highly coerced reading, imposing some scale of measurement (e.g., prototypicality) instead.

Dutch adjectival equatives are non-evaluative

(27) Jan is ***zo*** groot ***als*** Sue.
John is ZO tall ALS Sue
John is as tall as Sue.

(28) a. #Jan is 1m85 en Sue 1m80.
John is 1m85 and Sue 1m80
John's height is 1m85 and Sue's is 1m80. (evaluative)
b. Jan is 1m68 en Sue ook.
John is 1m68 and Sue too
John's height is 1m68 and Sue is 1m68 too. (degree)

(29) Die vlieg is zo dood als die mug.
that fly is so dead as that mosquito
The fly is just as (prototypically) dead as the mosquito.

Dutch verbal equatives

- Again, unlike German, **Dutch verbal equatives pattern like English in never having degree readings**.
- With degree achievement verbs, **only a manner reading is available and not a degree reading**.
- This is **despite the fact that Dutch marks verbal parameters with PMs**.

Dutch verbal equatives

(30) We hebben de pizza ***zo*** afgekoeld ***als*** de lasagne
we have the pizza ZO cooled.down ALS the lasagna
We cooled down the pizza like the lasagna.

a. Namelijk door te blazen.
namely by to blow
Namely by blowing.

b. #Namelijk tot 21 graden.
namely until 21 degrees
Namely to 21 degrees.

(degree achievements with *zo…als*)

PMs in Dutch are unambiguous

- **Despite the fact that Dutch marks both adjectival and verbal parameters with the PM *zo***, it **neither exclusively refers to degrees nor is always ambiguous**.
- The observed readings in Dutch are **not dependent on the PM *zo*, but on the syntactic category of the parameter** that *zo* marks.

Mandarin PMs

- The final case we consider is Mandarin Chinese: unlike any of the previous three (European) languages, **Mandarin explicitly marks whether it is referring to degrees or properties/manners in equatives**.
- In particular, Mandarin builds PMs using **a single morpheme *yang* 'sort, kind', combined with either the demonstrative *na* 'that' or the numeral *yi* 'one'**.
- **Each PM selects a particular SM**; *na-yang* is compatible only with *xiang* while *yi-yang* is compatible only with *gen*.

Mandarin adjectival equatives have different PMs

(31) Yuehan ***xiang/*gen*** Bier ***na-yang*** gao.
John like/*as Bill that-kind tall
John is tall like Bill.

(32) Yuehan ***gen/*xiang*** Bier ***yi-yang*** gao.
John as/*like Bill one-kind tall
John is as tall as Bill.

(Sun, 2021)

Mandarin adjectival equatives have different PMs

- As in German and Dutch, **PMs can occur outside equative contexts as well**; crucially, **it is only *na-yang* that demonstrates the same anaphoric use** as German and Dutch PMs.

(33) a. Yuehan shi ***na-yang/*yi-yang*** gao.
John is that-kind/one-kind tall
Intended: John is that tall.
(cf. *John is the same height as someone else*)

b. Yuehan hui ***na-yang/*yi-yang*** tiaowu.
John will that-kind/one-kind dance
John will dance that way.

(Sun, 2021)

Mandarin adjectival equatives

- We can demonstrate that **each particular PM refers to a different reading** using the diagnostic we previously established: **evaluativity**.
- With adjectives, ***na-yang* requires evaluativity when modifying an adjective**, indicating that it refers not (only) to degrees but also to properties.
- ***Yi-yang* on the other hand is non-evaluative**, indicating that it refers to degrees.

Mandarin PMs with adjectives and evaluativity

(34) Yuehan ***xiang*** Bier ***na-yang*** gao, #suiran Bier hen ai.
John like Bill that-kind tall #though Bill very short
John is tall like Bill # though Bill is quite short.

(35) Yuehan ***gen*** Bier ***yi-yang*** gao, suiran Bier hen ai.
John as Bill one-kind tall though Bill very short
John is as tall as Bill though Bill is quite short.

(Sun, 2021)

Mandarin PMs with verbs

- Moving on to verbs, **it is most natural to mark them with *na-yang* rather than *yi-yang***.
- Even for those speakers where *yi-yang* can be used, **it is telling that only the SM *xiang* which appears with *na-yang* is possible**, rather than *gen* which appears with *yi-yang*.
- Sun (2021) suggests that **there are two *yi-yang* PMs, with one behaving identically as *na-yang* while the other is a separate PM that does not require evaluativity**. We will focus on the *yi-yang* that is unlike *na-yang*.

Mandarin PMs with verbs

(36) Yuehan hui ***xiang/???gen*** Bier ***na-yang/yi-yang*** tiaowu.
John will like/as Bill that-kind/one-kind dance
John will dance in the same Bill dances.

(Sun, 2021)

Interim summary: Morphosyntax & semantics

- There is **significant variation in the morphosyntactic ingredients used to build comparisons of equality**, even within closely-related languages within the same family (Germanic) and across families.
- In particular, the presence or absence of PMs also corresponds to a different distribution of readings, i.e., **the presence of a PM can determine what the construction can(not) mean in the language**.
- Some of these differences **can be attributed to the syntactic category of the parameter that is being compared, though not always so**.

Interim summary: Morphosyntax & semantics

	English		German		Dutch		Mandarin	
	Adjs	Verbs	Adjs	Verbs	Adjs	Verbs	Adjs	Verbs
PMs	✓	✗	✓	✓	✓	✓	$\checkmark_{1,2}$	$\checkmark_{2}$
Degree reading	✓	✗	✓	✓	✓	✗	$\checkmark_{1}$	$\times_{2}$
Property/manner reading	✗	✓	✓	✓	✗	✓	$\checkmark_{2}$	$\checkmark_{2}$

1 = *gen...yi-yang* 2 = *xiang...na-yang*

Formal analysis

- Central concern: **How might we model the connection between how these languages morphosyntactically build equative constructions with what these constructions can mean?**
- One way to accomplish this might be to **look toward analyses of comparative (comparisons of inequality) constructions**, which have been much more intensively studied (e.g., Bresnan, 1973; Cresswell, 1976; Seuren, 1984; Heim, 1985, 2000; Kennedy, 1997, *a.m.o.*).

Formal Analysis: Degrees as grammatical primitives

- Central idea: Comparative constructions **make reference to/manipulate degrees**.
- Degrees are **semantic objects** (formally semantic type d) representing **points on totally ordered scales** (height, width, length, etc.) (e.g., Seuren, 1984; Kennedy, 1997).
- Total order: **If d_1 and d_2 are different points on a totally ordered scale, then it must be that $d_1 > d_2$ or $d_2 > d_1$.**

Formal Analysis: Gradable adjectives and degrees

- Assuming degrees are a primitive of the grammatical/semantic system, **gradable adjectives must then relate objects to degrees**.
- Formally, gradable adjectives are **relations between degrees and individuals**, i.e., functions from degrees to individuals to truth values <*d,et*> (Heim, 1985).
- In a simple bare 'positive' use of an adjective like *tall*, we intuitively need to **set a standard of comparison along which an individual is compared to be considered tall**, which is contextually sensitive.
- This is often assumed to be the **contribution of some null morpheme that introduces such a standard** (e.g., POS(ITIVE) in Kennedy, 1997).

(37) $[\![tall]\!]$: λd.λx. x is d-tall

(38) $[\![Kim\ is\ tall]\!]^c$: $\exists$d[Kim is d-tall & $d \geqslant \text{STANDARD}_c(\text{tall})$]

Formal Analysis: Comparatives relate two (sets of) degrees

- Against this general backdrop, **a comparative construction essentially asserts that one degree (provided by the matrix clause) is greater than another degree (provided by the standard clause)**.
- This is assumed to be the semantic contribution of the comparative morpheme, e.g., ***-er*** on English. The comparative SM ***than*** is assumed to be semantically vacuous.

(39) $[\![\text{-}er]\!]$: $\lambda D.\lambda D'.\ \textsc{max}(D) < \textsc{max}(D')$

- In prose: **The largest degree of a set of degrees D is smaller than the largest degree of a set of degrees D'**.

Formal Analysis: Comparatives relate two (sets of) degrees

- **A comparative clause thus provides the two sets of degrees** that the comparative morpheme relates. The surface construction is obtained through **comparative deletion**, which deletes the gradable adjective in the standard clause.

(40) Kim is taller than Tom.

a. $[\![\textit{Kim is tall}]\!]$: λd. Kim is d-tall
(set of degrees to which Kim's height reaches)

b. $[\![\textit{than Tom } \sout{\textit{is tall}}]\!]$: λd. Tom is d-tall
(set of degrees to which Tom's height reaches)

c. $[\![\textit{Kim is tall -er than Tom } \sout{\textit{is tall}}]\!]$:
$\textsc{max}(\lambda d.\ \text{Tom is } d\text{-tall}) < \textsc{max}(\lambda d.\ \text{Kim is } d\text{-tall})$

- In prose: **the maximum degree to which Tom is tall is less than the maximum degree to which Kim is tall**, i.e., Kim's height is greater than John's height.

English PM *as* relates degrees

- The standard analysis given to comparatives in English can be **straightforwardly extended to English equatives and PM *as***.
- For example, Rett (2013) analyzes PM *as* as analagous to comparative *-er*, **introducing the weaker less-than-or-equal-to relation** rather than the less-than relation.

(41) a. $[\![\text{-}er]\!]$: λD.λD'. MAX(D) $<$ MAX(D')
b. $[\![as]\!]$: λD.λD'. MAX(D) $\leqslant$ MAX(D')

English PM *as* relates degrees

- The **semantic composition of an English adjectival equative will therefore parallel that of a comparative**, modulo the precise relation between the two sets of degrees.

(42) Kim is as tall as Tom.

a. $[\![\textit{Kim is tall}]\!]$: λd. Kim is d-tall
(set of degrees to which Kim's height reaches)

b. $[\![\textit{as Tom } \sout{\textit{is tall}}]\!]$: λd. Tom is d-tall
(set of degrees to which Tom's height reaches)

c. $[\![\textit{Kim is as tall as Tom } \sout{\textit{is tall}}]\!]$:
$\textsc{max}(\lambda d.\ \text{Tom is } d\text{-tall}) \geqslant \textsc{max}(\lambda d.\ \text{Kim is } d\text{-tall})$

- In prose: **the maximum degree to which Tom is tall is less than or equal to the maximum degree to which Kim is tall**, i.e., Kim's height is greater than or equal to John's height.

English verbal equatives relate two (sets of) manners

- Since English verbal equatives lack PMs and degree readings, **Rett (2013) assumes that the grammar can make reference to *manners* as a semantic primitive**, here represented using a variable m.
- **A null morpheme attaches to these sentences and retrieves the manner in which an event was carried out**, and verbal equatives relate these two sets of manners.

English verbal equatives relate two (sets of) manners

- p here is the null morpheme retrieving manners, $\Re$ is a function that maps an event to the manner it is carried out.

(43) John danced as Sue danced.

a. $[\![\textit{John danced}]\!]$: $[\![\text{OP}_m\ \textit{John danced}\ \rho^m]\!] = \lambda\text{m}.\exists\text{e}[\text{DANCED}(\text{e},\textit{john}) \wedge \Re(\text{e},\text{m})]$

b. $[\![\textit{as Sue danced}]\!] = [\![\textit{as Sue danced}\ \rho^{m'}]\!]$: $\lambda\text{m'}.\exists\text{e'}[\text{DANCED}(\text{e'},\textit{sue}) \wedge \Re(\text{e'},\text{m'})]$

c. $[\![\textit{John danced as Sue danced}]\!]$: $\exists\text{m,e,e'}[\text{DANCED}(\text{e},\textit{john}) \wedge \Re(\text{e},\text{m}) \wedge \text{DANCED}(\text{e'},\textit{sue}) \wedge \Re(\text{e'},\text{m'})]$

Predicate Modification, Existential Closure

(Rett, 2013, p. 1122-1123)

- In prose: **there is a manner that characterizes John and Mary's dancing**.

German PMs are ambiguous

- The ingredients outlined above for English adjectival and equatives can again be **straightforwardly extended to German PMs**, albeit with a **slight rearrangement between the semantic ingredients and morphosyntactic elements**.
- Recall that **German marks both adjectival and verbal equatives with PMs and this can lead to both degree and proprty/manner readings**.
- Hohaus and Zimmermann (2021) therefore suggest that the **German PM *so* is systematically ambiguous**, and can make reference to both degrees and properties/manners.

German PMs are ambiguous

- In other words, **we merely need the same semantic primitives, degrees and manner**, but **allow the German PM *so* to *make reference to both of them***.

(44) a. $[\![so_{degree}]\!]$: $\lambda D_{dt}.\lambda D'_{dt}.\{d: D(d) = 1\} \subseteq \{d': D'(d') = 1\}$
b. $[\![so_{event-property}]\!]$: $\lambda R_{vt,t}.\lambda R'_{vt,t}.\{f: R(f) = 1\} \subseteq \{f': R'(f') = 1\}$
(Hohaus and Zimmermann, 2021, p. 122-125)

- For our purposes, we may take $R_{vt,t}$ (event-property) to be equivalent to having manner as a semantic primitive as in Rett's analysis for English.

German degree PM

- We can illustrate the meanings of degree and manner PMs with verbal equatives. **The degree version is possible with verbs that refer to degrees**, e.g., degree achievement verbs.

(45) Wir haben die pizza ***so*** abgekühlt ***wie*** die lasagn.
we have the pizza SO cooled WIE the lasagne
We cooled the pizza as we cooled the lasagne.

(46) a. $[\![so_{degree}]\!]$: $\lambda D_{dt}.\lambda D'_{dt}.\{d: D(d) = 1\} \subseteq \{d': D'(d') = 1\}$
b. $[\![(45)]\!]$: {d: we cooled the lasagna to *d*-temperature} $\subseteq$ {d': we cooled the pizza to *d'*-temperature}

- In prose: **the set of degrees to which we cooled the lasagna to is a subset or an identical set of degrees to which we cooled the pizza to**, i.e., the temprature of the pizza is equal to the temperature of the lasagna.

German manner PM

- Only **the manner version is available with verbs that do not refer to degrees**, e.g., activity verbs.

(47) Beckedahl spricht ***so wie*** er immer spricht.
Beckedahl talks SO WIE he always talks
Beckedahl talks just like he always does.

(48) a. $[\![so_{event-property}]\!]$: $\lambda R_{vt,t}.\lambda R'_{vt,t}.\{f: R(f) = 1\} \subseteq \{f': R'(f') = 1\}$

b. $[\![(47)]\!]$: $\exists e[\{f': C(f') \ \& \ \forall e'[e' \text{ is an event of B. talking} \rightarrow f'(e')]\} \subseteq \{f: f(e) \ \& \ e \text{ is an event of B. talking}\}]$

(Hohaus and Zimmermann, 2021, pp. 125)

- In prose: **the set of manners Beckedahl always talks in is a subset or an identical set of manners in which Beckdahl is talking now**, i.e., he is talking as he always talks.

Accounting for Dutch PM *zo*

- Given the semantic primitives postulated so far (degrees and manners), can these be used to account for the semantics of Dutch *zo* and equatives in general?
- The main difficulty: **the observed readings with Dutch are dependent on the syntactic category of the parameter that the PM is marking**.
- Simply saying *zo* can refer to both degrees and manners as in German begs the question of **why it can refer to degrees only with adjectives and to properties/manners only with verbs**.

A new semantic primitive: Eventuality kinds

- Anderson and Morzycki (2015) propose a different way of understanding degrees and manners: these are **derived properties of eventualities, namely they instantiate a kind of eventuality**.
- The notion of a kind is familiar from the nominal domain; in English, for example, bare plurals admit a kind-generic reading (Chierchia, 1998).

  (49) Dogs like to play.

- Central intuition: **an object kind is the totality of all its instances**, i.e., *dogs* in (49) is referring to the totality of dogs.

A new semantic primitive: Eventuality kinds

- Anderson and Morzycki (2015): degrees are simply state-kinds, i.e., they are **a particular sort of plurality of *states* of possessing some 'amount' of a property**, which corresponds to a degree measure.
- Manners are simply event kinds, i.e., they are **a particular sort of plurality of *events* that are carried out in some similar way**, which corresponds to a manner description.
- Of course, not every case of gathering some plurality of states or events will correspond to a coherent property; **degrees and manners are in some deeper cognitive sense (to be determined why) distinguished properties of states and events** (Anderson and Morzycki, 2015).

A new semantic primitive: Eventuality kinds

- For example, **measure phrases like *6 feet* name a particular sort of state kind, the totality of states in which an individual is tall to at least 6 feet**.
- The ordering on degrees in a degree-based framework can be reproduced with kinds. A 6-feet state kind (plurality of states of reaching 6-feet or more) necessarily includs a 7-feet state-kind, in an 8-feet state-kind etc. but not vice versa.
- **Adverbs like *elegant* name an event-kind**, namely the **plurality of events that are carried out elegantly**.
- **An eventuality (state or event) can then be said to *instantiate* a kind**, i.e., intuitively, it is included in the plurality of eventualities that share an identical property.

(50) a. Kim is *6 feet* tall.
b. Kim danced *elegantly*.

A new semantic primitive: Eventuality kinds

- Armed with these assumptions, we need only make some modifications to the formal setup. Following Anderson and Morzycki (2015), we can assume **the semantic system can make reference to kinds as a distinct object**, call it k.
- We can indicate **an object instantiates a kind by notating it as** $^{\cup}\boldsymbol{k}$ (Chierchia, 1998).
- Further, we **need not assume degrees as a semantic primitive in the meaning of adjectives at all**; these just denote states of having some amount of a property (Wellwood, 2015).

(51) a. $[\![\textit{Kim is 6 feet tall}]\!]$: λs.TALL(s,*kim*) $\wedge$ $^{\cup}$SIX-FEET(s)
b. $[\![\textit{Kim danced elegantly}]\!]$: λe.DANCE(e,*Kim*) $\wedge$ $^{\cup}$ELEGANT(e)

Dutch PM *zo* refers to kinds

- With this setup, we can now proceed to provide an analysis of Dutch PM *zo*. As with Anderson and Morzycki (2015), Yu and Heynen (2023) analyze ***zo* as compositionally introducing a kind variable *k***.
- It further asserts that **some unspecified semantic object (what it combines with) instantiates this free kind variable that it introduces**.
- Further, this kind that the object instantiates **must count as a distinguished property of that object**.

(52) a. DIST(o,P) is true iff P is among the distinguished properties of o.

b. $[\![zo]\!]$: $\lambda k.\lambda o{:}\text{DIST}(o,{}^{\cup}k).{}^{\cup}k(o)$

(Anderson and Morzycki, 2015, p. 811-812)

Dutch SM *als* encodes comparison

- Final ingredient: we **localize the core of equative semantics (the less-than-or-equal-to or the subset relation) to the SM *als*** instead of *zo*.
- This follows proposals in the comparatives literature that the SM contributes to comparative meaning (Alrenga et al., 2012; Alrenga and Kennedy, 2014).

(53) $[\![als]\!]$: $\lambda \mathrm{K}_{\pi t}.\lambda \mathrm{K'}_{\pi t}.\{\mathrm{k}:\mathrm{K}(\mathrm{k}) = 1\} \subseteq \{\mathrm{k'}:\mathrm{K'}(\mathrm{k'}) = 1\}$

Dutch adjectival equatives

(54) Jan is ***zo*** groot ***als*** Sue.
John is ZO tall ALS Sue
John is as tall as Sue.

(55) $\{k{:}\exists s[\textsc{tall}(s,sue) \wedge {}^{\cup}k(s)] = 1\} \subseteq \{k'{:}\exists s'[\textsc{tall}(s', jan) \wedge {}^{\cup}k'(s')] = 1\}$
the set of state kinds Sue's height instantiates is a subset of the set of state kinds John's height instantiates, i.e., they share the same degree of height

Dutch verbal equatives

(56) Nadine had ***zo*** gerend ***als*** Sigrid.
Nadine has ZO ran ALS Sigrid
Nadine ran as Sigrid ran.

(57) $\{k{:}\exists e.\textsc{run}(e,\textit{sigrid}) \wedge {}^{\cup}k(e) = 1\} \subseteq \{k'{:}\exists e'.\textsc{run}(e',\textit{nadine}) \wedge {}^{\cup}k'(e') = 1\}$
the set of event kinds Sigrid's running instantiates is a subset of the the set of event kinds Nadines's running instantiates, i.e., they ran in the same manner

Merits of a kinds-based analysis for Dutch

- Upshot: we have **a cross-categorial semantic analysis of Dutch PM *zo***, i.e., the semantic ingredient involved (kinds) is exactly the same across adjectives and verbs.
- What leads to the observed distribution of degree versus property/manner readings is down to **a deeper ontological property about state- and event-kinds, mapping exactly to syntactic category as observed**.

Two types of Mandarin PMs

- The ingredients postulated so far already give us enough to analyze Mandarin PMs.
- The central idea: **Mandarin can make reference to both degrees and kinds**, and this is **reflected in the choice of PM and SM**.

Two types of Mandarin PMs

- Sun (2021) takes ***na-yang*** **to refer to kinds in the same way as Dutch *zo*, meaning that it will be cross-categorial** (used with both adjectives and verbs).
- ***Yi-yang*** **refers to degrees** in the same way English *as* does and **appears only with adjectives**.

(58) a. $[\![na\text{-}yang]\!]$: $\lambda k.\lambda o{:}\textsc{dist}(o,{}^{\cup}k).{}^{\cup}k(o)$
b. $[\![yi\text{-}yang]\!]$: $\lambda D.\lambda D'.\ \textsc{max}(D) \leqslant \textsc{max}(D')$

Two types of Mandarin PMs

- The clearest way to illustrate will be with gradable adjectives, since in Mandarin these can take either PM-SM combination.
- **The *gen...yi-yang* equative involves a degree quantifier**, familiar from the analysis of English *as*.

(59) Yuehan ***gen*** Bier ***yi-yang*** gao.
John as Bill one-kind tall
John is as tall as Bill.

(60) $\textsc{max}(\lambda \text{d. Bill is } d\text{-tall}) \geqslant \textsc{max}(\lambda \text{d. John is } d\text{-tall})$

Two types of Mandarin PMs

- **The PM-SM *xiang...na-yang* will, on the other hand, quantify over degree state-kinds**.
- TALL_{POS} here refers to the constituent produced when the gradable adjective has combined with a (covert) POS morpheme, explaining why in Mandarin *na-yang* requires evaluativity.

(61) Yuehan ***xiang*** Bier ***na-yang*** gao.
John like Bill that-kind tall
John is tall like Bill.

(62) $\exists \text{s'}[^{\cup}\iota \text{k}[\exists \text{s}[\text{TALL}_{\text{POS}}(\text{s}, \textit{bill}) \wedge {}^{\cup}\text{k}(\text{s})]](\text{s'}) \wedge \text{TALL}_{\text{POS}}(\text{s'}, \textit{john})\ ]$

- In prose: **John's state of being considered tall instantiates the degree state-kind that Bill's state of being considered tall instantiates**. i.e., they are both considered tall and they also share the same height measure.

Comparing Mandarin to Dutch

- Mandarin therefore has **one PM that is semantically like Dutch *zo*, namely *na-yang***, which we analyze as introducing kinds.
- One key difference: with gradable adjectives, **Mandarin *na-yang* requires a gradable adjective interpreted evaluatively**. This is not observed with Dutch *zo*.
- Nonetheless, we can account for the Mandarin facts once again with **the same familiar semantic ingredients** (kinds, degrees, evaluativity), with a **different mapping between these semantic ingredients and the morphosyntactic pieces that introduce them**.

Global conclusions

- Starting observation: there is **a basic cognitive need of being able to compare two objects and deciding if they are (un)equal in terms of a measure along some (gradable) dimension**.
- Natural languages address this need with two basic kinds of linguistic constructions: **comparisons of inequality and equality**.
- We examined in detail here comparisons of equality (**equatives**), noting that **languages differ at least in terms of the PMs they use to mark the parameter of comparison** across adjectives and verbs.
- These differences in the use of PMs across adjectives and verbs **correspond to a difference in the distribution of degree versus manner readings of equative constructions**.

Theoretical implications

- Looking across four languages, we established based on the distribution of readings and morphosyntactic ingredients used to build equatives that we need at least three semantic primitives for any adequate analysis: **degrees**, **manners**, and **kinds**.
- **PMs in different languages can make reference to either of these ingredients**, In fact, languages can have distinct PMs that refer to distinct semantic primitives even for a single equative construction.
- Other theoretical implications: the distribution of PMs and readings in equatives can bear on the question of **what the right analysis of the meaning of gradable adjectives should be** (do they ever refer to degrees directly cf. Wellwood, 2015) as well as **the semantic contribution of SMs** (Alrenga et al., 2012; Alrenga and Kennedy, 2014).

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References I

Alrenga, P. and Kennedy, C. (2014). *No more* shall we part: Quantifiers in English comparatives. *Natural Language Semantics*, 22:1–53.

Alrenga, P., Kennedy, C., and Merchant, J. (2012). A new standard of comparison. In Arnett, N. and Bennett, R., editors, *Proceedings of the 30th West Coast Conference on Formal Linguistics*, pages 32–42. Somerville, MA: Cascadilla Proceedings Project.

Anderson, C. and Morzycki, M. (2015). Degrees as kinds. *Natural Language & Linguistic Theory*, 33:791–828.

Beck, S., Krasikova, S., Fleischer, D., Gergel, R., Hofstetter, S., Savelsberg, C., John, V., and Villalta, E. (2012). Crosslinguistic variation in comparison constructions. *Linguistic Variation Yearbook*, 9:1–66.

Bresnan, J. (1973). Syntax of the comparative clause construction in english. *Linguistic Inquiry*, 4:275–343.

Chierchia, G. (1998). Reference to kinds across languages. *Natural Language Semantics*, 6(4):339–405.

Corver, N. (1997). The internal syntax of the Dutch extended adjectival projection. *Natural Language & Linguistic Theory*, 15:289–368.

Corver, N. (2018). The freezing points of the (Dutch) adjectival system. In Hartmann, J. et al., editors, *Freezing: Theoretical approaches and empirical domains*, pages 143–194. De Gruyter Mouton.

Cresswell, M. (1976). The semantics of degree. In Partee, B., editor, *Montague Grammar*, pages 261–292. New York: Academic Press.

Haspelmath, M. and Buchholz, O. (1998). Equative and similative constructions in the languages of Europe. In van der Auwera, J. and Ó Baoill, D., editors, *Adverbial constructions in the languages of Europe*, pages 277–334. Berlin: Mouton de Gruyter.

Heim, I. (1985). Notes on comparatives and related matters. Ms., University of Texas, Austin.

Heim, I. (2000). Degree operators and scope. In Jackson, B. and Matthews, T., editors, *Proceedings of the 10th Semantics and Linguistic Theory conference*, pages 40–64. Ithaca: Cornell University.

Hohaus, V. and Zimmermann, M. (2021). Comparisons of equality with German *so...wie*, and the relationship between degrees and properties. *Journal of Semantics*, 38:95–143.

Kennedy, C. (1997). *Projecting the Adjective: The Syntax and Semantics of Gradability and Comparison*. PhD thesis, University of California, Santa Cruz.

References II

Kennedy, C. and Levin, B. (2008). Measure of change: The adjectival core of degree achievements. In McNally, L. and Kennedy, C., editors, *Adjectives and adverbs: Syntax, semantics and discourse*, pages 156–182. Oxford: Oxford University Press.

Langacker, R. (1987). *Foundations of cognitive grammar: Theoretical prerequisites (Vol. 1)*. Stanford: Stanford University Press.

Rett, J. (2013). Similatives and the argument structure of verbs. *Natural Language & Linguistic Theory*, 31:1101–1137.

Rett, J. (2015). *On the semantics of evaluativity*. Oxford: Oxford University Press.

Seuren, P. (1984). The comparative revisited. *Journal of Semantics*, 3:109–141.

Stassen, L. (1985). *Comparison and Universal Grammar*. Oxford: Blackwell.

Sun, Y. (2021). Equating by degrees or state-kinds, or both. In Schlöder, J., McHugh, D., and Roelofsen, F., editors, *Proceedings of the 22nd Amsterdam Colloquium*, pages 523–532. Amsterdam: ILLC, UvA.

Wellwood, A. (2015). On the semantics of comparison across categories. *Linguistics & Philosophy*, 38:67–101.

Yu, J. and Heynen, L. (2023). Equating by quantifying over kinds: *Zo...als* equatives in Dutch and beyond. Presented at the 97th Annual Meeting of the Linguistic Society of America, Denver CO.