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Morphosyntax-semantics mapping in the grammar of property concepts: A view from English, Mandarin, and beyond[1]

1 Introduction

Background: PROPERTY CONCEPTS = concepts typically lexicalized as adjectives in languages that have such a category, e.g., 'tall', 'good', 'wise' (Dixon 1982; Thompson 1989; Francez and Koontz-Garboden 2015, 2017)

Two oppositions in the grammar of property concept lexemes:

(1) ADJECTIVAL
  a. Kim is **wise**. POSITIVE
  b. Kim is **wiser** than Sandy. COMPARATIVE

(2) NOMINAL
  a. Kim has **wisdom**. POSITIVE
  b. Kim has **more wisdom** than Sandy. COMPARATIVE

My question: How does each opposition's MORPHOLOGICAL RELATIONSHIP relate to its SEMANTIC RELATIONSHIP, and how (if at all) do these morpho-semantic relations vary cross-linguistically?

Restated methodologically: How can studying these oppositions' cross-linguistic morphological patterns inform debate over the compositional semantics of the sentences they participate in?

Main proposals:

- The cross-linguistically stable nullness of positive semantics (Grano 2012; Grano and Davis 2018) can be captured by treating it as contextual domain restriction of a quantifier supplied by the possessive morpheme in (2-a) (à la Francez and Koontz-Garboden 2017) and by the adjective in (1-a) (Section 2).
- Sentence pairs like (1-a) and (2-a) are truth-conditionally and in some cases model-theoretically equivalent (à la Menon and Pancheva 2014; Hanink, Koontz-Garboden, and Makasso 2019) (Section 3).
- Many Mandarin possessed property predicates like *you jiazhi* 'have value' closely parallel English derivationally complex predicates like *valu-able*, reflecting a broader (analytic vs. synthetic) typological distinction between the two languages (Section 4).

[1]The work described here is based in part on collaboration with Yiwen Zhang. For helpful discussion and suggestions, I'd like to thank Bob Botne, Alex Cherici, Stuart Davis, Andrew Koontz-Garboden, Larry Moss, Roumyana Pancheva, Kevin Rottet, Rex Sprouse, the Indiana University Syntax-Semantics Reading Group, and the audience at DGFS 2020 Workshop 17, where an earlier version of this work was presented.

2 The positive/comparative opposition

2.1 Theoretical background

In degree-based analyses, both positive and comparative uses of gradable adjectives are *derived*:[2]

(3) [[tall]] = $\lambda d \lambda x.\text{HEIGHT}(x) \geq d$ $\langle d, et \rangle$
(HEIGHT = measure function from individuals to their respective degrees of height)

(4) a. John is two meters tall.
b. [[tall]]([[two meters]])([[John]]) = $\text{HEIGHT}(j) \geq 2m$
'John's height meets or exceeds two meters.'

(5) a. John is tall. ← POSITIVE
b. $[[\text{POS}]]^c = \lambda g_{\langle d,\langle e,t\rangle\rangle} \lambda x.\exists d[g(d)(x) \wedge d > d_c]$
c. $[[\text{POS}]]^c([[\text{tall}]])([[\text{John}]]) = \exists d[\text{HEIGHT}(j) \geq d \wedge d > d_c]$
$\approx$ 'There is some degree d such that John's height meets or exceeds d and d exceeds a contextually determined threshold d_c.'

(6) a. John is taller than Bill. ← COMPARATIVE
b. $[[\text{COMP}]] = \lambda g_{\langle d,\langle e,t\rangle\rangle} \lambda x \lambda y.\exists d[g(d)(y) \wedge \neg g(d)(x)]$
c. $[[\text{COMP}]]([[\text{tall}]])([[\text{than Bill}]])([[\text{John}]]) = \exists d[\text{HEIGHT}(j) \geq d \wedge \neg[\text{HEIGHT}(b) \geq d]]$
$\approx$ 'There is some degree d such that John's height meets or exceeds d and Bill's height does not meet or exceed d.'

2.2 Attested morphological patterns

This is at odds with a cross-linguistically stable asymmetry between positive and comparative forms:

(7)

	Positive form	*Comparative form*
English	tall	tall**er**
Irish	ard	ard**a**
French	grand	**plus** grand
Japanese	takai	takai

(8) **The POS/COMP Generalization:** Cross-linguistically, the comparative form of a gradable adjective is derived from or identical to its positive form (Grano 2012; Grano and Davis 2018).

If (8) holds universally, then it rules out two of four hypothetically possible derivational relationships that could hold between positive- and comparative-form adjectives (Grano and Davis 2018):

(9)

	Positive form	*Comparative form*	*Examples*
Pattern A	Adj	Adj	Japanese, ...
Pattern B	Adj	DERIV(Adj)	English, Irish, French, ...
Pattern C	DERIV(Adj)	Adj	Impossible?
Pattern D	DERIV_1(Adj)	DERIV_2(Adj)	Impossible?

[2] Cresswell 1976; von Stechow 1984; Heim 1985; Kennedy 1999; Kennedy and McNally 2005; Schwarzschild 2008

2.3 Mandarin as a counterexample?

Superficially, Mandarin instantiates Pattern C:[3]

(10) a. Zhangsan gao.
Zhangsan tall
'Zhangsan is taller.'

b. Zhangsan **hen** gao.
Zhangsan very tall
'Zhangsan is (very) tall.'

Grano 2012: Despite surface appearances, Mandarin is a Pattern A language.

Covert POS in Mandarin (cf. Liu 2010):

(11) a. Zhangsan gao **ma**?
Zhangsan tall Q
'Is Zhangsan tall?'

b. Zhangsan **bu** gao.
Zhangsan NEG tall
'Zhangsan is not tall.'

c. yi ge congming **de** haizi
one CL smart PRT child
'a smart child'

Why do COMP and *hen* pattern together to the exclusion of POS in the configuration in (12)?

(12) a. *Zhangsan [POS gao]. *Intended*: 'Zhangsan is tall.'
b. Zhangsan [COMP gao]. = 'Zhangsan is taller.'
c. Zhangsan [**hen** gao]. = 'Zhangsan is tall.'

The core proposal:

(13) **Universal Markedness Principle**: Universally, comparative semantics is provided by an explicit morpheme in syntax which is overt in some languages and null in others, whereas positive semantics is provided by a type-shifting rule that does not project in syntax.

(14) **The T[+V] constraint**: In Mandarin, the direct complement to T(ense) (or something like Tense[4]) must either be (an extended projection of) a verb or a functional morpheme that can in principle combine with (an extended projection of) a verb.

Consequence:

(15) a. * TP
T AP$_{\langle d,et\rangle}$ $\overrightarrow{\textbf{pos}}$ $\langle et\rangle$
gao

b. ✓ TP
T DegP$_{\langle et\rangle}$
Deg$_{\langle\langle d,et\rangle,\langle et\rangle\rangle}$ AP$_{\langle d,et\rangle}$
$\emptyset_{comp}$ gao

c. ✓ TP
T DegP$_{\langle et\rangle}$
Deg$_{\langle\langle d,et\rangle,\langle et\rangle\rangle}$ AP$_{\langle d,et\rangle}$
hen gao

[3] Sybesma 1999; Huang 2006; Gu 2008; Liu 2010, 2018; He and Jiang 2011; Grano 2012; Zhang 2015

[4] It is controversial whether Mandarin has Tense (e.g., Lin 2012). Let T stand for whatever head hosts the subject in main clauses. We might call it INFL to be neutral about its semantics. See also Grano 2017.

Predictions:

(16) a. Bare gradable adjectives (w/positive semantics) should be licit when structure intervenes between T and AP.
b. Bare gradable adjectives (w/positive semantics) should be licit when T is not projected.

Prediction (16-a) is supported by data like (11-a)–(11-b).

Prediction (16-b) is supported by data like (11-c).

See Grano 2012 for more details.

Interim conclusion: Mandarin is not a counterexample to the POS/COMP Generalization.

2.4 Arabic as a counterexample?

Superficially, Arabic instantiates Pattern D—we find triliteral roots (here, $\sqrt{Twl}$) with independently derived POS and COMP forms:[5]

(17) Aħmad **Tawiil**.
Ahmad tall
'Ahmad is tall.'

(18) Aħmad **aTwal** (min Basem).
Ahmad taller from Basem
'Ahmad is taller (than Basem).'

Evidence that the comparative form is based directly on the root rather than on the positive form (Grano and Davis 2018, reviewing Davis 2016):

- Affixal consonants present in some positive forms but not their comparative counterparts:

  (19) a. **mu**-*naasib* 'appropriate' / *ansab* 'more appropriate'
  b. *kaslaa***n** 'lazy' / *aksal* 'lazier'
  c. *rufa***yy***a*ʕ 'thin' / *arfa*ʕ 'thinner'

- Morpho-phonological changes in positive form (e.g., w → y _i) not preserved in comparative:

  (20) *baa***y***iZ* 'spoiled' / *ab***w***aZ* 'more spoiled' (cf. *ba***ww***aZ* 'to spoil')

- Comparative forms that lack positive counterparts:

  (21) a. *aSwab* 'more correct' / **Saayib*
  b. *azwa*ʔ 'more polite' / *zoo*ʔ (noun, not adjective)
  c. *a*ħ*a*ʔʔ 'more entitled' / ħ*a*ʔ*ii*ʔ*i* 'genuine' (NOT: 'entitled')

This all suggests:

(22) $[[\sqrt{Twl}]] = \lambda d\lambda x.\textbf{height}(x) \geq d$ DEGREE-INTRODUCING ROOT

(23) $[[\text{aCCaC}]] = \lambda g_{\langle d,\langle e,t\rangle\rangle}\lambda x\lambda y.\exists d[g(d)(y) \wedge \neg g(d)(x)]$ TEMPLATIC COMPARATIVE

[5] All Arabic data reported in this handout are from Cairene Egyptian Arabic.

(24) **The Templatic** POS **Hypothesis:**
$[[\text{CaCiiC}]]^c = \lambda g_{\langle d,\langle e,t\rangle\rangle} \lambda x.\exists d[g(d)(x) \wedge d > d_c]$

Reasons for nonetheless rejecting the Templatic POS Hypothesis (Grano and Davis 2018):

- Unpredictable variation in shape of putative positive template:

  (25) a. *kibiir* 'big', *šaaTir* 'clever', *wiħiš* 'bad', *Tawiil* 'tall', *Saʔb* 'difficult', ...
  b. CiCiiC, CaaCiC, CiCiC, CaCiiC, CaCC, ...

- Putative positive template used for non-adjectives:

  (26) *zimiil* 'companion', *kaatib* 'writer', *bariid* 'mail', *faDl* 'favor'

- Putative positive forms showing up in non-positive syntactic contexts:

  (27) Aħmad Tawiil **awi/giddan**.
  Ahmad tall very/extremely
  'Ahmad is very/extremely tall.'

  (28) Aħmad Tawiil (**awi**) **li-daragit** innu yilmis is-saʔf.
  Ahmad tall very to-degree that.he touches the-ceiling.
  'Ahmad is tall enough to touch the ceiling.'

  (29) Il-madiina amaan **xaaliS**.
  the-city safe completely
  'The city is completely safe.'

  (30) Iš-šibbaak wisix **šuwayya**.
  the-window dirty little
  'The window is a little dirty.'

  (31) Aħmad mašguul **aktar min Basem**.
  Ahmad busy more than Basem
  'Ahmad is busier than Basem.'

Interim conclusion: POS has no exponence in Arabic; Arabic is a Pattern B language after all; the search for POS continues...

→ See also Vanden Wyngaerd, Starke, De Clercq, and Caha (2020) on Slovak, another superficial Pattern D language whose apparent positive form suffix *-k* cannot actually be identified with POS (e.g., they show it is compatible with measure phrases and degree questions).

2.5 POS *as contextual domain restriction?*

Analytical lesson: Either there is no POS and we need to pursue theories that don't require it such as Kamp 1975; Klein 1980; Wellwood 2015; or POS is (for some reason) typically or even universally covert.

Fleshing out the latter option:

A Francez and Koontz-Garboden 2017-style approach: Positive semantics as contextual quantifier domain restriction:

(32) a. Everyone went to the party.
= Everyone [in some contextually restricted domain] went to the party.
b. John has money.
= John has [some contextually lower-bounded amount of] money.

(33) John has wisdom.
= John has [some contextually lower-bounded amount of] wisdom.

(34) John is wise.
→ same as (33)?

On this view, the nullness of POS reflects the more general pattern of nullness of contextual domain restriction.

But then, what supplies the quantifier that gets contextually restricted?

- (33): the possessive morpheme *have*
- (34): the adjective itself?

That brings us to…

3 The adjectival/nominal opposition

3.1 Theoretical background

Francez and Koontz-Garboden's (2015; 2017) question: What is the analytical relationship between property concept sentences like (35) and those like (36)?

(35) John **is wise**.

(36) John **has wisdom**.

Francez and Koontz-Garboden's answer: Adjectives like *wise* are INDIVIDUAL-CHARACTERIZING, whereas (some) property concept nouns like *wisdom* are QUALITY-DENOTING, therefore requiring possessive morphosyntax to establish the appropriate semantic relation with the subject:

(37) [[wisdom]] = $\lambda p.p \leq$ **wisdom** $\langle pt \rangle$
($\leq$ = 'is a portion of')
(**wisdom** = the maximal plural portion of wisdom)

(38) a. #John is wisdom.
b. [[John is wisdom]] = $j \leq$ **wisdom**
'John is a portion of wisdom.'

(39) [[have]] = $\lambda P \lambda x \lambda I \subset \{y | P(y) = 1\}.\exists^I z[\pi(x, z)]$ $\langle pt, \langle e, \iota t \rangle \rangle$
(π = possession relation)
(I = variable over [contiguous, left-bounded] intervals[6])

[6] **Interval:** For any quality P, an interval $I \subset P$ is a set of portions such that $\exists q \in P[I = \{p | q \leq p\}]$
(Francez and Koontz-Garboden 2017:45)

(40) [[John has wisdom]] = $\exists^{I \subset \{y | y \leq \mathbf{wisdom}\}} z[\pi(j, z)]$
'There is some (contextually restricted) interval of wisdom z such that John possesses z.'

Two sources of agnosticism in their analysis:

- Are intuitively equivalent sentences like (35)–(36) MODEL-THEORETICALLY EQUIVALENT? I.e., do they "express the same truth conditions derived in the same compositional way from the same model-theoretic parts" (2017: 142)?
- What is the morpho-semantic relation between words like *wise* and *wisdom*? I.e., is *wisdom*'s quality-denoting status predictable from the composition of its parts *wis(e)* and *-dom*?

3.2 Attested morphological patterns

Question: Are there any constraints on possible derivational relations between adjectival and nominal property concept words, like what we found for positive vs. comparative forms?

Positive/comparative derivational relations (repeated from above):

(41)

	Positive form	*Comparative form*	*Examples*
Pattern A	Adj	Adj	Japanese, ...
Pattern B	Adj	DERIV(Adj)	English, Irish, French, ...
Pattern C	DERIV(Adj)	Adj	Impossible?
Pattern D	DERIV_1(Adj)	DERIV_2(Adj)	Impossible?

Answer: No!

(42)

	Adjective	*Noun*	*Examples*
Pattern A	Form	Form	French *calme* 'calm'–*calme* 'calmness'[7]
Pattern B	Form	DERIV(Form)	English *happy–happi***ness**, *wise–wis***dom**
Pattern C	DERIV(Form)	Form	English *joy***ful**–*joy*
Pattern D	DERIV_1(Form)	DERIV_2(Form)	Arabic *ħakiim* 'wise'–*ħikma* 'wisdom'

Probing Pattern D:

(43) Aħmad **ħakiim**.
Ahmad wise
'Ahmad is wise.'

(44) Aħmad ʕandu **ħikma**.
Ahmad at.him wisdom
'Ahmad has wisdom.'

Why think *ħakiim* 'wise' and *ħikma* 'wisdom' are both directly derived from the root $\sqrt{\hbar km}$?

Because if *ħikma* 'wisdom' were derived from *ħakiim* 'wise', we'd expect nominal counterparts of CaCiiC adjectives to have a consistent prosodic shape, contrary to fact (Stuart Davis and Youssef Haddad, p.c.):

(45)

a.	*ħakiim* 'wise' / *ħikma* 'wisdom'	CaCiiC / CiCCa
b.	*šariif* 'noble' / *šaraf* 'nobility'	CaCiiC / CaCaC
c.	*gariiʕ* 'audacious' / *gurʕa(t)* 'audacity'	CaCiiC / CuCCa(t)

Now: How to connect the observed patterns with a compositional semantics? Here we'll consider Patterns C, D, and B, in that order.

[7] Thanks to Kevin Rottet for this example.

3.3 N→A morpho-semantics (Pattern C)

Question: If *joy* has a quality-denoting denotation, as in (46), what must *-ful* denote so that *joy+ful* yields an individual-characterizing denotation?

(46) [[joy]] = $\lambda p.p \leq$ **joy** $\langle pt \rangle$

Answer: It depends on how we implement individual-characterizing denotations.

If we take the textbook degree relation approach to gradable adjectives, it's not obvious how we would proceed:

(47) a. [[joyful]] = $\lambda d \lambda x.\text{JOY}(x) \geq d$ $\langle d, et \rangle$
b. [[joy]] = $\lambda p.p \leq$ **joy** $\langle pt \rangle$
c. [[-ful]] = ???

If instead we take the view that individual-characterizing denotations incorporate a possession relation (à la Menon and Pancheva 2014 on Malayalam, Francez and Koontz-Garboden (2017:134) on Wolof, and Hanink et al. (2019:209) on Basaá), then it becomes quite easy:

(48) a. [[joyful]] = $\lambda x \lambda I \subset \{y | y \leq$ **joy**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$
b. [[joy]] = $\lambda p.p \leq$ **joy** $\langle pt \rangle$
c. [[-ful]] = $\lambda P \lambda x \lambda I \subset \{y | P(y) = 1\}.\exists^I z[\pi(x, z)]$ $\langle pt, \langle e, \iota t \rangle \rangle$

On this view:

(49) a. [[have]] = [[-ful]]
b. [[have joy]] = [[joyful]]

Some suggestive data:

(50) Kim **has** joy. ≈ Kim is joy**ful**. ≈ Kim is **full** of joy.

3.4 Root→N/A morpho-semantics (Pattern D)

Question: If *ħakiim* 'wise' and *ħikma* 'wisdom' have denotations as in (51) and (52), respectively, how can we factor out the common contribution of the root $\sqrt{\hbar km}$ from the adjectivizing and nominalizing templates?

(51) [[ħakiim]] = $\lambda x \lambda I \subset \{y | y \leq$ **wisdom**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$

(52) [[ħikma]] = $\lambda p.p \leq$ **wisdom** $\langle pt \rangle$

Option 1: Let the nominalizing template be semantically vacuous; then it works just like above:

(53) [[$\sqrt{\hbar km}$]] = $\lambda p.p \leq$ **wisdom** $\langle pt \rangle$

(54) a. [[CaCiiC]] = $\lambda P \lambda x \lambda I \subset \{y | \leq P\}.\exists^I z[\pi(x, z)]$ $\langle pt, \langle e, \iota t \rangle \rangle$
b. [[ħakiim]] = $\lambda x \lambda I \subset \{y | y \leq$ **wisdom**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$

(55) a. [[CiCCa]] = $\lambda P.P$ $\langle pt, pt\rangle$
b. [[ħikma]] = $\lambda p.p \leq$ **wisdom** $\langle pt\rangle$

Option 2: A Menon and Pancheva 2014-style approach

(56) [[$\sqrt{\hbar km}$]] = **wisdom** p

(57) a. [[CaCiiC]] = $\lambda p\lambda x\lambda I \subset \{y| \leq p\}.\exists^I z[\pi(x,z)]$ $\langle p, \langle e, \iota t\rangle\rangle$
b. [[ħakiim]] = $\lambda x\lambda I \subset \{y|y \leq$ **wisdom**$\}.\exists^I z[\pi(x,z)]$ $\langle e, \iota t\rangle$

(58) a. [[CiCCa]] = $\lambda p\lambda q.q \leq p$ $\langle p, pt\rangle$
b. [[ħikma]] = $\lambda p.p \leq$ **wisdom** $\langle pt\rangle$

3.5 A→N morpho-semantics (Pattern B)

Question: If *happy* has a denotation like (59-a), what must be the contribution of *-ness* to yield a denotation for *happiness* like (59-c)?

(59) a. [[happy]] = $\lambda x\lambda I \subset\{y|y \leq$ **happiness**$\}.\exists^I z[\pi(x,z)]$ $\langle e, \iota t\rangle$
b. [[-ness]] = ???
c. [[happiness]] = $\lambda p.p \leq$ **happiness** $\langle pt\rangle$

This is the most challenging pattern because it seems that *-ness* would need to *remove* meaning (roughly, the possessive component), violating the Monotonicity Hypothesis (Koontz-Garboden 2009).

Option 1: Root+covert adjectivizer

(60) [[happy]] = **happiness** p

(61) a. [[a]] = $\lambda p\lambda x\lambda I \subset \{y|y \leq p\}.\exists^I z[\pi(x,z)]$ $\langle p, \langle e, \iota t\rangle\rangle$
b. [[a+happy]] = $\lambda x\lambda I \subset\{y|y \leq$ **happiness**$\}.\exists^I z[\pi(x,z)]$ $\langle e, \iota t\rangle$

(62) a. [[-ness]] = $\lambda p\lambda q.q \leq p$ $\langle p, pt\rangle$
b. [[happiness]] = $\lambda p.p \leq$ **happiness** $\langle pt\rangle$

Option 2:

(63) [[happy]] = $\lambda x\lambda I \subset\{y|y \leq$ **happiness**$\}.\exists^I z[\pi(x,z)]$ $\langle e, \iota t\rangle$

(64) a. [[-ness]] = $\lambda\alpha\lambda p.p \in \{y \mid \exists x\exists I[\alpha(x)(I) \wedge y \in I]\}$ $\langle\langle e, \iota t\rangle, pt\rangle$
b. [[happiness]] = $\lambda p.p \in \{y \mid \exists x\exists I \subset \{z|z \leq$**happiness**$\}\exists^I a[\pi(x,a) \wedge y \in I]\}$ $\langle pt\rangle$
'true of p iff p is a **possessed** portion of happiness'

(64-b) is somewhat more complex than what we were after:

(65) [[happiness]] = $\lambda p.p \leq$ **happiness** $\langle pt\rangle$
'true of p iff p is a portion of happiness'

But if *all* portions of happiness are possessed (compare (66-a) and (66-b)), then maybe (64-b) will do after all.

(66) a. This water belongs to no one.
b. ?This happiness belongs to no one.

3.6 Taking stock

The maximally 'transparentist' view:

(67) N→A

a. [[joy]] = $\lambda p.p \leq$ **joy** $\langle pt \rangle$
b. [[-ful]] = $\lambda P \lambda x \lambda I \subset \{y|P(y) = 1\}.\exists^I z[\pi(x, z)]$ $\langle pt, \langle e, \iota t \rangle \rangle$
c. [[joyful]] = $\lambda x \lambda I \subset \{y|y \leq$ **joy**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$

(68) Root→A/N

a. $[[\sqrt{\hbar km}]]$ = **wisdom** p
b. [[CaCiiC]] = $\lambda p \lambda x \lambda I \subset \{y| \leq p\}.\exists^I z[\pi(x, z)]$ $\langle p, \langle e, \iota t \rangle \rangle$
c. [[CiCCa]] = $\lambda p \lambda q.q \leq p$ $\langle p, pt \rangle$
d. [[ħakiim]] = $\lambda x \lambda I \subset \{y|y \leq$ **wisdom**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$
e. [[ħikma]] = $\lambda p.p \leq$ **wisdom** $\langle pt \rangle$

(69) A→N

a. [[happy]] = $\lambda x \lambda I \subset \{y|y \leq$ **happiness**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$
b. [[-ness]] = $\lambda \alpha \lambda p.p \in \{y \mid \exists x \exists I[\alpha(x)(I) \wedge y \in I]\}$ $\langle \langle e, \iota t \rangle, pt \rangle$
c. [[happiness]] = $\lambda p.p \in \{y \mid \exists x \exists I \subset \{y|y \leq$ **happiness**$\}.\exists^I z[\pi(x, z) \wedge y \in I]\}$ $\langle pt \rangle$

The maximally 'uniformist' view:

(70) N→A

a. $[[\sqrt{joy}]]$ = **joy** p
b. [[-ful]] = $\lambda p \lambda x \lambda I \subset \{y| \leq p\}.\exists^I z[\pi(x, z)]$ $\langle p, \langle e, \iota t \rangle \rangle$
c. [[n]] = $\lambda p \lambda q.q \leq p$ $\langle p, pt \rangle$
d. [[joyful]] = $\lambda x \lambda I \subset \{y|y \leq$ **joy**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$
e. [[joy]] = $\lambda p.p \leq$ **joy** $\langle pt \rangle$

(71) Root→A/N

a. $[[\sqrt{\hbar km}]]$ = **wisdom** p
b. [[CaCiiC]] = $\lambda p \lambda x \lambda I \subset \{y| \leq p\}.\exists^I z[\pi(x, z)]$ $\langle p, \langle e, \iota t \rangle \rangle$
c. [[CiCCa]] = $\lambda p \lambda q.q \leq p$ $\langle p, pt \rangle$
d. [[ħakiim]] = $\lambda x \lambda I \subset \{y|y \leq$ **wisdom**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$
e. [[ħikma]] = $\lambda p.p \leq$ **wisdom** $\langle pt \rangle$

(72) A→N

a. $[[\sqrt{happy}]]$ = **happy** p
b. [[a]] = $\lambda p \lambda x \lambda I \subset \{y|y \leq p\}.\exists^I z[\pi(x, z)]$ $\langle p, \langle e, \iota t \rangle \rangle$
c. [[-ness]] = $\lambda p \lambda q.q \leq p$ $\langle p, pt \rangle$
d. [[happy]] = $\lambda x \lambda I \subset \{y|y \leq$ **happiness**$\}.\exists^I z[\pi(x, z)]$ $\langle e, \iota t \rangle$
e. [[happiness]] = $\lambda p.p \leq$ **happiness** $\langle pt \rangle$

3.7 Some consequences

Regardless of which of the above options we take, any combination of the above views has the following consequences:

What we gain:

- An account of the nullness of POS (contextual domain restriction typically being covert)
- An account of the intuitive equivalence between *wise* and *have wisdom*

What we lose:

- A semantic explanation for certain modifier/predicate co-occurrence restrictions

3.7.1 Varieties of equivalence

What is the source of the intuitive equivalence between (73) and (74)?

(73) John is **wise**.

(74) John **has wisdom**.

Three progressively weaker kinds of equivalence:

I. Model-theoretic equivalence in Francez and Koontz-Garboden's (2017) sense: Expressing "the same truth conditions derived in the same compositional way from the same model-theoretic parts" (p. 142) (cf. Carnap's 1947 'intensional isomorphism').

(75) a. John saw a **woodchuck**.

b. John saw a **groundhog**.

→ Model-theoretically equivalent given parallel structure and synonymy of *woodchuck* and *groundhog*.

II. Intensional (aka logical) equivalence: Having the same truth conditions; picking out the same sets of possible worlds.

(76) a. John **smokes**.

b. **It's not the case that** John **doesn't smoke**.

→ Intensionally equivalent, but not model-theoretically equivalent.

III. Contextual equivalence: Truth conditionally equivalent only when considered relative to some set of contingent background assumptions.

(77) a. John **died**.

b. John**'s soul left his body**.

→ Equivalent only if it is assumed that someone dies iff their soul leaves their body.

Which (if any) of these three notions of equivalence is at play in (78-a)–(78-b)?

(78) a. John **is wise**.

b. John **has wisdom**.

If *contextually equivalent*, we'd expect there to be some background assumption on which their equivalence relies, but it is hard to see what that assumption would be. Consider also:

(79) a. #John **is wise**, but he **doesn't have wisdom**.
b. #John **has wisdom**, but he **isn't wise**.

Cf.:

(80) a. John **died**, but his **soul didn't leave his body**.
b. John's **soul left his body**, but he **didn't die**.

Another consideration:

(81) Q: Why is John **wise**?
A: Because he **has wisdom**.[8] ← UNINFORMATIVE ANSWER

Cf.:

(82) Q: Why did John **die**?
A: Because his **soul left his body**. ← POTENTIALLY INFORMATIVE ANSWER

Conclusion: Pairs like (78-a)/(78-b) seem to be *not* merely contextually equivalent, and our semantic theory should predict this!

How to adjudicate between model-theoretic equivalence and truth-conditional equivalence? In the absence of empirical diagnostics, let the theory decide.

For example, the 'transparentist' theory gives us hybrid results:

Model-theoretic equivalence (since [[-ful]] = [[have]]):

(83) a. John is **joyful**.
b. John **has joy**.

Truth-conditional equivalence but not model-theoretic equivalence (since *-ness* and *-dom* make semantic contributions that have no analogues in (84-a)/(85-a)):

(84) a. John is **happy**.
b. John **has happiness**.

(85) a. John is **wise**.
b. John **has wisdom**.

3.7.2 Co-occurrence restrictions

If *wise* and *have wisdom* are truth-conditionally equivalent, why the following contrast?

(86) a. Kim is **very** [wise].
b. *Kim **very** [has wisdom].

[8] Thanks to Larry Moss for this example.

In fact, one reason truth-conditional/model-theoretic equivalence has been pursued for other languages is that this kind of contrast is *not* found:

(87) a. Awa [rafet-na] **lool**.
Awa pretty-FIN very
'Awa is very pretty.'
b. Awa [am na xel] **lool**.
Awa have FIN wit very
Lit.: 'Awa very has wit.' WOLOF (Baglini 2015:17)

(88) a. hí-nuní híí hí [yé hi-kɛŋí] **ŋgandak**.
19-bird 19.that 19.SUB be 19-big very
'That bird is very big.'
b. kim a [gweé ŋguy] **ŋgandak**.
Kim AGR has strength very
Lit.: 'Kim very has strength.' BASAÁ (Hanink et al. 2019)

(89) a. Zhangsan **hen** [congming].
Zhangsan very smart
'Zhangsan is (very) smart.'
b. Zhangsan **hen** [you zhihui].
Zhangsan very have wisdom
Lit.: 'Zhangsan very has wisdom.' MANDARIN (Zhang 2020)

One possibility: (90) is semantically interpretible, but deviant for syntactic reasons.

(90) *Kim **very** [has wisdom].

(91) **Syntactic parameter:** *very* (and similar expressions) {can / cannot} combine with VP.

4 Mandarin possessed property concepts and analyticity

- *Why* might a language lexicalize certain property concept words as individual-characterizing on the one hand or quality-denoting on the other hand? (Is it idiosyncratic or systematic?)
- In this section, I argue that one source of systematic variation in this area may be based on the broader typological distinction between relatively analytic vs. relatively synthetic languages.

4.1 Data and puzzles

Possessed property concept predicates in Mandarin:

(92) Zhangsan hen you {zhihui/caihua/yongqi/jingyan}.
Zhangsan very have wisdom/talent/courage/experience
'Zhangsan has (a lot of) wisdom/talent/courage/experience.'

Puzzle #1: Subjective meanings only for possessed property concepts (Li 2019):

(93) *Zhangsan hen you **gaodu**.
Zhangsan very have height
Lit.: 'Zhangsan has (a lot of) height.'

(94) a. *Zheli de shui hen you **shendu**.
here PRT water very have depth
Intended: 'The water here has (a lot of) depth.'
b. Zhe pian wenzhang hen you **shendu**.
this CL article very have depth
'This article has (a lot of) depth.' (adapted from Li 2019)

Puzzle #2: Split behavior of *you* 'have' w.r.t. gradability hallmarks (Li 2019):

(95) a. Zhangsan **hen** you **zhihui**.
Zhangsan very have wisdom
'Zhangsan has (a lot of) wisdom.'
b. Zhangsan **bi Lisi** you **zhihui**.
Zhangsan SM Lisi have wisdom
'Zhangsan has more wisdom than Lisi.'

(96) a. Zhangsan (*__hen__) you **shui**.
Zhangsan very have water
'Zhangsan has (*intended:* a lot of) water.'
b. *Zhangsan **bi Lisi** you **shui**.
Zhangsan SM Lisi have water
Intended: 'Zhangsan has more water than Lisi.'

Puzzle #3: Possessed property concepts pattern like adjectives w.r.t. *hen* requirement (Zhang 2020):

(97) a. Zhangsan gao.
Zhangsan tall
'Zhangsan is taller (than someone know from context).'
b. Zhangsan **hen** gao.
Zhangsan very tall
'Zhangsan is (very) tall.'

(98) a. Zhangsan xihuan Lisi.
Zhangsan like Lisi
'Zhangsan likes Lisi.'
b. Zhangsan **hen** xihuan Lisi.
Zhangsan very like Lisi
'Zhangsan likes Lisi a lot.'

(99) a. Zhangsan you zhihui.
Zhangsan have wisdom
'Zhangsan has more wisdom (than someone known from context).'
b. Zhangsan **hen** you zhihui.
Zhangsan very have wisdom
'Zhangsan has (a lot of) wisdom.'

4.2 Zhang's (2020) analysis

Two flavors of the possessive morpheme (cf. Francez and Koontz-Garboden 2017 on Ulwa):

(100) [[you$_1$]] = $\lambda P \lambda x . \exists z [\pi(x, z) \wedge P(z)]$ 'CONCRETE' POSSESSION

(101) [[you$_2$]] = $\lambda P \lambda x \lambda I \subset \{y | P(y) = 1\} . \exists^I z [\pi(x, z)]$ 'PROPERTY' POSSESSION

[*you* is independently known to be multi-functional: possessive verb, aspectual auxiliary (Huang 1988), existential quantifier, equative marker (Xie 2014).]

Composition with direct object:

(102) a. [[you$_1$ shui ('water')]] = $\lambda x . \exists z [\pi(x, z)\ \&\ water(z)]$
b. [[you$_2$ zhihui ('wisdom')]] = $\lambda x \lambda I \subset \{y | y \leq \mathbf{wisdom}\} . \exists^I z [\pi(x, z)]$

An interval semantics for *hen* 'very' (cf. Francez and Koontz-Garboden 2017 on Wolof *lool* 'very', where ! is a threshold-raising function):

(103) [[hen]] = $\lambda \alpha_{\langle e, \iota t \rangle} \lambda x \lambda J_\iota . \alpha(x, !(J))$

Consequences for **Puzzle #2**:

(104) [[hen you$_2$ zhihui]] = $\lambda x \lambda J_\iota \subset \{y | y \leq \mathbf{wisdom}\} . \exists^{!(J)} z [\pi(x, z)]$

(105) [[hen you$_1$ shui]] $\rightarrow$ *Type mismatch!*

Solving **Puzzle #3**:

- The distinct *semantic* flavors (*you*$_1$ vs. *you*$_2$) correlate with distinct *syntactic* flavors:
- *you*$_1$ phrases are VPs whereas *you*$_2$ phrases are AdjPs.
- *you*$_2$ is a functional morpheme that combines with a nominal projection but returns an extended projection of a different category (specifically, adjectival).
- cf. the English copula *be* in the framework of Grimshaw 2005, which combines with a variety of lexical categories (adjectival, nominal) but returns an extended verbal projection.
- Then, Puzzle #3 falls out from Grano's (2012) account of the Mandarin *hen* puzzle: AdjPs in Mandarin cannot combine directly with Tense but instead require appropriate intervening functional morphology such as *hen*.

As for **Puzzle #1**: see Zhang 2021.

4.3 Property concept grammar and analyticity

Sapir (1921): *Analytic* = one-to-one relation between words and concepts; *Synthetic* = multiple concepts combined into a single word

Huang (2015): Many typologically interesting properties of Mandarin can be tied together under the more general property of high analyticity in Mandarin grammar.

In Huang's modern theoretical terms: Analytic = tendency for functional heads to be overtly realized and to have independent word status rather than being covertly realized and attracting movement to create complex (synthetic) word forms.

'Light verbs' and 'Light nouns' (Huang 2015):

(106) a. Zhangsan **da-le penti**.
Zhangsan hit-PRF sneeze
'Zhangsan **sneezed**.' LIGHT VERBS

b. Zhangsan **chang ge**.
Zhangsan sing song
'Zhangsan **sings**.' PSEUDO NOUN INCORPORATION

c. Zhangsan **kaishi du** yi-ben shu.
Zhangsan begin one-CL book
'Zhangsan **began** a book.' ABSENCE OF EVENT COERCION

d. Zhangsan **nong-po-le** chuangzi.
Zhangsan make-break-PRF window
'Zhangsan **broke** the window.' RESULTATIVE MARKERS

(107) a. Zhangsan mai-le yi-**ben shu**.
Zhangsan buy-PRF one-CL book
'Zhangsan bought a **book**.' CLASSIFIER

b. Shu **zai** zhuozi-**shang**.
book at table-top
'The book is **on** the table.' LOCALIZER

Proposal: *you*$_2$ as a 'light adjective' (phrase-building adjectivizer):

	Mandarin	Literal English translation	Idiomatic English translation
a.	**you** daoli	have reason	reason**-able**
b.	**you** fengdu	have poise	grace**-ful**
c.	**you** jiazhi	have value	valu**-able**
d.	**you** keneng	have possibility	poss**-ible**
e.	**you** liliang	have power	power**-ful**
f.	**you** meili	have charm	charisma**-tic**
g.	**you** mingqi	have fame	fam**-ous**
h.	**you** paitou	have style	styl**-ish**
i.	**you** qifaxing	have inspiration	inspir**-ing**
j.	**you** weidao	have taste	taste**-ful**
k.	**you** wenti	have problem	problem**-atic**
l.	**you** xiwang	have hope	hope**-ful**
m.	**you** xuewen	have knowledge	knowledge**-able**
n.	**you** yisi	have meaning	interest**-ing**
o.	**you** yongchu	have use	use**-ful**
p.	**you** yongqi	have courage	courage**-ous**

Table 1: Subjective qualities in Mandarin and English

In contrast, dimensional concepts tend to be simplex and mono-morphemic in both Mandarin and English: e.g., *da* 'big', *gao* 'tall', *kuan* 'wide', and *shen* 'deep'.

Counterexamples: Mandarin complex *you zhihui* 'have wisdom' vs. English simplex *wise*; Mandarin simplex *piaoliang* vs. English complex *beauti-ful*.

Cross-linguistic tendency for subjective predicates to be lexicalized as (quality-denoting) nouns vs. objective/dimensional predicates to be lexicalized as (individual-characterizing) adjectives?

5 Conclusions and future directions

Main conclusions:

- **Positive/comparative opposition:** Positive semantics has no known morphological exponence, and one way of capturing this is to reduce positive semantics to contextual domain restriction, which is similarly covert.
- **Nominal/adjectival opposition:** All logically possible derivational patterns are attested, and capturing these patterns seems naturally to lead to truth-conditional and in some cases model-theoretic equivalence between adjectival property concept sentences and possessed nominal property concept sentences, a view convergent with Menon and Pancheva 2014; Hanink et al. 2019.
- **Property concepts and parametric variation:** Many Mandarin possessed property concept predicates have counterparts in English as derivationally complex adjectives, suggesting that the analytic/synthetic continuum is a relevant factor influencing variation in the grammar of property concepts.

A couple of future directions:

- Analytical consequences of introducing states (Baglini 2015; Wellwood 2015) or tropes (Moltmann 2009) into the ontology?
- Relevance of the contrast observed by Moltmann (2009) between absolute vs. positive nominalizations (e.g. *height* and *tallness*)?

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