

# Measurement Scales and Gradability: on the semantics of the possessive property concept construction in Mandarin Chinese\*

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## Abstract

In Mandarin Chinese, gradable predicates can be classified into two types based on their morphosyntactic features: one consisting of gradable lexemes including gradable adjectives like *gao* ‘tall’ and gradable verbs like *xihuan* ‘to like’; the other consisting of verbal phrases that contain a possessive/existential morpheme, *you*, and a bare NP (‘*you* + NP’; the possessive Property Concept construction). The goal of this paper is to provide a formal semantic analysis of the ‘*you* + NP’ construction. In particular, we show that the gradability of this construction is conditioned by the NP inside: when the NP inside denotes abstract substances (e.g., *wisdom*), ‘*you* + NP’ is gradable; if NPs denote physical objects (e.g., *apples* and *water*), ‘*you* + NP’ is non-gradable. We argue that abstract and non-abstract NPs differ in the type of measure scale they are associated with: abstract NPs are associated with an ordinal or an interval scale that lacks an absolute zero point; non-abstract NPs are associated with a ratio scale that contains such a point. The semantics of the existential/possessive morpheme *you* makes reference to the minimum degree on a scale and is sensitive to this distinction. Our analysis of ‘*you* + NP’ suggests a more fine-grained typology of scales that gradable predicates are associated with: in addition to the distinction between bounded and unbounded scales (Kennedy & McNally 2005), it is also necessary to differentiate between scales that contain an absolute zero point and those that do not.

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\* My interest on this topic started more than ten years ago in Roger’s seminar on degrees and scales, for which I wrote a term paper on it. I am very grateful to have the opportunity to return to this topic and dedicate this updated ‘term paper’ to Roger. I am deeply indebted to him for his inspirations and guidance over the years. I thank Jessica Rett and Daniel Altshuler for providing me with this opportunity. I thank Jessica Rett, an anonymous reviewer, Itamar Francez and the audience of Chicago Linguistic Society 53 for questions and comments. All remaining mistakes are my own.



- c. Zhangsan duo you zhihui?  
                   how have wisdom  
 ‘How wise is Zhangsan.’

Though sharing the same distribution, gradable VPs like *you zhihui* ‘have wisdom’ are morphosyntactically different from gradable adjectives/verbs like *gao* ‘tall’ and *xihuan* ‘to like’: the former have an internal syntactic structure, consisting of a verb, *you* ‘to have or to exist’ (ex.6) and a bare NP, while the latter are lexical items.

- (6) a. Zhangsan you yi liang zixingche.  
                   have one CL bicycle.  
 ‘Zhangsan has a bicycle.’  
 b. zhuozi shang you yi bei shui.  
    table top exist one cup water.  
 ‘On top of the table, there is a cup of water.’

It is important to note that gradable ‘*you + NP*’ phrases are not idiomatic expressions. Their syntactical productivity is evidenced by a non-exhaustive list of existing ‘*you + NP*’ phrases in Mandarin Chinese and an increasing number of newly coined ‘*you + NP*’ expressions. The table in A provides more examples of this kind.

Table A: Gradable ‘*you + NP*’ phrases in Mandarin Chinese

<b>you + NP</b>	<b>Gloss</b>	<b>Eng. Trans.</b>
you daoli	have reason	reasonable
you xuewen	have knowledge	knowledgeable
you qu	have fun	fun
you yongchu	have use	useful
you mingqi	have fame	famous
you jiazhi	have value	valuable
you ke'neng	have possibility	possible
you xiwang	have hope	hopeful
you weidao	have taste	tasteful

Moreover, speakers are creatively inventing new ‘*you + NP*’ expressions. (7) and (8) exemplify two newly coined expressions actively used by young people in China. The first one is *you ai* or *you love* ‘have love’, which means caring (when used to describe people) (7a) or cozy (when used to describe places) (7b).

- (7) New Expression 1: *you ai* or *you love* ‘have love’: caring, cozy  
 a. Zhangsan changchang bangzhu wo; ta hen you ai.  
                   often help me he very have love  
 ‘Zhangsan often helps me; he is very caring.’  
 b. Zhe ge fangjian hen you ai.  
    this Cl room very have love  
 ‘This room is very cozy.’

Another example is *you ganjue* or *you feel* ‘have feel’, which roughly means classy or unique.

- (8) New Expression 2: *you ganjue* or *you feel* ‘have feel’: classy, unique  
zhe bu dianjing de ge hen you ganjue.  
This CI movie POSS song very has feel  
‘The songs of this movie are very unique.’

(7) and (8) show that native speakers have an active knowledge of how to construct a gradable ‘you + NP’ expression, which lends strong support to their productivity.

This paper focuses on the study of the semantics of gradable ‘you + NP’ expressions. In particular, we are interested in the paradigms in (9) and (10), which show that not all NPs can combine with *you* to form a gradable predicate. The gradability of ‘you + NP’ does not correlate to the mass/count distinction of the NP inside.

- (9) a. fangzi-li you ren. <count noun>  
house-inside have people  
‘There are people inside the house.’  
b. \*fangzi-li hen you ren.  
house-inside very have people  
Int: ‘There are many people inside the house.’
- (10) a. beizi-li you shui. <mass noun>  
cup-inside water  
‘There is water inside the cup’  
b. \*beizi-li hen you shui.  
cup-inside very has water  
Int: ‘There is a lot of water inside the cup.’

Comparing the examples in (7 & 8) with those in (9b & 10b), (at least) two questions arise. First, what kind of NP is allowed to form a gradable ‘you + NP’ expression? Second, what is the semantic ingredient that conditions the gradability of ‘you + NP’ expressions? Our answers to these questions make important reference to the four-level taxonomy of measurement types—ratio-scale, interval-scale, ordinal-scale and nominal-scale measures (Stevens 1946, 1975). Specifically, we argue for a semantic distinction between NPs that denote abstract substances like *wisdom* and those that denote physical objects like *water* or *people*: the measurement scale for the former is an interval or an ordinal scale which lacks an absolute zero point, where the measurement scale for the latter is a ratio scale that contains such a point.

Francez and Koontz-Garboden (2010, 2015, 2017) make a cross-linguistic investigation on the semantics of predicates consisting of a possessive or an existential morpheme and a bare NP in languages including English, Ulwa, Hausa, etc. They refer to this type of predicate as possessive Property Concept (PC) predicates. Following them, I will refer to gradable ‘you + NP’ expressions in Mandarin Chinese as Possessive PC predicates.

The rest of the paper is structured as follows. Section 2 aims to provide an answer to the empirical question we raised above—what kind of NP is allowed in possessive PC predicates? We show that possessive PC predicates are a subset of subjective predicates in Mandarin: they are either evaluative predicates (e.g., *wise*) or predicates of personal taste (e.g., *tasty*). The NP inside the possessive PC predicate must denote abstract substances associated with scales that are not

objective physical measures. Section 3 briefly reviews Francez and Koontz-Garboden (2015, 2017)'s proposal of the possessive PC predicate in Ulwa (Misumalpan, Nicaragua). We show that directly extending their proposal to Mandarin Chinese encounter difficulties. Section 4 lays out our semantic analysis of possessive PC predicates, in which gradability falls out as a result of the interaction between the semantic of *you* and different measure scales associated with abstract and non-abstract NPs.

## 2. Subjectivity and the abstract NP

The goal of this section is to show that possessive PC predicates in Mandarin are subjective predicates: they are either evaluative predicates (e.g., *wise*) or predicates of personal taste (e.g., *tasty*). The NP inside the possessive PC predicate denotes abstract substances associated with scales that are not objective physical measures.

To support our first claim, we show that the subjectivity of possessive PC predicates can be diagnosed by the faultless disagreement test (Lasersohn 2005, Stephenson 2007)--two interlocutors disagree with one another without one of them being at fault.<sup>1</sup> Before looking at this test, it is important to differentiate three classes of predicates (Bierwisch 1989, Bylinina 2017 and references therein): dimensional adjectives (e.g., *tall*), evaluative adjectives (e.g., *wise*) and predicates of personal taste (e.g., *tasty*). Although all of them pass the faultless disagreement test in positive form (11), only the latter two pass the test in comparative form (12). Such a difference suggests that only evaluative adjectives and predicates of personal taste have lexically encoded subjectivity available in both positive and comparative forms (Kennedy 2013).<sup>2</sup>

- (11) a. Kim: John is tall.  
Anna: No, John is not tall.  
b. Kim: John is wise.  
Anna: No, John is not wise.  
c. Kim: This cake is tasty.  
Anna: No, this cake is not tasty.
- (12) a. Kim: John is taller than Mary.  
Anna: No, John is not taller than Mary.  
b. Kim: John is wiser than Mary.  
Anna: No, John is not wiser than Mary.  
c. Kim: This cake is tastier than that cake.  
Anna: No, this cake is not tastier than that cake.

Turning to possessive PC predicates in Mandarin, they pattern with evaluative adjectives and predicates of personal taste in English in that they pass the test in both positive and comparative form, suggesting that they, too, have lexically encoded subjectivity.

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<sup>1</sup> Another common diagnostic for subjectivity is to test whether a predicate can be embedded under the subjective attitude verb *find*: evaluative adjectives and predicates of personal taste can, but dimensional adjectives cannot. (Kennedy 2013). Unfortunately, I cannot find such an equivalent in Mandarin Chinese.

<sup>2</sup> Kennedy (2013) argues that the subjectivity of dimensional adjectives in positive form is encoded in the null POS morpheme that contributes a positive meaning.

- (13) a. Anna: Zhangsan you zhihui.  
                   have wisdom  
                   ‘Zhangsan has wisdom.’  
       Kim: bu dui, Zhangsan mei you zhihui.  
                   not correct NEG have wisdom  
                   ‘No, Zhangsan does not have wisdom.’  
       b. Anna: Zhangsan bi Lisi you zhihui.  
                   COMP have wisdom  
                   ‘Zhangsan has more wisdom than Lisi.’  
       Kim: bu dui, Lisi bi Zhangsan you zhihui.  
                   not correct COMP have wisdom  
                   ‘No, Lisi has more wisdom than Zhangsan.’

So where is this subjectivity encoded in possessive PC predicates? There is a strong intuition that the NP inside a possessive PC predicate must denote abstract substances associated with scales that are *not objective* physical measures (ex. *wisdom*). One clear piece of evidence in support of this intuition comes from NPs that are ambiguous between an abstract and a non-abstract meaning. For example, the word *shendu* ‘depth’ in Mandarin has both a dimensional sense (e.g., the depth of water) and an evaluative sense (e.g., the depth of understanding): while the former is associated with a conventional objective measure scale, the latter is associated with a subjective scale (i.e., the assessment of the depth of understanding is subjective). When *shendu* combines with *you* to form a possessive PC predicate, it only takes on its evaluative sense, as shown in (14) and (15).<sup>3</sup>

- (14) a. \*zheli de shui hen you shendu.  
                   here Poss water very have depth  
                   Int: ‘The water here is very deep.’  
       b. zhe pian wenzhang hen you shendu.  
                   this CL article very have depth  
                   ‘This article is very deep.’  
       (15) a. \*zheli de shui bi nali de shui you shendu.  
                   Here Poss water COMP there Poss water have depth  
                   Int: ‘the water here is deeper than the water there.’  
       b. zhe pian wenzhang bi na pian wenzhang you shendu.  
                   this CL article COMP that CL article have depth  
                   ‘This article is deeper than that article.’

Another example of this kind is the word *wenti*, which means questions or problems (troubles). While it is easy to measure the amount of questions one has in an objective manner, it is not so to measure the amount of problems (i.e., what is considered as a problem/trouble is a matter of opinion). The verbal phrase *you wenti* in (16) is ambiguous between an objective description--Zhangsan has a question, and a subjective assessment--Zhangsan is problematic. This ambiguity disappears, once it is embedded in a degree construction as shown in (17). Only the subjective reading remains.

<sup>3</sup> The intended meaning of (14a) is expressed as *zheli de shui hen shen* ‘the water here is very deep’, where adjective *shen* ‘deep’ is used.

- (16) Zhangsan you wenti.  
           have question  
 (i) Zhangsan has a question. (non-subjective)  
 (ii) Zhangsan is problematic. (subjective)
- (17) a. Zhangsan hen you wenti.  
           very have question  
 (i)\*Zhangsan has many questions. (\*non-subjective)  
 (ii) Zhangsan is very problematic. (subjective)
- b. Zhangsan bi Lisi (geng) you wenti.  
           COMP (even) have question  
 (i)\*Zhangsan has more questions than Lisi. (\*non-subjective)  
 (ii) Zhangsan is even more problematic than Lisi. (subjective)

Morphologically, NPs that bear the suffix *gan* ‘a feel of, a sense of’ can all combine with the verb *you* to form a ‘gradable’ possessive PC predicate. Table B below provides some examples of this kind.

Table B: NP bearing the suffix *gan* ‘a feel of, a sense of’

	NP- <i>gan</i>	Gloss
hen you	youmo- <i>gan</i>	humor-feel
	xingfu- <i>gan</i>	happiness-feel
	juli- <i>gan</i>	distance-feel
	anquan- <i>gan</i>	safty-feel
	qinqie- <i>gan</i>	friendliness-feel
	shuxi- <i>gan</i>	familiarity-feel

Given the above empirical facts, we assume that possessive PC predicates in Mandarin are subjective predicates and the NP inside denotes abstract substances associated with subjective measures. Then, another question arises: how does this difference affects the gradability of the possessive PC predicate in Mandarin? Before answering this question, in the following section we briefly review Francez and Koontz-Garboden (2015, 2017)’s proposal of possessive PC predicates in Ulwa (Misumalpan, Nicaragua). We show that directly extending their analysis to Mandarin Chinese does not provide a satisfactory answer for the questions we raised.

### 3. Existing proposal and its extension to Mandarin Chinese

Francez and Koontz-Garboden (2010, 2015, 2017) provide the first formal semantic analysis of possessive PC predicates. They observe that crosslinguistically there are many languages that have two types of Property Concept (PC) lexemes: PC adjectives (e.g., *wise*), and PC nominals (e.g., *wisdom*). While the former is used in canonical PC constructions that involve the copula verb (ex. *John is wise*); the latter often trigger ‘possessive strategies of predication’, in which PC nominals combine with a possessive or an existential morpheme to form a PC predicate.

TYPE	LANGUAGE	PARAPHRASE
Nominal possessive marking 'have'	Ulwa Ulwa, Huitoto, Hausa	— She has strength. She is with strength.
Existential: BEARER pivot	Hausa	There is her with strength.
Existential: PROPERTY pivot	Hausa	There is strength at her.
Existential: possessive NP pivot	Bisa	There is her strength.

TABLE 1. Possessive strategies of predication.

(Francez and Koontz-Garboden 2015, 542)

Francez and Koontz-Garboden (2015, 2017) propose that PC nominals (e.g., *wisdom*) are semantically distinct from other mass nouns (e.g., *water*). The former denote a set of ‘portions’ of substances. For instance, *wisdom* denotes a set of portions of wisdom, as shown in (18).

$$(18) \quad [[wisdom]] = \lambda p_p. \text{wisdom}(p)$$

Portions are a primitive entity (of type  $p$ )<sup>4</sup>. They are subject to a total preorder  $\leq$  (smaller than or equal to). Hence, the denotation of *wisdom* differs from that of *water* in that the latter denotes a set of water substance partially ordered by a mereological part-whole relation (Link 2002).<sup>5</sup>

$$(19) \quad [[water]] = \lambda x_e. \text{water}(x)$$

Given its semantics in (19), *wisdom* alone cannot serve as a predicate of an individual. It combines with the possessive morpheme *have* to form a Possessive PC predicate. The function of *have* is to relate individuals to portions, as shown in (20).

$$(20) \quad [[have]] = \lambda P_{\langle p, t \rangle} \lambda x \lambda D. \exists^D z [P(z) \wedge \pi(x, z)]$$

In (20),  $P$  is variable over (abstract) substances.  $\pi$  is a possessive relation.  $D$  is a variable over sets of portions; it provides a domain restriction for the existential quantifier such that the value of  $z$  is restricted to portions that count as ‘big enough’ in the context. Composing *have* with the quality NP *wisdom* and the subject *John* yields the truth-conditions for the sentence *John has wisdom*, as shown in (21).

$$(21) \quad [[John has wisdom]] = \exists^D z [\text{wisdom}(z) \wedge \pi(\text{John}, z)]$$

(21) says that the sentence is true iff there is a portion of wisdom that counts as ‘big enough’ in the context and John possesses it.

Extending Francez and Koontz-Garboden’s analysis directly to possessive PC predicates in Mandarin Chinese encounters an immediate difficulty: in Mandarin Chinese, unlike in English, possessive PC predicates are gradable: they share the same distribution with gradable adjectives in degree constructions (ex.1-5). On the standard degree-based analyses, gradable adjectives

<sup>4</sup> Francez and Koontz-Garboden (2015, 548) on footnote 19 observe: “We take portions to be a sort of individual, that is, a subtype of type  $e$ , the type of simple individuals”.

<sup>5</sup> Francez and Koontz-Garboden (2015, 454) observe that the preorder  $\leq$  preserves the mereological part-of relation, so that given a substance  $P$ , and two portions  $p, q \in P$ :  $p \subseteq q \rightarrow p \leq q$ .



denote relations between individuals and degrees (of type  $\langle d, \langle e, t \rangle \rangle$ ). For instance, gradable adjective *gao* ‘tall’ denotes a relation between an individual  $x$  and  $x$ ’s heights (22a). Composing *wisdom* in (18) with *have* in (20), however, does not yield a ‘gradable’ predicate that share the same semantic type as the gradable adjective (22b).

- (22) a.  $[[gao]] = \lambda d \lambda x. \text{height}(x) \geq d$   $\langle d, \langle e, t \rangle \rangle$   
 b.  $[[have\ wisdom]] = \lambda x \lambda D. \exists^D z [P(z) \wedge \pi(x, z)]$   $\langle \langle e, \langle p, t \rangle \rangle, t \rangle$

It would be ideal if we can modify Francez and Koontz-Garboden’s analysis to account for the possessive PC predicate in Mandarin. In the following, we will make such an attempt. The first step we take is to reinterpret Francez and Koontz-Garboden’s analysis under the degree-based framework. In fact, Francez and Koontz-Garboden (2015, 554) suggest a way to do so:

“The distinction we propose between the two kinds of PC lexemes can equally well be stated using scales, without affecting the explanation of variation between possessive and canonical PC constructions. A translation of our theory into one based on a scalar ontology could be constructed along the following lines. What we call substance-denoting PC lexemes are recast as scale-denoting PC lexemes... Possession plays the same role it does in our substance-based analysis, namely that of contributing a relation between individuals to scales.”

Under this proposal, *wisdom* has the semantics in (23a): it denotes a set of degrees on a scale of wisdom. Given that ‘*you* + NP’ predicates in Mandarin Chinese can be gradable or non-gradable, we need two semantics of *you*: one projects a degree argument, and one does not. The semantics of the gradable *you* is provided in (23b). It not only relates individuals to scales, but also contributes a degree argument such that when *you* combines with an abstract NP like *wisdom*, it returns a gradable predicate (23c).

- (23) a.  $[[zhihui]] = \lambda d_d. \text{wisdom}(d)$   
 b.  $[[you_{gradable}]] = \lambda P_{\langle d, t \rangle} \lambda d \lambda x. [P(d) \wedge \pi(x, d)]$   
 c.  $[[you\ zhihui]] = \lambda d \lambda x. [\text{wisdom}(d) \wedge \pi(x, d)]$

On the other hand, the non-gradable possessive morpheme *you<sub>non-gradable</sub>* has the semantics in (24b). When *you<sub>non-gradable</sub>* combines with a mass noun like *shui* ‘water’, the result is a non-gradable possessive predicate, as shown in (24c).

- (24) a.  $[[shui]] = \lambda x_e. \text{water}(x)$   
 b.  $[[you_{non-gradable}]] = \lambda P_{\langle e, t \rangle} \lambda x. \exists z [P(z) \wedge \pi(x, z)]$   
 c.  $[[you\ shui]] = \lambda x. \exists z [\text{water}(z) \wedge \pi(x, z)]$

As it is easy to see, the above analysis leaves several important questions open. First and foremost, the degree argument in the semantics of the gradable *you* in (24b) seems stipulative; it is not clear why the degree argument  $d$  in (23b) cannot be existentially quantified like the individual argument  $z$  in (24b). Also, an explanation is also needed to account for the subjectivity and the gradability of the possessive PC predicates, as we have seen in section 2.

## 4. Proposal

In this section, we propose a new analysis of the possessive PC predicate in Mandarin. Different from Francez and Koontz-Garboden (2015, 2017), we assume that abstract and non-abstract NPs have the same semantic denotation: they denote sets of substances (of type  $\langle e, t \rangle$ ). However, they differ in the type of measure scale they are associated with: abstract NPs like *wisdom* are associated with an ordinal or an interval-scale which does not contain an absolute zero point; non-abstract NPs like *water* are associated with a ratio-scale that contains such a point. The semantics of the verb *you* is sensitive to this distinction, thus giving rise to variation in gradability.

### 4.1 Taxonomy of measure types

Measurement theory offers four-level classification of measure types: nominal-scale, ordinal-scale, interval-scale and ratio-scale measures (Stevens 1946, 1975). Below we briefly look at each type and explain their main differences.

The first level in the classification is the nominal-scale. The main function of this measure type is to indicate the equality and inequality of two entities. No ordering is imposed on the values of a nominal scale. Examples include the truth-values {T, F} (or {1, 0}), gender selection {F, M}, and lexical categories {Nouns, Verbs, Adjectives, etc.}

The second level in the classification is the ordinal-scale. The ordinal-scale measure indicates not only the equality and inequality of entities but also their ranking (e.g., 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup>, etc.). Differences between values on an ordinal scale are not meaningful. Examples include the ranking of participants in a swimming competition (i.e., first prize, second prize, third prize, etc.).

The third level in the classification is the interval scale, where in addition to all the features of an ordinal scale, equal differences between values represent equal intervals. Also, the zero point on the scale is arbitrary and negative values can be used. Examples include the year date in calendars and temperature in the Celsius or Fahrenheit scale. The fact that the water freezing point is mapped to the 0°C is arbitrary. The freezing point does not correspond to non-existence of temperature; in fact it corresponds to 273°K.

The fourth level in the classification is the ratio scale, which has all the functions of an ordinal scale and a meaningful non-arbitrary zero. Examples are most conventional measurement scales including length, weight, age measures.

### 4.2 The gradability of ‘*you* + NP’

Abstract substances such as *wisdom* or *happiness*, unlike other physical objects, are *not* associated with conventional measurement scales. They are internal states, which make it hard to define their existence and measure units objectively (Sassoon 2010). Therefore, we assume that measure scales associated with abstract NPs (e.g., *wisdom*) are different from those associated with non-abstract NPs (e.g., *water*): the former are associated with an ordinal-scale or an interval-scale measure, while the latter are associated with a ratio-scale measure. Both scales permit a total ordering of degree values, but only a ratio-scale contains an absolute zero point.

We further assume that the semantics of the possessive or existential morpheme *you* in Mandarin Chinese makes reference to the minimum point on a scale. It indicates that the quantity of the relevant substance denoted by the NP is greater than the minimal degree  $d_{\text{minimum}}$ .

Specifically, on a ratio-scale,  $d_{\text{minimum}}$  is an absolute zero, and on an ordinal or an interval scale, it is a relative zero. This semantics is spelled out in (25).

$$(25) \quad [[\textit{you}]] = \lambda P_{\langle e, t \rangle} \lambda d \lambda x. \exists z [P(z) \wedge \pi(x, z) \wedge |z| \geq d \wedge d > d_{\text{minimum}}], \text{ where } d_{\text{minimum}} \text{ is an absolute or a relative zero on a scale.}$$

In (25), *you* composes with  $P$ —a set of substance, and yields a relation between individual  $x$  and degree  $d$  such that  $x$  possesses some  $P$ -substance whose quantity is greater than an absolute or a relative zero— $0_{a/r}$ . Below let us implement this semantics to see how it captures the gradability of possessive PC predicates.

Let us start with the non-gradable predicate *you shui* ‘have water’. The NP *shui* denotes a set of water substance that is associated with a ratio scale (26a). The possessive morpheme *you* indicates that the quantity of substance is greater than absolute zero (26b). Composing the denotation of water in (26a) with that of *you* in (26b) returns the semantics in (26c)—a relation between individual  $x$  and degree  $d$  such that  $x$  possesses a non-zero quantity of water.

$$(26) \quad \begin{array}{ll} \text{a.} & [[\textit{shui}]] = \lambda x_e. \textit{water}(x) \\ \text{b.} & [[\textit{you}]] = \lambda P_{\langle e, t \rangle} \lambda d \lambda x. \exists z [P(z) \wedge \pi(x, z) \wedge |z| \geq d \wedge d > 0_a] \\ \text{c.} & [[\textit{you shui}]] = \lambda d \lambda x. \exists z [\textit{water}(z) \wedge \pi(x, z) \wedge |z| \geq d \wedge d > 0_a] \end{array}$$

A careful examination of the formula in (26c) reveals that the last two conjuncts— $|z| \geq d \wedge d > 0_a$  are in fact redundant, as their semantics are already entailed by the logical existential quantifier— $\exists z$ , which says that there is some  $z$  whose quantity is greater than (absolute) zero. It follows that there is no need for the semantics of *you shui* to project a degree argument as the conjuncts involving the degree variable are not indeed necessary. Without the degree argument, (26c) and (27) are truth-conditionally equivalent.

$$(27) \quad [[\textit{you shui}]] = \lambda x. \exists z [\textit{water}(z) \wedge \pi(x, z)]$$

Turning to gradable possessive PC predicates, let us consider the semantics of *you zhishui* ‘have wisdom’. The NP *zhishui* ‘wisdom’ denotes a set of wisdom substance (28a), parallel to that of *shui* ‘water’ in (26a). However, unlike *shui* ‘water’, *zhishui* ‘wisdom’ is associated with an ordinal/interval scale that contains no absolute zero. When the NP composes with *you*, the latter forces a relative zero point— $0_r$  on the scale.

$$(28) \quad \begin{array}{ll} \text{a.} & [[\textit{zhishui}]] = \lambda x_e. \textit{wisdom}(x) \\ \text{b.} & [[\textit{you}]] = \lambda P_{\langle e, t \rangle} \lambda d \lambda x. \exists z [P(z) \wedge \pi(x, z) \wedge |z| \geq d \wedge d > 0_r] \\ \text{c.} & [[\textit{you zhishui}]] = \lambda d \lambda x. \exists z [\textit{wisdom}(z) \wedge \pi(x, z) \wedge |z| \geq d \wedge d > 0_r]. \end{array}$$

In (28c), the last two conjuncts— $|z| \geq d \wedge d > 0_r$  are no longer entailed by the logical existential quantifier because of relative zero— $0_r$ , which accounts for the obligatory presence of the degree argument.

Then how is the value of  $0_r$  decided on a scale? I assume that  $0_r$  is a context-dependent value like  $d_s$  in the semantics of POS<sup>6</sup>. POS is a null degree morpheme which is often assumed to be present in the positive construction (Cresswell 1976), as exemplified in (29).

- (29) The LF of *John is tall*: John is POS tall  
 a.  $[[\text{POS}]] = \lambda P_{\langle d, \langle e, t \rangle \rangle} \lambda x. \exists d [P(d)(x) \wedge d > d_s]$ , for some contextually valued standard  $d_s$ .  
 b.  $[[\text{John is POS tall}]] = \exists d [\text{tall}(d)(\text{John}) \wedge d > d_s]$

On the semantics of (29a), the sentence *John is tall* means that John's height is greater than some contextually determined standard  $d_s$ . If John is a basketball player,  $d_s$  is roughly the average height of basketball players.

If  $0_r$  in (28c) is the same as  $d_s$  in (29b), it is predicted that degree constructions with possessive PC predicates are always evaluative. This prediction is indeed borne out. Unlike gradable adjectives like *gao* 'tall', possessive PC predicates can express a positive meaning without the degree morpheme *hen*. It has been frequently observed that bare adjectives in Mandarin Chinese have a comparative meaning (Li and Thompson 1981, Sybesma 1999). The sentence in (30a) with the bare adjective *gao* 'tall' can only be appropriately used in a context where Zhangsan's height is greater than some contextually salient individual. To express a positive meaning, the degree morpheme *hen* has to be used in front of the adjective, as shown in (30b).<sup>7</sup>

- (30) a. Zhangsan      gao.  
                          tall  
                          'Zhangsan is taller (than someone salient in the context).'  
                          \*'Zhangsan is tall.'  
 b. Zhangsan      hen      gao.  
                          very      tall  
                          'Zhangsan is tall.'

In contrast to (30a), the sentence in (31) with the possessive PC predicate *you zhihui* 'have wisdom' expresses a positive meaning—Zhangsan's wisdom exceeds some contextual standard.<sup>8</sup> In the same vein, adding a negative morpheme in front of the possessive PC predicate does not mean that Zhangsan has (absolutely) no wisdom (31b); rather it means that Zhangsan's wisdom does not meet the standard. This negative form can be modified by *hen* to indicate the great distance that Zhangsan's wisdom falls below the standard (31c).

- (31) a. Zhangsan      you      zhihui.  
                          have      wisdom

<sup>6</sup> Or EVAI in Rett (2008, 2015).

<sup>7</sup> The examples in (30) leads some researchers to claim that the morpheme *hen* in Mandarin is an overt realization of the null POS morpheme in English (Liu 2010). Grano (2012) argues for an opposite view. Our analysis sides with Grano's proposal that *hen* is not an overt realization of POS.

<sup>8</sup> On the other hand, non-gradable 'you + NP' predicates like *you shui* in (i) only means that there is some water in the cup whose quantity is greater than zero.

- (i) beizi      li      you      shui.  
      cup      inside      have      water  
      'There is water in the cup.'

- ‘Zhangsan has wisdom.’
- b. Zhangsan      mei      you      zhihui  
                              Neg    have    wisdom
- ‘Zhangsan has no wisdom’
- c. Zhangsan      hen      mei      you      Zhihui.  
                              very    Neg    have    wisdom
- ‘Zhangsan does not have much wisdom.’

Other degree constructions with possessive PC predicates also carry an evaluative inference. Comparing the comparative in (32a) with that in (32b), while the former does not entail that either Zhangsan or Lisi is tall, the latter entails that both Zhangsan and Lisi have wisdom.

- (32) a. Zhangsan      bi      Lisi      gao.  
                              COMP            tall
- ‘Zhangsan is taller than Lisi.’
- b. Zhangsan      bi      Lisi      you      zhihui.  
                              COMP            have    wisdom
- ‘Zhangsan has more wisdom than Lisi.’

The fact that  $d_{\text{minimum}}$  in the semantics of *you* can sometimes be interpreted as (absolute) zero 0 and sometimes as a contextually valued standard  $d_s$  draws an interesting parallel to the semantics of the null morpheme POS in front of relative adjectives and absolute adjectives (Kennedy & McNally 2005, Kennedy 2007). Relative adjectives are vague and have context dependent interpretations. For instance, adjective *tall* is a relative adjective. As shown in (29b), the truth-value of the sentence *John is tall* can vary with respect to the contextual standard  $d_s$ . If John is a 4 year old kid, *John is tall* is true if he is compared to his peers of similar age, but false if he is compared to adults.

Absolute adjectives, on the other hand, are not vague and context-dependent. They come in two varieties. Minimum Standard absolute adjectives such as those in (33) require the arguments to possess some minimal degree of the property they describe (Kennedy 2007).

- (33) a. The gold is impure.  
       b. The table is wet.  
       c. The door is open  
       d. The rod is bent

The sentence in (33a) does not mean that the degree to which the gold is impure exceeds some context-dependent standard of impurity for gold; it simply means that the gold contains a *minimum* amount of impurity. Likewise, the sentences in (33b-d) are interpreted in the similar manner.

Maximum Standard absolute adjectives as those in (34) require their arguments to possess a maximal degree of the property in question. The sentence in (34a), for example, does not mean that the purity of the platinum is greater than some contextual standard; rather it means it is maximally pure.

- (34) a. The platinum is pure.  
       b. The floor is dry.

- c. The door is closed.
- d. The rod is straight.

Assuming that relative and absolute adjectives share the same semantics (i.e., they denote relations between individuals and degrees) and both need to combine with POS to be converted into properties of individuals,  $d_s$  in the semantics POS needs to have different values in (35): in (35a) it is a context-dependent value; in (35b) and (35c) it is a fixed standard--the minimal degree in (35b) and the maximal degree in (35c).

- (35)
- a. John is POS tall.
  - b. The gold is POS impure
  - c. The platinum is POS pure

In light of the above paradigm, Kennedy (2007) proposes the principle of Interpretive Economy to account for the different interpretations of POS in (35).

- (36) Interpretive Economy  
 Maximize the contribution of the conventional meanings of the elements of a sentence to the computation of its truth conditions.

Absolute adjectives are associated with scales that contain either a minimum or maximum (i.e., closed scales). Speakers are required to maximize the role of conventional meanings of absolute adjectives by associating  $d_s$  with either maximum or minimum elements on a scale.

It turns out that the same principle in (36) may be employed to explain different values of  $d_{\text{minimum}}$  in the semantics of *you* in (25). That is, speakers are required to associate  $d_{\text{minimum}}$  with an absolute zero to maximize the role of the conventional measure scales associated with non-abstract NPs, and to associate  $d_{\text{minimum}}$  with the contextually valued  $d_s$  for abstract NPs that are not associated with any conventional scale. In this sense, non-gradable '*you* + NP' predicates are parallel to Minimum standard absolute adjectives, and gradable '*you* + NP' predicates (Possessive PC predicates) are parallel to relative adjectives.

Our analysis of '*you* + NP' also suggests a more fine-grained typology of scales for gradable predicates. Kennedy & McNally (2005) and Kennedy (2007) argue that scales may vary with respect to boundedness properties. There are four possible variations: a scale could lack either a minimal or maximal point, it could contain a minimum but no maximum, it could contain a maximum but no minimum, or it could contain both a minimum and a maximum, as illustrated in (37).

- (37) A typology of scale structures

- |                     |        |                 |
|---------------------|--------|-----------------|
| a. (totally) open   | ○————○ | tall, expensive |
| b. lower closed     | ●————○ | wet, bent       |
| c. upper closed     | ○————● | pure, straight  |
| d. (totally) closed | ●————● | opaque, open    |

All the scale structures above do not indicate whether they contain zero or whether the minimum is zero, as Kennedy (2007) observes in footnote 28:

“A related but distinct feature that could be linguistically significant is whether a scale is bounded or unbounded. All closed scales are bounded on the relevant endpoint(s), but open scales may be further distinguished by whether they approach a value (e.g. 0) but do not include it, or whether they are completely unbounded. The representations in (i) are meant to abstract away from this distinction, so that ° could in principle mean either ‘open and bounded’ or ‘open and unbounded’.

Given our previous discussions, although possessive PC predicates and dimensional adjectives like *tall* are both associated with unbounded (open) scales, they differ in that the former are associated with completely unbounded scales that do not include zero (open and unbounded) while the latter are associated with unbounded scales that include zero (open and bounded).

## 5. Concluding remarks

To conclude, in this paper we show that there are two groups of ‘*you* + NP’ expressions in Mandarin Chinese. Although they both are made up of the possessive/existential morpheme *you* and a (bare) NP, they differ in (grammatical) gradability. Gradable ‘*you* + NP’ expressions are subjective predicates and the NP inside denotes abstract substances associated with scales that are not objective physical measures.

We propose that abstract NPs (ex. *wisdom*) and non-abstract NPs (ex. *water*) are associated with different measure scales: the former are associated with an ordinal or interval scale that does not contain an absolute zero point, whereas the latter are associated with a ratio scale that contains such a point. The semantics of *you*, which makes reference to the minimum degree on a scale, is sensitive to this distinction, thus giving rise to variation in gradability.

Our analysis of *you* in gradable and non-gradable ‘*you* + NP’ expressions draws an interesting parallel to the semantics of the null degree morpheme POS that modifies relative or (minimum standard) absolute adjectives: both contain a degree variable that can refer to either a fixed standard (i.e., absolute zero or minimum) or a contextual-dependent value. Both phenomena can be accounted for by Kennedy (2007)’s Interpretive Economy.

If our analysis of gradable/non-gradable ‘*you* + NP’ expressions in Mandarin Chinese is on the right track, it supports Sassoon (2010)’s claim that the grammar of natural language is sensitive to the distinctions of measure theory’s taxonomy of measure types. Yet, it also raises interesting questions. One of them concerns ‘differentials’. Differentials are expressions that measure the gap between two degrees on a scale (Schwartzschild 2005). On an ordinal scale, differences between values are not informative. If possessive PC predicates are associated with an ordinal scale, it is predicted that they are not licensed in degree constructions that express differences, for instance, differential comparatives. In fact, comparatives that involve possessive PC predicates in Mandarin do not allow differentials, as shown by the contrast in (38).

- (38) a. Zhangsan      bi      Lisi      gao      hen      duo.  
                                 COMP      tall      very      much  
                                 ‘Zhangsan is a lot taller than Lisi.’
- b. ??Zhangsan      bi      Lisi      you      zhihui      hen      duo.  
                                 COMP      have      wisdom      very      much  
                                 ‘Zhangsan has a lot more wisdom than Lisi.’

Nonetheless, it is still possible to compare or ask about the amount of wisdom one has (39).

- (39) a. Zhangsan de zhihui bi Lisi duo hen duo.  
          POSS wisdom COMP much very much  
          ‘Zhangsan’s wisdom is a lot more than Lisi’s wisdom.’  
      b. Zhangsan you duoshao zhihui?  
          have how.much wisdom  
          ‘How much wisdom does Zhangsan have?’

Moreover, Francez and Koontz-Garboden (2015, 2017) observe that there are many languages that have non-gradable possessive PC predicates, unlike those in Mandarin Chinese. This calls for an explanation for the cross-linguistic difference.

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