Same Type of Comparatives, But with Different Syntax and Semantics

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Abstract

Two aspects of Chinese adjectival *bi*-comparatives (*bi*-comparatives) remain underexplored. First, a critical morphosyntactic difference between bare (without differential phrases) and differential *bi*-comparatives (with differential phrases) is that the morpheme *chu*, literally meaning 'beyond/exceed', is exclusively licensed in the latter, but not in the former. Second, unlike their English counterparts, *bi*-comparatives do not freely allow measure phrases (MPs) as the standard of comparison. These observations suggest that degrees may be accessible in some constructions, but not in others. I propose that (i) bare *bi*-comparatives do not characterize an ordering of degrees, but a directed scale segment (Schwarzschild 2020); and (ii) differential *bi*-comparatives also characterize a directed segment, but it allows the mapping of the segment onto a degree specified by the differential phrase, a role fulfilled by *chu* (à la Wellwood 2015). Taken together, Chinese adjectival *bi*-comparatives may constitute a case where degrees are not encoded in the lexical semantics of gradable adjectives (GAs), but introduced via a functional morpheme (Wellwood 2015; Bochnak et al. 2020).

1 Introduction

One prominent way of constructing comparatives in Chinese involves using the morpheme *bi*, which typically signifies the comparative nature of such constructions, as schematized in (1).

(1) X *bi* Y Dimension (Differential Phrase)

Descriptively, X represents items being compared and Y represents the standard of comparison, with the dimension of comparison indicated by either gradable adjectives (GAs) or verbs. On the surface, differential phrases are generally optional. This paper will specifically focus on *bi*-comparatives that utilize GAs as the main predicate, such as (2).

(2) a. ZS bi LS **gao**.
ZS BI LS tall
'ZS is taller than LS.'

b. ZS bi LS **gao** 5-gongfen.
ZS BI LS tall 5-cm
'ZS is 5 cm taller than LS.'

I designate (2a) as '**bare *bi*-comparatives**', referring to comparative constructions without differential phrases, and (2b) as '**differential *bi*-comparatives**', which are comparative constructions that include a differential phrase indicating the extent of difference between the two compared items along a specific dimension.

Two aspects of Chinese adjectival *bi*-comparatives remain underexplored in the current literature. First, canonically, both bare and differential *bi*-comparatives do not freely allow an MP to be the standard of comparison, as in (3b) and (4b). Cross-linguistically, Chinese, like its counterpart English, is categorized as having a positive setting for the 'Degree Semantics Parameter' (DSP), which posits that 'a language {does/does not} have gradable predicate (type $\langle d, \langle e, t\rangle\rangle$ and related), i.e. lexical items that introduce degree arguments' (Beck et al. 2009:19). This parameter setting predicts that both languages exhibit expressions that refer to degrees and combine with degree operators. Specifically, (i) both English and Chinese are predicted to allow a comparison with a degree denoted by an MP, as in 'Sheldon is taller than **180 cm**'; and (ii) both are predicted to freely allow comparatives with a differential phrases, as in 'Sheldon is **5 cm** taller than Leonard'. However, the [+DSP] setting for Chinese incorrectly predicts the grammaticality of (3b) and (4b), while it correctly predicts (4a).

(3) a. ZS bi **LS** gao.
ZS BI LS tall
'ZS is taller than LS.'

b. ??/*ZS bi **180-gongfen** gao.
ZS BI 180-cm tall
Intended: 'ZS is taller than 180 cm.'

(4) a. ZS bi **LS** gao 5-gongfen.
ZS BI LS tall 5-cm
'ZS is 5 cm taller than LS.'

b. ??/*ZS bi **180-gongfen** gao 5-gongfen.
ZS BI 180-cm tall 5-cm
Intended: 'ZS is 5 cm taller than 180 cm.'

In (3a) and (4a), if we replace LS with an MP, the result is ungrammatical or seriously degraded, as in (3b) and (4b) [1]. This raises a question: **How to explain the canonical unavailability of MPs as the standard of comparison in Chinese adjectival *bi*-comparatives?** Second, despite the general surface structure sketched in (1), a critical morphosyntactic difference exists between bare and differential *bi*-comparatives: the morpheme *chu*, literally meaning 'beyond/exceed', is exclusively licensed in the latter, but not in the former, as in (5).

(5) a. *ZS bi LS gao-**chu**.
ZS BI LS tall-CHU
Intended: 'ZS is taller than LS.'

b. ZS bi LS gao-**chu** *(5-gongfen).
ZS BI LS tall-CHU 5-cm
'ZS is 5 cm taller than LS.'

The ungrammaticality of (5a) shows that *chu* is disallowed when there is no MP, whereas it can combine with a GA only when an MP is present, as in (5b), whose meaning is the same as (4a). This raises another question: **Why is the morpheme *chu* permitted in differential *bi*-comparatives but not in bare *bi*-comparatives?**

The observations above seem to suggest that degrees are accessible in some constructions, but not in others. Specifically, I propose that (i) bare *bi*-comparatives do not characterize an ordering of degrees, but a directed scale segment (Schwarzschild 2020); and (ii) differential *bi*-comparatives also characterize a directed segment, but it allows the mapping of the segment onto a degree specified by the differential phrase, a role fulfilled by the morpheme *chu* (à la Wellwood 2015). Taken together, Chinese adjectival *bi*-comparatives may constitute a case where degrees are not encoded in the lexical semantics of GAs, but introduced via a functional morpheme (Wellwood 2015; Bochnak et al. 2020).

2 Ingredients

This paper makes use of three established approaches to account for the semantics of Chinese adjectival *bi*-comparatives. First, I follow Wellwood (2015) and Cariani, Santorio, and Wellwood (2023), which interpret bare GAs as invoking state structures and expressing contextually-determined threshold properties, as in (6a). When a GA appears in comparatives, a silent morpheme DEG invokes a **bg**(**background**) function and discards the threshold properties, as in (6b). A canonical comparative construction in English is illustrated in (7).

(6) a. $[\![\text{tall}]\!]^c = \lambda s_v.s \in Dom(\langle D_{\textbf{height}}, \succcurlyeq_{\textbf{height}}\rangle).\textbf{tall}_C(s)$ b. $[\![\text{DEG}]\!]^c = \lambda P_{vt}\lambda v_v.\textbf{bg}(P,v)$

(7) a. $\text{Joe}_{[+\text{ho}]}$ is taller than $\text{Katie}_{[+\text{ho}]}$.
b. $[\![(7a)]\!]^c$ = T iff $(\exists s)(\textbf{holder}(s, j)$ & $\textbf{bg}(\textbf{tall}_C)$ & $A(\mu)(s) > \textbf{max}(\lambda d'.(\exists s')(\textbf{holder}(s', k)$ & $\textbf{bg}(\textbf{tall}_C)$ & $A(\mu)(s') > d')))$

θ-marked syntactic arguments are interpreted as properties of eventualities, which flows from the neodavidsonian framework (Champollion 2015). (7b) says that Joe is in a state in the domain of the background structure associated with the contextually-determined property of being tall, the measurement of which exceeds any such state of Katie.

[1] Concerning the availability of MPs as the standard of comparison in Chinese adjectival *bi*-comparatives, complications typically arise depending on the specific GA involved. First, for GAs associated with traditional measurement units, such as *gao* 'tall', *chang* 'long', and *kuan* 'wide', MPs may be licensed as the standard of comparison if preceding discourse provides the same MPs. Second, for GAs like *re* 'hot' and *leng* 'cold,' MPs can serve as the standard of comparison only if they represent a temperature value that meets or exceeds the contextually determined threshold. Finally, for GAs such as *kuai* 'fast' and *man* 'slow,' MPs are categorically disallowed as the standard of comparison, irrespective of the discourse context. The analysis of this restriction will be reserved for a separate research.

Second, I adopt the segmental semantics by Schwarzschild (2020), which argues that a comparative characterizes a directed segment σ, i.e., a segment of a line that has directionality, defined by a scale and two points on that scale – **START** and **END**, as illustrated by (8).

(8) a. Raj is taller than Leonard.

b. $[\![(8a)]\!]^c = (\exists\sigma)(\mathbf{END}(\sigma) = \mu_\sigma(r)\ \&\ \mu_\sigma = \text{HEIGHT}\ \&\ \nearrow(\sigma)\ \&\ \mathbf{START}(\sigma) = \mu_\sigma(l))$

(8b) says there is a rising segment starting with Leonard's height and ending with Raj's height.

Third, I take the equivalency relation by Bale (2006) as the definition for the equivalency relation for states, as in (9).

(9) $(\forall s \in D_A)((s_x \succcurlyeq_A s \Leftrightarrow s_y \succcurlyeq_A s)\ \&\ (s \succcurlyeq_A s_x \Leftrightarrow s \succcurlyeq_A s_y))$ (A for adjectives)

According to this definition, two states s_x and s_y are equivalent to each other if and only if every state to which s_x is related, s_y is also related and vice versa. Next, after forming equivalency classes by grouping all the states that are equivalent to each other into the same set, an ordering can be achieved by ranking equivalency classes according to how their members are related to one another. Namely, if the members of the equivalency class X are greater than the members of the equivalency class Y, then X is ordered above Y. Such an ordering is connected, transitive, reflexive, and anti-symmetric (cf. Bale 2006).

Overall, I take it that a segment is conceptualized as a connected region that orders equivalency classes of states. When a comparative characterizes a directed scale segment, the start and end points of this segment correspond, respectively, to two equivalency classes—each consisting of a set of states. The comparative 'a is taller than b' is to characterize a rising segment whose start point is the equivalency class containing b's height state and end point is the equivalency class containing a's height state.

3 Two Fundamental Issues

First, GAs in Chinese, despite the same surface forms, may receive different interpretations.

(10) a. ZS juede LS **gao**.
ZS believe LS tall
'ZS believes that LS is tall.'
→ LS is tall.

b. ZS bi LS **gao**.
ZS BI LS tall
'ZS is taller than LS.'
↛ ZS or LS is tall.

GA *gao* 'tall' in (10a) receives a positive reading, implying that Lisi is tall. In contrast, despite the same surface GA, (10b) does not entail that ZS or LS is tall. To capture such a property of GAs, based on Cariani, Santorio, and Wellwood (2023), I assume that there is a silent morpheme BG (background) immediately preceding the GA in *bi*-comparatives that invokes a **bg** function and helps the GA discard the threshold property, as shown in (11).

(11) a. $[\![\text{BG}]\!]^c = \lambda P_{vt}\lambda v_v.\mathbf{bg}(P,v)$ b. $[\![\text{BG } gao]\!]^c = [\![\text{BG}]\!]^c([\![gao]\!]^c) = \lambda s.\mathbf{bg}(\mathbf{tall}_C)(s)$

When a GA appears in (10b), BG inputs a property and outputs its background structure (i.e., an overall ordering of states of height, and states of being tall are part of this broader ordering).

Second, building on Liu (2018), I argue that Chinese adjectival *bi*-comparatives have an overt comparative morpheme *jiao*, as exemplified in (11).

(12) a. ZS **jiao** gao.
ZS JIAO tall
'ZS is taller than somebody.'

b. ...jiage **jiao** bi yiqian gui...
price JIAO BI previous expensive...
'...the price is more expensive than before...'

The morpheme *jiao* contributes a *greater-than* meaning to (12a), and it may occur overtly in (12b), an example extracted from the CCL corpus at Peking University. I further assume that it may be covert in examples like (2a) or (2b), represented as JIAO. It is formally defined in (13).

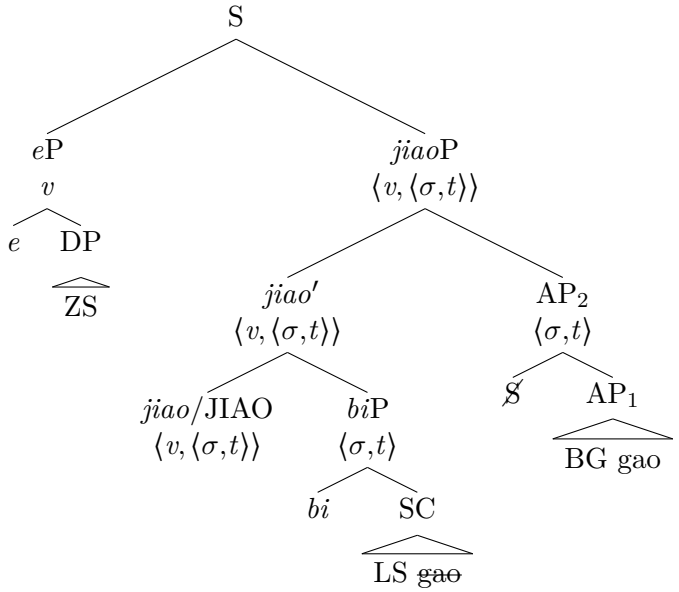
(13) $[\![jiao/\text{JIAO}]\!]^c = \lambda s\lambda\sigma.\mathbf{END}(\sigma) = s^{\smile\zeta}$ $\langle v,\langle\sigma,t\rangle\rangle$

In essence, *jiao* and its covert allomorph JIAO are semantically equivalent to *more*/*-er* in English comparatives in the sense of Schwarzschild (2020), which introduces the end point of a directed segment. According to (13), the end point of the segment corresponds to an equivalency class containing a height state held by an individual, represented as $s^{\smile\zeta}$ following Bale (2006).

4 Chinese Bare *bi*-Comparatives

Based on the two fundamental issues outlined above, I assign the structure in (14) to (2a).

(14)



Structurally, two points require clarification here. First, I take it that the comparative morpheme *jiao*/JIAO takes both *bi*P and AP as its arguments (cf. Bresnan 1973; Heim 2000; Bhatt and Pancheva 2004). Second, with the respect to the internal structure of *bi*P, following Liu (1996, 2011) and Erlewine (2018), I posit that there is an instance of AP within it, which forms a small clause with DP but is subject to obligatory deletion (Hsieh 2017). Before we proceed to interpret the structure in (14), two points are also in order. First, for *bi*, I synthesize the semantics of *than* in English comparatives, as proposed in degree-based approaches (Stechow 1984; Rullmann 1995; Kennedy 1997), with the semantics assigned to *than* in segmental semantics by Schwarzschild (2020) – the standard marker introducing the start point of a segment. Specifically, I propose that the standard marker *bi* performs two functions: (a) introducing the start point of a segment characterized by an adjectival *bi*-comparative; and (b) taking the characteristic function of a set of states and outputting the maximal state that the set maps to an equivalency class corresponding to the start point of the segment. The semantics of *bi* is formalized in (15).

(15) $[\![bi]\!]^c = \lambda g_{vt}\lambda\sigma_\sigma.\mathbf{START}(\sigma) = (\mathbf{max}(g))^{\text{-}\zeta}$

The internal structure of the *bi*P is given schematically in (16a), which is interpreted in (16b-c).

(16) a. $[_{biP}\ bi\ [_{SC}\ \text{LS}_{[+ho]}\ \sout{\text{BG } gao}]]$

b. $[\![\text{SC}]\!]^c = [\![[\text{LS}_{[+ho]}]]\!]^c\ \&\ [\![[\text{BG } gao]]\!]^c = \lambda s.\mathbf{holder}(s, l)\ \&\ \mathbf{bg}(\mathbf{tall}_C)(s)$

c. $[\![biP]\!]^c = [\![bi]\!]^c([\![\text{SC}]\!]^c) = \lambda\sigma.\mathbf{START}(\sigma) = (\mathbf{max}(\lambda s.\mathbf{holder}(s, l)\ \&\ \mathbf{bg}(\mathbf{tall}_C)(s)))^{\text{-}H}$

Second, following Schwarzschild (2020), I posit the existence of an operator $\not{S}$ (composed of an 'S' for scale and a line through it representing a segment) that combines with a GA, resulting in a predicate of segments. The operator is defined in (17).

(17) $[\![\not{S}]\!]^c = \lambda f_{vt}\lambda\sigma.\sigma \sqsubseteq \{S \subseteq f : \exists s \in f.(S = s^{\text{-}\zeta})\}\ \&\ \sigma_C$

Given a set of states, a segment is constructed from a set of equivalency classes formed out of this set of states. This can be represented as $\sigma \sqsubseteq \{S \subseteq f : \exists s \in f.(S = s^{\text{-}\zeta})\}$, which is essentially equivalent to $\sigma \sqsubseteq Dom(D_{\text{-}\zeta}, \succeq_{\text{-}\zeta})$, namely the domain of a segment consists of a set of equivalency classes of states and each equivalency class is linearly ordered. The subset relation $\sqsubseteq$ is adopted from Schwarzschild and Wilkinson (2002). σ_C is used to represent the directionality of the segment determined by contextually supplied GAs: when the operator combines with a positive GA, it introduces a predicate of a rising segment; conversely, when it combines with a negative GA, it introduces a predicate of a falling segment. Thus, AP_2 in (14) is interpreted in (18).

(18) $[\![\text{AP}_2]\!]^c = [\![\not{S}]\!]^c([\![[_{\text{AP1}}\text{BG gao}]]\!]^c) = \lambda\sigma.\sigma \sqsubseteq Dom(D_{\text{-}H,\succeq_{\text{-}H}}) \;\&\; \nearrow(\sigma)$ $\langle\sigma, t\rangle$

With all the requisite assumptions in position, the interpretation of (14) is derived in (19).

(19) a. $[\![jiao\text{P}]\!]^c = ([\![\text{JIAO}]\!]^c \;\&\; [\![bi\text{P}]\!]^c) \;\&\; [\![\text{AP}_2]\!]^c = \lambda s_1\lambda\sigma.\mathbf{END} = s_1{}^{\text{-}H} \;\&\; \mathbf{START}(\sigma) = (\mathbf{max}(\lambda s.\mathbf{holder}(s, l) \;\&\; \mathbf{bg}(\mathbf{tall}_C)(s)))^{\text{-}H} \;\&\; \sigma \sqsubseteq Dom(D_{\text{-}H,\succeq_{\text{-}H}}) \;\&\; \nearrow(\sigma)$

b. $[\![e\text{P}]\!]^c = [\![e]\!]^c([\![\text{ZS}_{[+\text{ho}]}]\!]^c) = [\lambda P_{vt}.\epsilon s_1(P(s_1)](\lambda s.\mathbf{holder}(s, z)) = (\epsilon s_1)(\mathbf{holder}(s_1, z))$

c. $[\![\text{S}]\!]^c = [\![jiao\text{P}]\!]^c([\![e\text{P}]\!]^c) = \lambda\sigma.\mathbf{END} = ((\epsilon s_1)(\mathbf{holder}(s_1, z)))^{\text{-}H} \;\&\; \mathbf{START}(\sigma) = (\mathbf{max}(\lambda s.\mathbf{holder}(s, l) \;\&\; \mathbf{bg}(\mathbf{tall}_C)(s)))^{\text{-}H} \;\&\; \sigma \sqsubseteq Dom(D_{\text{-}H,\succeq_{\text{-}H}}) \;\&\; \nearrow(\sigma)$

Some clarification is required at this point. First, there exists a type mismatch between *jiao* and *bi*P, as well as between *jiao′* and AP_2. This mismatch can be resolved by applying the 'Segment Identification' rule (Schwarzschild 2020:237), which is reformulated in (20).

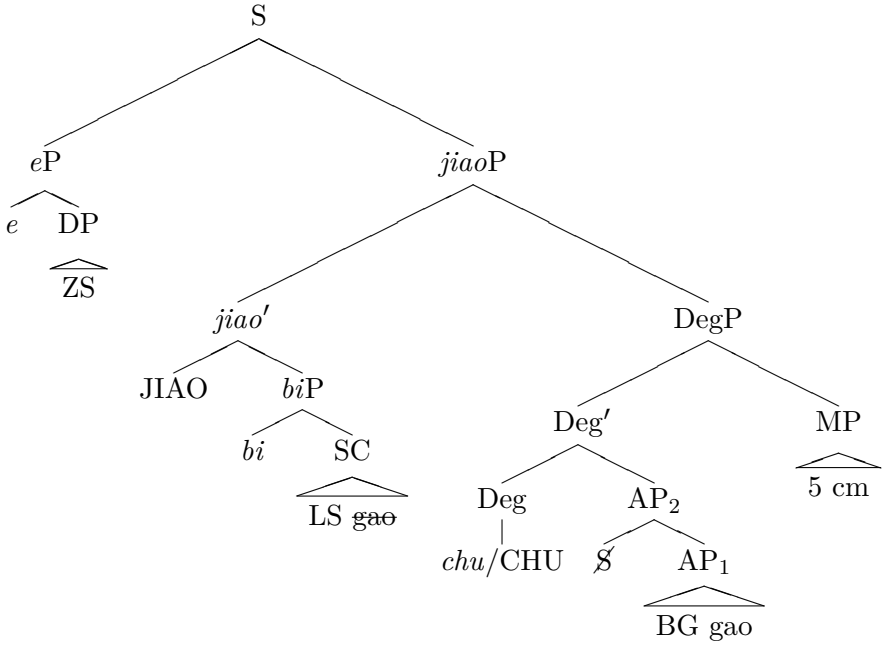
(20) **Segment Identification** (states-based verison)
'Let α be a node with two daughters, β and γ. Let β be of type $\langle v,\langle\sigma,t\rangle\rangle$ and γ be of type $\langle\sigma,t\rangle$, then $[\![\alpha]\!]^{g,c} = \lambda v\lambda\sigma.[\![\beta]\!]^{g,c}(v)(\sigma) \;\&\; [\![\gamma]\!]^{g,c}(\sigma)$.'

Following this rule, *jiao* and *bi*P, as well as *jiao′* and AP_2, combine intersectively, as illustrated in (19a) and (19b), respectively. Second, I assume that DP *ZS* combines with a silent indefinite determiner *e* (interpreted using ϵ operator), which is the indefinite counterpart of ι and does not presuppose uniqueness (see Heusinger 1997). This is explicated in (19b). It is crucial to note that the state held by ZS must be commensurate with the state held by LS in (19c), namely the start and end points of the segment characterized by the *bi*-comparative must both correspond to equivalency classes consisting solely of height states. Putting everything together, (14) has the logical form in (19c). This interpretation is true just in case there is a rising segment that begins with an equivalency class containing the height state held by LS and ends with an equivalency class containing the height state held by ZS. Thus, bare adjectival *bi*-comparatives characterize a directed segment by accessing equivalency classes of sets of states held by individuals, which directly blocks degree-denoting MPs as the standard of comparison.

5 Differential *bi*-Comparatives

One crucial morphosyntactic distinction between bare and differential *bi*-comparatives lies in the possible occurrence of the morpheme *chu* 'beyond/exceed' in the latter. To characterize the role of *chu* in differential *bi*-comparatives, I follow Gu and Guo (2015) and argue that *chu* (or its covert allomorph CHU) is a functional morpheme acting as Deg head that projects a Degree Phrase in the structure. I assign the structure in (21) to (2b).

(21)



To interpret the structure in (21), I follow Grano and Kennedy (2012) and argue that the morpheme *chu*/CHU is a functional morpheme that introduces a degree argument, namely mapping a segment onto a degree, based on the idea that degrees are intervals (Schwarzschild and Wilkinson 2002). *chu*/CHU is formally defined in (22) below in which Σ is a variable ranging over a set of segments.

(22) $[\![chu/\text{CHU}]\!]^c = \lambda\Sigma_{\sigma t}\lambda \boldsymbol{d}\lambda\sigma.\Sigma(\sigma)\ \&\ \mu(\sigma) \geq \boldsymbol{d}$

Based on the definition in (22), (21) is interpreted in the following.

(23) a. $[\![\text{Deg}']\!]^c = [\![\text{Deg}]\!]^c([\![\text{AP}_2]\!]^c) = \lambda d\lambda\sigma.\sigma \sqsubseteq Dom(D_{\text{-}H,\succeq\text{-}H})\ \&\ \nearrow(\sigma)\ \&\ \mu(\sigma) \geq d$

b. $[\![\text{DegP}]\!]^c = [\![\text{Deg}']\!]^c([\![\text{MP}]\!]^c) = \lambda\sigma.\sigma \sqsubseteq Dom(D_{\text{-}H,\succeq\text{-}H})\ \&\ \nearrow(\sigma)\ \&\ \mu(\sigma) \geq \textbf{5 cm}$

c. $[\![\text{S}]\!]^c = [\![jiao\text{P}]\!]^c([\![e\text{P}]\!]^c)$
$= \lambda\sigma.\textbf{END} = ((\epsilon s_1)(\textbf{holder}(s_1,\ z)))^{\text{-}H}\ \&\ \textbf{START}(\sigma) = (\textbf{max}(\lambda s.\textbf{holder}(s,\ l)\ \&\ \textbf{bg}(\textbf{tall}_C)(s)))^{\text{-}H}\ \&\ \sigma \sqsubseteq Dom(D_{\text{-}H,\succeq\text{-}H})\ \&\ \nearrow(\sigma)\ \&\ \mu(\sigma) \geq \textbf{5 cm}$

Note that there is a type mismatch between *jiao*′ ($\langle v, \langle\sigma,\ t\ \rangle\rangle$) and DegP ($\langle\sigma,\ t\rangle$), which would be resolved by the 'Segment Identification' rule described in (20). Given the projection of DegP headed by the morpheme *chu*/CHU in the syntax of differential *bi*-comparatives, as in (21), the interpretation of differential *bi*-comparatives, to some extent, diverges from that of bare *bi*-comparatives. This distinction is elucidated in (23a-b), in which it is demonstrated that the Deg head introduces a degree argument. The syntactic structure above DegP is interpreted in a manner consistent with the analysis provided in (19). In a word, the differential *bi*-comparative in (21) has the logical form in (23c), which says that it is true just in case there is a rising segment that starts with an equivalency class containing LS's height state, ends with an equivalency class containing ZS's height state, and is measured 5 cm. The core idea is that a pivotal difference between bare and differential *bi*-comparatives lies in the accessing of degrees facilitated by a functional morpheme in the latter. That is why *chu*/CHU can only occur in differential *bi*-comparatives. Overall, differential *bi*-comparatives build a directed segment based on equivalency classes of sets of states and access degrees indirectly via the functional morpheme which maps the segment onto a degree. This rules out the permissibility of having a direct comparison with a degree, given that MPs directly predicate of degrees (Schwarzschild 2005).

6 Conclusion

From a descriptive point of view, two defining features of Chinese adjectival *bi*-comparatives have been underexplored: (a) the canonical prohibition against MPs from serving as the standard of comparison both in bare and differential *bi*-comparatives; and (b) the exclusive licensing of the morpheme *chu* in differential *bi*-comparatives. Building on these observations, I propose that the *bi*-phrase, which functions as the standard phrase, characterizes an ordering of equivalency classes whose ordering base is states (Wellwood 2015). This semantic constraint inherently precludes degree-denoting MPs from serving as the standard of comparison in both bare and differential *bi*-comparatives. I further argue that degrees in Chinese adjectival *bi*-comparatives are accessed indirectly, i.e., via a functional morpheme. This may potentially offer support for some cross-linguistic patterns observed by Bochnak et al. (2020) which argues that a range of functional morphemes, such as comparative morphemes and degree modifiers, introduce degrees. However, as briefly noted in footnote 1, there are cases where MPs can serve as the standard of comparison when certain GAs function as the main predicate of comparison, provided appropriate discourse contexts are established. The semantics proposed here aims to provide a foundation for future research to explore the sources of variation in the restrictions on MPs as standards of comparison.

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