

Mandarin bare indefinites¹

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Abstract. The recent literature on bare nouns in articleless languages suggests that they are subject to cross-linguistic variation. In this paper, we add Mandarin bare nouns to the debate. We identify a hitherto unnoticed restriction on their indefinite readings in object position and argue that it is related to the notion of *stereotypicality*. We develop a formal analysis of stereotypical verb-noun combinations, and show how it allows us – in combination with the independently motivated assumption that Mandarin *yī* ‘one’ is developing into an indefinite article – to derive the relevant restriction. We conclude that Mandarin bare nouns cannot freely take on indefinite readings and that Mandarin can no longer be considered a run-of-the-mill articleless language.

Keywords: Mandarin, bare nouns, (in)definiteness, stereotypicality

1. Introduction

A popular view on bare nouns (BNs) in articleless languages is that they freely take definite and indefinite readings (Chierchia, 1998). Dayal (2004) argues that that this view can be maintained for bare plurals (BPs) but not for bare singulars (BSs): Hindi BSs only allow for definite readings. Borik (2016) adds another piece to the puzzle and argues that Russian BSs do allow for indefinite readings (see also – among others – Geist, 2010). The opposition between Hindi and Russian entails that BNs in articleless languages are not created equal and that we need to go beyond surface-level observations to get a better grip on the data and the underlying generalizations. In this paper, we add Mandarin BNs to the debate. We identify a hitherto unnoticed restriction on their indefinite readings, propose a formal analysis, and discuss its implications for BNs in Mandarin and for the bigger cross-linguistic picture.

The paper is set up as follows. Section 2 introduces the relevant restriction on indefinite readings of Mandarin BNs, Sections 3 and 4 develop our analysis and in Section 5, we conclude and reflect on the implications of our analysis for our understanding of BNs in Mandarin and across languages.

2. Mandarin BNs and their indefinite readings

Examples like (1) are in line with the standard view that Mandarin – being an articleless language – allows for its BNs to take on definite and indefinite readings. We compare (1) with (2) and observe that *diànyǐng* ‘movie’ and *tǎlóu* ‘tower’ both allow for a definite reading but that only *diànyǐng* allows for an indefinite reading: to get an indefinite reading for *tǎlóu*, we need to add the numeral *yī* ‘one’ and the relevant classifier (3). With the contrast between (1)

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and (2), we identify a hitherto unnoticed restriction that targets the indefinite readings of Mandarin BNs.

- (1) *Wǒ zài kàn diànyǐng.*
 I ASP see movie
ok ‘I’m watching a movie.’
ok ‘I’m watching the movie.’

- (2) *Wǒ zài kàn tǎlóu.*
 I ASP see tower
 # ‘I’m watching a tower.’
ok ‘I’m watching the tower.’

- (3) *Wǒ zài kàn yī-zuò tǎlóu.*
 I ASP see one-CLF tower
 ‘I’m watching a tower.’

We note that *diànyǐng* and *tǎlóu* both occur as objects. The restriction on indefinite readings of BNs that we are after is thus different from the well-documented syntactic restriction on indefinite readings of BNs in subject position (Cheng & Sybesma, 1999). Our focus will consequently be on BNs in object position. We further note that the availability of definite readings for Mandarin BNs has also been under debate recently (see, e.g., Jenks, 2018). With Bremmers, Liu, van der Klis and Le Bruyn (2021), we maintain that Mandarin BNs in general do allow for definite readings and focus on the (un)availability of their indefinite readings. The final restriction that we build in, is to focus on contexts for which we can replicate the full paradigm in (1) to (3), viz. those in which the BNs have singular (count) referents and the numeral *yī* followed by the relevant classifier is a viable alternative for marking indefiniteness.

With our empirical focus in place, our main research questions are (i) what the relevant restriction is that distinguishes (1) from (2) and (ii) how to derive it. We tackle the first question in Section 3 and the second in Section 4.

3. Accounting for the data: identifying the restriction

The sole difference between (1) and (2) is the object noun: *diànyǐng* ‘movie’ vs. *tǎlóu* ‘tower’. The same type of contrast, however, surfaces when we do not vary the object noun but the verb:

- (4) *Wǒ chuān-zhe lán sè qúnzi.*
 I wear-ASP blue dress
ok ‘I’m wearing a blue dress.’
ok ‘I’m wearing the blue dress.’

- (5) *Wǒ ná-zhe lànsè qúnzi.*
 I hold_up-ASP blue dress
 # ‘I’m holding up a blue dress.’
ok ‘I’m holding up the blue dress.’
- (6) *Wǒ ná-zhe yī-jàn lànsè qúnzi.*
 I hold_up-ASP one-CLF blue dress
 ‘I’m holding up a blue dress.’

The contrast between (4) and (5) is the same as the one between (1) and (2): whereas the object in (4) allows for both a definite and an indefinite reading, the object in (5) only allows for a definite reading and requires the addition of the numeral *yī* with the relevant classifier to bring out the indefinite reading (6). However, where (1) and (2) differ in the object noun, (4) and (5) differ in the choice of verb: *chuān* ‘wear’ vs. *ná* ‘hold up’.

The fact that the contrast between (1) and (2) is replicated in (4) and (5) but that it is the variation in the verb that drives the contrast rather than the variation in the noun, leads us to assume that the relevant restriction is to be situated neither at the level of the object noun (N) nor at the level of the verb (V) but at the level of the combination of the two (VN). The first research question we introduced above therefore amounts to capturing what it is that distinguishes VN combinations like WATCH MOVIE and WEAR DRESS from VN combinations like WATCH TOWER and HOLD UP DRESS. We write these VN combinations in English and in small caps to reflect our working assumption that what distinguishes them does not depend on the Mandarin verbs and nouns *per se* but on their semantics.

We hypothesize that the relevant difference between VN combinations allowing for indefinite readings of BNs and those imposing a definite reading is to be related to the notion of *stereotypicality* (see, among others, Aguilar-Guevara & Zwarts, 2013). At an intuitive level, we hope it is clear to the reader that watching is something we typically do with movies but not with towers and that what we typically do with dresses is to wear them, not to hold them up. In more linguistic terms, we propose to define stereotypical VN combinations as those in which the verb picks up on a relation that is included in the object noun. In the remainder of this section, we develop the relevant bits of this definition and show that it allows us to classify WATCH MOVIE and WEAR DRESS as stereotypical VN combinations and WATCH TOWER and HOLD UP DRESS as non-stereotypical VN combinations. In Section 4, we will then tackle the question how stereotypicality plays a role in the availability of indefinite readings of Mandarin BNs.

The first bit of our definition of stereotypical VN combinations that we develop further is concerned with the relations included in object nouns. We assume nouns come with a broad set of relations linking their sortal and relational arguments. These include the ones that are standardly assumed to be part of relational nouns (Barker, 1992) but also those that come with their QUALIA structure (Pustejovsky, 1995).

Relational nouns are nouns like *son* whose definition requires reference to two individuals:

- (7) $\llbracket \text{SON} \rrbracket = \lambda z \lambda x (\text{son_of}(z)(x))$

In (7), z is the relational argument and x the sortal argument. In English, the relational argument of relational nouns can be realized by – among others – the *of*-genitive. In the case of *son*, this argument identifies the parent (e.g., *Mary* for *son of Mary*). However, not all nouns are relational in the strict sense that they come with an explicit relational argument as in (7). Taking the noun *dress* as an example, defining what a dress is in no way requires reference to more than the object itself. The basic semantics of *dress* can thus be defined as in (8):

$$(8) \quad \llbracket \text{DRESS} \rrbracket = \lambda x(\text{dress}(x))$$

In English, the opposition between relational and non-relational nouns has been tied to the felicity of the *of*-genitive (Barker, 1992): whereas relational nouns straightforwardly combine with the *of*-genitive, non-relational nouns rely more on the prenominal genitive. A noun like *dress* would then felicitously appear in configurations like *Mary's dress* but configurations like *the dress of Mary* would – all other things being equal – be less felicitous.

We leave the opposition between the prenominal and the *of*-genitive aside and turn to a more important observation for our present purposes, *viz.* that non-relational nouns like *dress* do combine with genitives and that the interpretation of the genitive is automatically geared in certain directions. In our *dress* example, *Mary's dress* can for instance straightforwardly be interpreted as referring to the dress that Mary is wearing. We follow Pustejovsky (1995) in assuming that the knowledge that guides us towards interpretations like these is encoded in the lexicon. The specific proposal Pustejovsky makes is that nouns do not only come with their standard semantics of the type in (8) but also with a more elaborate semantics including information on what the objects denoted by the noun typically consist of/are part of, what they are typically used for, and how they typically come into being. Pustejovsky refers to these different pieces of information as – respectively – the constitutive, telic, and agentive QUALIA.² For our *dress* example, these QUALIA would specify the parts of a dress (bodice, sleeve, skirt, ribbon, etc.) as well as the fact that dresses are part of an outfit, that they are made for wearing and that they only exist after someone has made them. Zooming in on the telic and the agentive QUALIA of *dress*, (9) presents a possible formalization in the notation typically used in QUALIA Theory.³

$$(9) \quad \begin{array}{ll} \text{telic QUALE} & \text{wear } (y, *x*) \\ \text{agentive QUALE} & \text{make } (z, *x*) \end{array}$$

The argument x marked with the asterisks corresponds to the sortal argument x in (8). The arguments y and z are extra arguments that are introduced in the QUALIA structure and are related to the sortal argument through the *wear* and *make* relations. Given that y and z stand in a relation to the sortal argument x , we consider them relational arguments. At the same time, we acknowledge that these relational arguments cannot have the same status as those of relational nouns (Barker, 1992) and we analyze them as implicit relational arguments.

² We follow Vikner & Jensen (2002) in assuming that the constitutive QUALE contains information on what the objects denoted by the noun typically consist of and belong to. Strictly speaking, this is an extension of the original proposal by Pustejovsky who assumes the constitutive QUALE only contains information on what the objects denoted by the noun consist of.

³ We leave aside event variables as they do not interact with the analysis we will be developing in Section 4.

Following Le Bruyn, Swart and Zwarts (2016), we formalize these as dynamically existentially closed-off arguments. Integrating y into the semantics in (8) then looks as follows:

$$(10) \llbracket \text{DRESS} \rrbracket (I^{st} \text{ version}) = \lambda x \mathcal{E} y (\text{dress}(x) \& \text{wear}(x)(y))$$

In Section 4, we develop a formally more precise version but for our present purposes, the sketch in (10) will do. We assume that \mathcal{E} is the dynamic existential quantifier as it is used in Dynamic Montague Grammar (Groenendijk & Stokhof, 1990; Dekker, 1993). In (10), it closes off the relational argument y that stands in the *wearer* relation to the sortal argument x . By closing off y by a dynamic existential quantifier, we make sure that it does not have the same status as the relational argument z in (7) while at the same time guaranteeing that it remains available for (dynamic) binding. The relevance of keeping y available for binding will be explained in detail in Section 4.

We have now fixed our assumptions about relations included in object nouns. These relations hold between the noun's sortal argument and its explicit or implicit relational arguments. Relational nouns come with explicit relational arguments whereas non-relational nouns come with implicit relational arguments related to their QUALIA structure. With these assumptions in place, we can move on and explain what we mean when we say that a verb picks up on a relation included in its object noun.

Let us take WEAR DRESS as an example and start from a standard semantics for WEAR:

$$(11) \llbracket \text{WEAR} \rrbracket = \lambda x \lambda y (\text{wear}(x)(y))$$

On the semantics in (11), the transitive verb WEAR establishes a relation between two arguments and identifies its object argument as the *wearee* and its subject argument as the *wearer*. For WEAR DRESS, we say that WEAR picks up on the relation included in its object noun because two conditions are fulfilled. The first condition is that the noun itself is (implicitly) relational and also identifies *wearee* and *wearer* arguments (see (10)). The second condition is that the *wearee* and *wearer* arguments of the noun end up as the *wearee* and *wearer* arguments of the verb. For WEAR DRESS, this means that the sortal argument of the noun (its *wearee* argument) ends up referring to the same entity as the *wearee* object argument of the verb and that the relational argument of the noun (its *wearer* argument) ends up referring to the same entity as the subject *wearer* argument of the verb. More generally, we say that a verb picks up on the relation included in its object noun if its subject and object arguments end up referring to the same entities as the object noun's relational and sortal arguments and if the relation it establishes between these entities is the same as the one established by its object noun.

We can now go back to our definition of stereotypical VN combinations and confirm that it allows us to classify the relevant VN combinations, which we introduced at the beginning of this section: WATCH MOVIE, WEAR DRESS, WATCH TOWER and HOLD UP DRESS. Our definition states that VN combinations count as stereotypical if the verb picks up on a relation included in the object noun. For WEAR DRESS, we have established that this is the case, and we can straightforwardly classify it as stereotypical. The classification of WATCH MOVIE is also straightforward: MOVIE arguably comes with an implicitly relational argument that is related to its sortal argument by the *watcher* relation. The relational *watcher* argument of MOVIE will then

end up referring to the same entity as the subject *watcher* argument of WATCH, and the sortal *watchee* argument of MOVIE will end up referring to the same entity as the object *watchee* argument of WATCH. We conclude that WATCH MOVIE can be classified as a stereotypical VN combination on a par with WEAR DRESS. For the two other VN combinations – WATCH TOWER and HOLD UP DRESS – we argue that they should be classified as non-stereotypical according to our definition. TOWER is a non-relational noun and its QUALIA arguably do not contain a *watch* relation. The same holds for HOLD UP DRESS: DRESS is an implicitly relational noun, but the relations included in its QUALIA arguably do not include the *hold up* relation. We conclude that WATCH TOWER and HOLD UP DRESS count as non-stereotypical VN combinations on our definition and can thus be differentiated from the stereotypical VN combinations WEAR DRESS and WATCH MOVIE.

In this section, we have defined stereotypical VN combinations as those in which the verb picks up on a relation in the noun. In Section 4, we turn to the question how stereotypicality ends up playing the role it plays in the availability of indefinite readings of Mandarin BNs ((1)-(6)). As our answer unfolds, we will also address a question that we have left pending in the current section, *viz.* whether stereotypical VN combinations always rely on implicitly relational nouns or whether run-of-the-mill relational nouns like SON can also appear in them.

4. Accounting for the data: deriving the restriction

The analysis we work out proceeds in two steps. The first is to provide a precise compositional formalization of what it means for a VN combination to be stereotypical (4.1). The second is to show how this formalization gives us a straightforward handle on the role of stereotypicality in the availability of indefinite readings of Mandarin BNs (4.2).

4.1. Formalizing stereotypicality

The definition of stereotypical VN combinations we presented in Section 3 requires the verb and the noun to share their arguments and to establish the same relation between them. Rather than simply positing these requirements, we want our analysis of stereotypical VN combinations to derive them. Our running example will be WEAR DRESS. We set the stage by establishing what a standard derivation of WEAR DRESS looks like. In (12), we work out this derivation with the semantics of WEAR in (11) and a variant of the semantics of DRESS in (10) with a statically existentially closed-off relational argument.

- (12) $\llbracket \text{WEAR DRESS} \rrbracket =$
- | | | |
|----|---|---|
| a. | $\lambda x \lambda y (\text{wear}(x)(y)) \quad \lambda x \exists z (\text{dress}(x) \& \text{wear}(x)(z))$ | type clash |
| b. | $\lambda R_{\langle e, \langle e, t \rangle \rangle} \lambda y \exists x \exists z (R(x)(y) \& \text{dress}(x) \& \text{wear}(x)(z))$ | \exists type shift of DRESS |
| c. | $\lambda y \exists x \exists z (\text{wear}(x)(y) \& \text{dress}(x) \& \text{wear}(x)(z))$ | λ-conversions |

Combining WEAR on its standard $\langle e, \langle e, t \rangle \rangle$ semantics with an $\langle e, t \rangle$ semantics of DRESS leads to the type clash in (12a). This type clash can be resolved with an existential type shift that we implement in (12) in such a way that DRESS can take transitive WEAR as its argument. For our present purposes, it is immaterial whether this shift is realized covertly or overtly. After

combining (12b) with WEAR and carrying out the relevant conversions, the result is as in (12c). We observe that (12c) neatly formalizes the sharing of arguments between the noun and the verb for their *wearee* argument x . However, their *wearer* arguments z and y are formally independent and there is no way to directly equate them to each other. We also observe that the predicates in the first and third conjunct in (12c) happen to be the same but that this identity is not enforced or even established anywhere in the derivation. We conclude that (12c) does not directly implement the requirements for WEAR DRESS to count as a stereotypical VN combination. More generally, there is nothing in the derivation that allows us to identify it as the derivation of a stereotypical VN combination and distinguish it from the derivation of a non-stereotypical VN combination.

In this section, we propose an enriched semantics for nouns and verbs that leads to a converging derivation for pairs of verbs and nouns that make up stereotypical VN combinations, and to a derivation that crashes for pairs of verbs and nouns that make up non-stereotypical VN combinations. We start with the semantics of nouns, and then move to the semantics of verbs. For nouns, we adopt their standard semantics and merely work out the dynamic analysis we sketched in Section 3. For verbs, there will be real differences between their standard semantics and the one we develop for when they occur in stereotypical VN combinations. These differences are concerned with their argument structure and the way their lexical content is realized. It is good for the reader to keep in mind that the requirements on stereotypical VN combinations we identified in Section 3 were formulated on the basis of the standard semantics of verbs. Given that we change their argument structure and the way their lexical content is realized, notions like *wearee argument of the verb* and *relational information conveyed by the verb* will at some point no longer make sense in our analysis. At that point, we will reformulate the requirements on stereotypical VN combinations at a higher level of abstraction. This reformulation will lead us – at the end of this section – to reconsider the extent of the class of stereotypical VN combinations and argue that it is broader than the original formulation of the requirements might lead us to believe.

We start by defining the semantics of nouns in stereotypical VN combinations. As we indicated above, we take this semantics to be standard but reformulate it dynamically. In (10), we already proposed a sketch of a dynamic analysis for DRESS. In (13), we turn this sketch into its final formally precise version:

$$(13) \quad \llbracket \text{DRESS} \rrbracket (\text{final version}) = \lambda x \mathcal{E} d_1 (\uparrow \text{dress}(x); \uparrow \text{wear}(x) (\uparrow d_1))$$

The general format of (13) is close to that in (10). As we indicated before, \mathcal{E} is the dynamic version of the existential operator as it is used in Dynamic Montague Grammar. In the same vein, $;$ is the dynamic version of $\&$. Next to regular variables like x , (13) also brings in a new type of variable represented by d_n , where d stands for *discourse marker*. For the purposes of this paper, it suffices to note that d s with subscripts were introduced in Dynamic Montague Grammar to make a notational distinction between functional and content material. Variables that are abstracted over count as functional, and will therefore be represented by regular variables. Subscripted variables like d_l are bound by dynamic quantifiers and count as content material in the sense that they do not have to undergo any further operation to be interpretable within a proposition. The final notational difference between (10) and (13) is the addition of up arrows. Their role is to mark the shift from static expressions to dynamic ones. We follow

standard practice in making this shift explicit for discourse markers and predicate constants but leaving it implicit for all functional material.

With the semantics in (13) in place, we can develop a special semantics for WEAR that allows it to equate its *wearer* argument to the *wearer* argument of DRESS. It is this semantics that we assume comes into play in stereotypical VN combinations. To signal the special status of WEAR in these combinations, we refer to it as WEAR_{ST}. A crucial ingredient of WEAR_{ST} is the explicitation operator proposed by Le Bruyn et al. (2016), who, in turn, build on Dekker (1993).

We define the explicitation operator – *EXPL* for short – as follows:

$$(14) \quad \llbracket \text{EXPL}(P) \rrbracket = \lambda y \lambda x (\uparrow P(x); \uparrow d_n \equiv y) \text{ iff } P \text{ has an implicit argument } d_n, \text{ where } n \text{ ranges over } i, ii, \text{ etc.;} \\ \text{undefined otherwise.}$$

The input for EXPL is a one-place predicate with a sortal argument x and an implicitly relational argument d_n . Its output is a two-place predicate in which the implicitly relational argument d_n is made explicit through dynamic equation (\equiv) to the variable y that is abstracted over. The effect of EXPL on non-relational nouns with an implicitly relational argument is illustrated in (15) for DRESS.

$$(15) \quad \llbracket \text{EXPL}(\text{DRESS}) \rrbracket = \lambda y \lambda x \mathcal{E}d_1(\uparrow \text{dress}(x); \uparrow \text{wear}(x)(\uparrow d_1); \uparrow d_1 \equiv y)$$

What (15) shows, is that EXPL(DRESS) comes out as a full-fledged relational expression with a sortal *wearee* argument x that belongs to the set of dresses and a relational *wearer* argument y . The crucial ingredient is the equation of $\uparrow d_1$ and y . This equation would be impossible if the *wearer* argument of DRESS were closed off by a static existential operator. By closing it off with a dynamic existential operator, we make sure that we can dynamically equate it to y and make it available for subsequent binding.

The special semantics we propose for WEAR_{ST} comes with a built-in version of EXPL. (16) presents a first version of the semantics we have in mind. (17) further spells out the result of combining it with the semantics of DRESS in (13).

$$(16) \quad \llbracket \text{WEAR}_{\text{ST}} \rrbracket (I^{\text{st}} \text{ version}) = \lambda P \lambda y \mathcal{E}d_2((\text{EXPL}(P))(y)(\uparrow d_2); \uparrow \text{wear}(\uparrow d_2)(y))$$

$$(17) \quad \llbracket \text{WEAR}_{\text{ST}} \text{ DRESS} \rrbracket (I^{\text{st}} \text{ version}) = \\ \lambda y \mathcal{E}d_2 \mathcal{E}d_1(\uparrow \text{dress}(\uparrow d_2); \uparrow \text{wear}(\uparrow d_2)(\uparrow d_1); \uparrow d_1 \equiv y; \uparrow \text{wear}(\uparrow d_2)(y))$$

Let us start with (17). What we see there is that combining the semantics of WEAR_{ST} in (16) with that of DRESS in (13) allows us to equate the *wearer* argument $\uparrow d_1$ of DRESS to the *wearer* argument y of WEAR_{ST}, as desired. This means that the semantics we have now captures the sharing of the *wearer* arguments of the noun and the verb. Given that EXPL is undefined if there is no implicit argument to equate y to, the semantics of WEAR_{ST} in (16) furthermore derives the sharing of these arguments as a requirement. In this sense, the semantics of (16) already brings us very close to what we need the semantics of a verb in a stereotypical VN combination to look like. There is more work to be done, though. Indeed, even though the identity of the second

and fourth conjunct in (17) makes it clear that the verb contributes the same relational information as the noun, nothing in the semantics of $WEAR_{ST}$ in (16) requires the identity of the relational information in these conjuncts.

Before we develop the semantics of $WEAR$ further so as to implement the identity requirement of the relational information of the noun and the verb, we take a closer look at its current version and draw the attention of the reader to a formal detail that shows that we have come to the point where directly applying the requirements on stereotypical VN combinations in their formulation in Section 3 no longer works. For the sharing of the *wearer* arguments we discussed above, there is no real problem as both $WEAR_{ST}$ and $DRESS$ take a *wearer* argument. However, even though $DRESS$ takes a *wearee* argument, $WEAR_{ST}$ does not. This is due to the fact that $WEAR_{ST}$ in (16) is no longer of type $\langle e, \langle e, t \rangle \rangle$ but of type $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$: it combines directly with an $\langle e, t \rangle$ version of $DRESS$.⁴ The upshot of this is that it no longer makes sense to try to check the requirement that $WEAR_{ST}$ and $DRESS$ share their *wearee* arguments. What we *can* check is that the second and the fourth conjunct in (17) both include $\uparrow d_2$ as the *wearee* argument of *wear*. Given that the second conjunct originates in the semantics of the noun and the fourth conjunct in the semantics of the verb, we can still see argument sharing at work at the level of the predicates included in $DRESS$ and $WEAR_{ST}$. We conclude that $WEAR_{ST}$ $DRESS$ complies with the argument sharing requirement – both for *wearer* and *wearee* arguments – but that it no longer makes sense to spell out this requirement at the level of $WEAR_{ST}$ and $DRESS$ themselves.

Rather than trying to reformulate the argument sharing requirement at a deeper level of embedding, we propose to think of it at a higher level of abstraction. Our proposal is to think of the verb and the noun in stereotypical VN combinations as forming a single unit and to reformulate the argument sharing requirement as a requirement on stereotypical VN combinations to come with a single set of arguments. With this proposal in place, the relevant check for argument sharing is in the result of the derivation, where we expect to find only two argument variables. $WEAR_{ST}$ $DRESS$ is in line with this requirement. This may not be obvious yet in the dynamic formulation in (17) but it becomes clear in its static counterpart in (18):

$$(18) \llbracket WEAR_{ST} DRESS \rrbracket (static\ version\ of\ (17)) = \lambda y \exists x (wear(x)(y) \& dress(x) \& wear(x)(y))$$

The dynamic equation of the *wearer* argument of the noun to y in (17) translates into y ending up as the *wearer* argument in the first and the third conjunct in (18). The result of this is that there are no longer three argument variables as in (12c) but two, as dictated by our reformulated argument sharing requirement.

The reader might at this point wonder whether $WEAR_{ST}$ could not simply be of type $\langle e, \langle e, t \rangle \rangle$, allowing us to maintain the original formulation of our argument sharing requirement. We argue that an $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ analysis is to be preferred and that the reformulation of the argument sharing requirement is inevitable. The change from an $\langle e, \langle e, t \rangle \rangle$ to an $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ type is due to the $\langle e, t \rangle$ input EXPL requires: given that this input has to come from the object noun, it makes sense for $WEAR_{ST}$ as a whole to be analyzed as type $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ rather than as type $\langle e, \langle e, t \rangle \rangle$. We submit that it would be hard to gain access to the implicit relational argument of $DRESS$ in

⁴ We rely on static types for easy reference. Given that the end result of all derivations can be rewritten statically, we submit that the easy interpretation of static types outweighs the need for formal precision.

another way. The only viable alternative we can think of is to build the EXPL operator into the existential type shift. However, it is unclear how this move could be motivated. Indeed, the existential type shift is designed to resolve type clashes, and building EXPL into it would be an unnecessary complication at best. We conclude that building EXPL into an $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$ version of WEAR is the most elegant way to gain access to the implicit relational argument of DRESS. We consequently maintain our reformulated argument sharing requirement and link it to the theoretical intuition that the verbs and nouns in stereotypical VN combinations form a single unit with a single set of arguments.

Our newly established intuition that the verb and noun in a stereotypical VN combination form a single unit not only sheds new light on how to think of the argument sharing requirement but also on how to conceptualize and implement the requirement that the noun and verb come with the same relational information. Addressing these issues will guide us towards the final version of the semantics we propose for WEAR_{ST}.

If we think of stereotypical VN combinations as forming a single unit with a single set of arguments, we can also rethink the requirement that the noun and verb come with the same relational information as a requirement on stereotypical VN combinations to come with a single relation that they establish between their arguments. In the current version of our semantics of WEAR_{ST} and DRESS, they each come with their own relational information. We thus need to think of a way to merge these and make sure that this merger reflects our original requirement that the noun and verb come with the same relational information. To do so, we propose to adapt the semantics of WEAR_{ST} in (16), and turn the relational information it has into a check on the relational information of its first argument. This move guarantees that we end up with a single relation being established by WEAR_{ST} DRESS while maintaining the original sameness of relational information requirement that allows us to guarantee that WEAR_{ST} can only lead to converging derivations with nouns that include the *wear* relation in their semantics.

The formal operationalization of the above strategy is to define a family of explicitation operators, each of which targets relational arguments that stand in a specific relation to the noun's sortal argument. One such operator is EXPL_WEAR: this operator targets implicit relational arguments that stand in the *wear* relation to the noun's sortal argument. With operators like these in place, we can adapt the semantics of WEAR in (16) and propose its final version in (19):

$$(19) \quad \llbracket \text{WEAR}_{\text{ST}} \rrbracket (\text{final version}) = \lambda P \lambda y \mathcal{E}d_2((\text{EXPL_WEAR } (P))(y)(\uparrow d_2))$$

The result of combining WEAR_{ST} on its semantics in (19) with DRESS on its semantics in (13) is given in (20). In (21), we further spell out the static counterpart of this result.

$$(20) \quad \llbracket \text{WEAR}_{\text{ST}} \text{ DRESS} \rrbracket (\text{final version}) = \lambda y \mathcal{E}d_2 \mathcal{E}d_1(\uparrow \text{dress}(\uparrow d_2); \uparrow \text{wear}(\uparrow d_2)(\uparrow d_1); \uparrow d_1 \equiv y)$$

$$(21) \quad \llbracket \text{WEAR}_{\text{ST}} \text{ DRESS} \rrbracket (\text{static version of (20)}) = \lambda y \exists x (\text{dress}(x) \& \text{wear}(x)(y))$$

The semantics in (19) is parallel to that in (16) and the reader can check in (21) that the result of combining WEAR_{ST} with DRESS involves a single set of arguments. The crucial difference between (19) and (16) is that (19) no longer comes with an extra conjunct establishing the *wear*

relation between $\uparrow d_2$ and y . The semantic contribution of this conjunct is incorporated into the explicitation operator EXPL_WEAR . This allows us to end up with a single relation being predicated of x and y in (21) while at the same time guaranteeing that WEAR_{ST} can only combine with nouns that include a *wear* relation in their semantics. We conclude that the semantics in (19) neatly captures our intuition that WEAR_{ST} and its object noun form a single unit in a stereotypical VN combination and come with a single set of arguments and a single relation established between these.

Throughout this section, we have worked towards a general format for the semantics of nouns and verbs appearing in stereotypical VN combinations. For nouns, we have relied on their standard semantics with the only proviso that their implicit relational arguments receive a dynamic analysis (e.g., (13)). For verbs, our analysis has been more involved, and we have developed a stereotypicality semantics for them that is different from their standard semantics (e.g., (19)). A crucial ingredient of this stereotypicality semantics is an explicitation operator that incorporates the relational information included in the verb's standard semantics and allows the verb's subject to bind the noun's relational argument. We have argued that this operator allows us to derive the relevant requirements on stereotypical VN combinations that we identified in Section 3. Along the way, we have reformulated these requirements and captured them at a higher level of abstraction with the theoretical intuition that verbs and nouns in stereotypical VN combinations form a single unit and should consequently come with a single set of arguments and establish a single relation between them. Our running example of a stereotypical VN combination has been $\text{WEAR}_{\text{ST}} \text{ DRESS}$ but the reader can easily check that a similar analysis would lead to a converging derivation for $\text{WATCH}_{\text{ST}} \text{ MOVIE}$ and a derivation that crashes for $\text{HOLD UP}_{\text{ST}} \text{ DRESS}$ and $\text{WATCH}_{\text{ST}} \text{ TOWER}$. We conclude that stereotypicality is a property of VN combinations that can be traced back to the semantics of the verb and the noun and the way they are put together.

Before moving on to Section 4.2 and showing how our analysis of stereotypical VN combinations gives us a handle on the availability of indefinite readings of Mandarin BNs, we want to take a moment to reflect on the VN combinations that come out as stereotypical on the basis of the analysis that we have developed. This is important in view of the fact that we have reformulated the requirements on stereotypical VN combinations and captured them at a higher level of abstraction. In what follows, we argue that this reformulation results in a broader class of stereotypical VN combinations than the original formulation of the requirements might lead us to believe. In Section 4.2, this will allow us to check whether our analysis generalizes to data that it was not originally designed to account for.

We assume that any verb can *a priori* be given a stereotypicality semantics similar to that of WEAR_{ST} in (19). The upshot of this is that we expect all verbs whose standard semantics involves relations like those included in the constitutive, telic, and agentive *QUALIA* of nouns to *a priori* be able to appear in stereotypical VN combinations. For nouns to appear in these, they should come with relational information in their *QUALIA*. In our analysis, *QUALIA* then play a pivotal role and the stereotypical VN combinations we predict can be organized per *QUALIA*: $\text{WATCH}_{\text{ST}} \text{ MOVIE}$ and $\text{WEAR}_{\text{ST}} \text{ DRESS}$ depend on the telic *QUALIA*, $\text{WRITE}_{\text{ST}} \text{ BOOK}$ and $\text{MAKE}_{\text{ST}} \text{ DRESS}$ are related to the agentive *QUALIA*, and $\text{HAVE}_{\text{ST}} \text{ RIBBON}$ (for a dress) and $\text{HAVE}_{\text{ST}} \text{ KEYBOARD}$ (for an iPad) are connected with the constitutive *QUALIA*.

Of the above stereotypical VN combinations, the ones based on the constitutive *QUALIA* deserve special attention as they involve the verb *HAVE_{ST}*. On our original formulation of the requirements on stereotypical VN combinations in Section 3, the verb and the noun were required to come with the same relational information. However, *HAVE* arguably does not come with any relational information of its own (Partee, 1999; Landman, 2004) and we would consequently have to conclude that *HAVE_{ST} RIBBON* and *HAVE_{ST} KEYBOARD* do not qualify as stereotypical VN combinations. We argue that our reformulation of the requirements on stereotypical VN combinations leads us to another conclusion. In our reformulation, we have shifted from a focus on sameness of relational information to a focus on the verb and noun forming a single unit establishing a single relation between two argument variables. With this new focus, the sameness of relational information requirement can be implemented either by merging the relational information of the noun with that of the regular version of the verb (cf. *WEAR_{ST}* in (19)) or by assuming that the verb simply copies whatever relational information the noun comes with. We argue that the latter strategy can successfully be implemented for *HAVE_{ST}*. Our implementation consists in building the original version of the explicitation operator in (14) into *HAVE_{ST}*. The semantics of *HAVE_{ST}* we propose is given in (22):

$$(22) \llbracket \text{HAVE}_{\text{ST}} \rrbracket = \lambda P \lambda y \mathcal{E}d_2((\text{EXPL}(P))(y)(\uparrow d_2))$$

The crucial difference between *HAVE_{ST}* in (22) and *WEAR_{ST}* in (19) is that the latter comes with a subtype of the explicitation operator whereas the former comes with the standard one. The semantics in (22) leads to a converging derivation for *HAVE_{ST} RIBBON* and *HAVE_{ST} KEYBOARD*. We illustrate this for *HAVE_{ST} RIBBON* in (24) with the semantics of *RIBBON* in (23). In (25), we spell out the static version of (24).

$$(23) \llbracket \text{RIBBON} \rrbracket = \lambda x \mathcal{E}d_1(\uparrow \text{ribbon}(x); \uparrow \text{come_with}(x)(\uparrow d_1))$$

$$(24) \llbracket \text{HAVE}_{\text{ST}} \text{ RIBBON} \rrbracket = \lambda y \mathcal{E}d_2 \mathcal{E}d_1(\uparrow \text{ribbon}(\uparrow d_2); \uparrow \text{come_with}(\uparrow d_2)(\uparrow d_1); \uparrow d_1 \equiv y)$$

$$(25) \llbracket \text{HAVE}_{\text{ST}} \text{ RIBBON} \rrbracket (\text{static version of (24)}) = \lambda y \exists x (\text{ribbon}(x) \& \text{come_with}(x)(y))$$

As (25) allows us to verify, *HAVE_{ST}* and *RIBBON* end up forming a single unit in the derivation: (25) includes a single set of argument variables (x and y) and a single relation is established between them. We conclude that VN combinations like *HAVE_{ST} RIBBON* and *HAVE_{ST} KEYBOARD* count as stereotypical.

The semantics in (22) invites two further observations. The first is a more technical one and has to do with the fact that the semantics in (22) – as it stands – predicts that *HAVE_{ST}* can combine with any noun that comes with a relation in its *QUALIA* and lead to a felicitous stereotypical VN combination that picks up on this relation. This prediction is clearly not borne out as *HAVE_{ST} MOVIE* does not have the same meaning as *WATCH_{ST} MOVIE*. We note that *HAVE_{ST}*'s lack of relational information does not entail that there are no further properties of *HAVE_{ST}* that restrict the nouns it can felicitously combine with. One of these properties is that it is a static verb (Landman, 2004), and we consequently predict it not to be able to give rise to stereotypical VN combinations based on the eventive relations included in the telic and agentive *QUALIA*. As they need not interact with the explicitation operator, we leave the working out of the relevant properties for another study.

The second observation about (22) is a more important one as it has a direct impact on the extent of the class of stereotypical VN combinations. The semantics of HAVE_{ST} in (22) is now optimized for nouns that come with relational information in their QUALIA, but a slight reformulation also allows HAVE_{ST} to combine with nouns that are explicitly relational:

$$(26) \llbracket \text{HAVE}_{\text{ST}}' \rrbracket = \lambda R_{\langle e, \langle e, t \rangle \rangle} \lambda y \exists x (R(y)(x)) \quad (= \lambda R \lambda y \mathcal{E}d_2(R(y)(\uparrow d_2)))$$

HAVE_{ST}' is different from HAVE_{ST} in that it combines with explicitly relational nouns whose relational argument is directly accessible whereas HAVE_{ST} combines with implicitly relational nouns whose relational argument can only be accessed through an application of the explicitation operator. However, the end result of combining HAVE_{ST} and HAVE_{ST}' with their corresponding noun types is the same: they end up forming a single unit with the nouns, establishing a single relation between two argument variables. We illustrate this for HAVE_{ST}' in (27), where we present the result of combining it with the relational noun SON:

$$(27) \llbracket \text{HAVE}_{\text{ST}}' \text{ son} \rrbracket = \lambda y \exists x (\text{son_of}(y)(x))$$

HAVE_{ST}' and SON in (27) form a single unit: (27) includes a single set of argument variables (x and y) and a single relation is established between them. We conclude that VN combinations that involve HAVE_{ST}' and a relational noun qualify as stereotypical VN combinations on a par with those with HAVE_{ST} or WEAR_{ST} and implicitly relational nouns. The upshot of this is that the VN combinations that qualify as stereotypical not only include those that build on relational information in the QUALIA of implicitly relational nouns but also those that build on the relational information included in explicitly relational nouns. The general format of the verbs included in these combinations is always the same: their first argument is predicative – they are not of type $\langle e, \langle e, t \rangle \rangle$ but of type $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ (WEAR_{ST}/HAVE_{ST}) or type $\langle \langle e, \langle e, t \rangle \rangle, \langle e, t \rangle \rangle$ (HAVE_{ST}') – and they link the relational argument of their object noun to their subject.

4.2. Stereotypicality and Mandarin BNs

In Section 4.1, we developed an analysis of stereotypical VN combinations that captures their stereotypicality as a property that can be traced back to the semantics of the verb and the noun and the way these are put together. The theoretical intuition we pursued was that the verb and the noun in stereotypical VN combinations form a single unit, come with a single set of argument variables, and establish a single relation between these. The nouns involved in stereotypical VN combinations are explicitly or implicitly relational (cf. our discussion of HAVE_{ST}' vs. HAVE_{ST}/WEAR_{ST}) and the verbs have a special $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ or $\langle \langle e, \langle e, t \rangle \rangle, \langle e, t \rangle \rangle$ semantics that takes over the relational content of the noun – with or without a check (cf. our discussion of WEAR_{ST} vs. HAVE_{ST}/HAVE_{ST}') – and ensures that its relational argument ends up being bound by the subject. The analyses we developed for verbs and nouns lead to converging derivations for VN pairs that make up stereotypical VN combinations and to derivations that crash for VN pairs that make up non-stereotypical VN combinations. Crucially, the analyses we proposed are language independent and thus capture the stereotypicality of VN combinations in a language-independent fashion. In the present section, we explain how stereotypicality – as derived in Section 4.1 – ends up playing the role it plays in the availability of indefinite readings of Mandarin BNs (cf. our discussion of (1) to (6)).

The feature of our analysis of stereotypical VN combinations that comes into play in explaining the role of stereotypicality in the interpretation of Mandarin BNs is the $\langle\langle e, t \rangle, \langle e, t \rangle\rangle / \langle\langle e, \langle e, t \rangle \rangle, \langle e, t \rangle\rangle$ status of the verbs. In Section 4.1, we argued that giving verbs in stereotypical VN combinations an $\langle\langle e, t \rangle, \langle e, t \rangle\rangle$ semantics was the best way to ensure that the relational argument of implicitly relational nouns could be bound by the subject. A similar argumentation can be set up for HAVE_{EST}’ on its $\langle\langle e, \langle e, t \rangle \rangle, \langle e, t \rangle\rangle$ semantics when it combines with (explicitly) relational nouns. If we want to make sure that the relational argument of the noun is available for binding by the subject of HAVE_{EST}’, we can either make HAVE_{EST}’ select relational nouns directly or conceive of a special version of the existential type shift that can close off the sortal argument of the noun while keeping its relational argument active. As before, we note that the existential type shift is designed to resolve type clashes. Conceiving a version that would do anything else would consequently be an unnecessary complication. We conclude that making HAVE_{EST}’ select relational nouns directly on its $\langle\langle e, \langle e, t \rangle \rangle, \langle e, t \rangle\rangle$ semantics is the best way of ensuring that their relational argument can be bound by the subject. Clearly, for languages with a full-fledged indefinite article system, one can consider having different versions of the indefinite article and include one that existentially closes off the sortal argument of the noun while keeping the relational argument active (Partee, 1999). However, for languages without an indefinite article or with an indefinite article that is not fully grammaticalized, this move seems less straightforward.

The consequence of adopting an $\langle\langle e, t \rangle, \langle e, t \rangle\rangle / \langle\langle e, \langle e, t \rangle \rangle, \langle e, t \rangle\rangle$ semantics for verbs in stereotypical VN combinations is that the sortal argument of their nouns can only be existentially closed off after the nouns combine with the verb. This explains why the semantics we proposed for WEAR_{ST}, HAVE_{EST}, and HAVE_{EST}’ all come with a built-in existential quantifier that closes off the sortal argument of the object noun. The presence of this quantifier in stereotypical VN combinations is likely to go unnoticed in languages with a full-fledged indefinite article – all indefinite VN combinations require the article – as well as for languages that have not started to develop an indefinite article – all indefinite VN combinations have BNs in them. Suppose however that a language has started to develop an indefinite article but has not fully grammaticalized it. In this type of language, the stereotypicality status of VN combinations is likely to come into play as a relevant factor in the presence/absence of the indefinite article. Stereotypical VN combinations already guarantee that the sortal argument of their noun is existentially closed off and adding the indefinite article is not required for type purposes. Non-stereotypical VN combinations would be different in that their noun’s sortal argument is not independently guaranteed to be existentially closed off. For languages developing an indefinite article, we consequently predict that – all other things being equal – non-stereotypical VN combinations are likelier to require an indefinite article than their stereotypical counterparts.

We assume that Mandarin is a language that has started to develop a singular indefinite article, *viz.* the numeral *yī* ‘one’. Independent support for this assumption comes from the numeral’s frequency: a comparison between the Chinese Web 2017 corpus and the English Web 2018 corpus shows that the relative frequency of the numeral *yī* is 4,5 times higher than that of its English counterpart *one*. We take this difference in frequency to indicate that Mandarin *yī* is more than a numeral and has started to develop into an indefinite article. The prediction that follows is that nouns in non-stereotypical VN combinations in Mandarin are likelier to require the addition of *yī* to obtain an indefinite reading than nouns in stereotypical VN combinations.

This is exactly what we find in the data: a definite reading is available for all BNs in (1), (2), (4) and (5), but an indefinite reading is only available for the BNs in the stereotypical VN combinations *WATCH_{ST} MOVIE* and *WEAR_{ST} DRESS*. The nouns in the non-stereotypical VN combinations require the addition of the numeral *yī* to obtain an indefinite reading ((3) and (6)). With our extension of the class of stereotypical VN combinations from Section 3 to Section 4, we predict *HAVE_{ST} RIBBON*, *HAVE_{ST} KEYBOARD* and *HAVE_{ST} SON* to pattern with *WATCH_{ST} MOVIE* and *WEAR_{ST} DRESS* in allowing their nouns to occur as BNs on an indefinite reading. This expectation is borne out:

- (28) *Zhè tiáo qúnzi yǒu sīdài.*
 this CLF dress have ribbon
 ‘This dress has a ribbon.’
- (29) *Zhè ge iPad yǒu jiànpán.*
 this CLF iPad have keyboard
 ‘This iPad has a keyboard.’
- (30) *Mǎli yǒu érzi.*
 Mary has son
 ‘Mary has a son.’

(28) to (30) contain *sīdài* ‘ribbon’, *jiànpán* ‘keyboard’ and *érzi* ‘son’ as BNs and allow for them to take on indefinite readings. We conclude that the analysis of stereotypical VN combinations we have developed in Section 4.1, combined with the independently motivated assumption that the numeral *yī* is developing into a singular indefinite article, neatly accounts for the restriction on indefinite readings of Mandarin BNs we identified in Sections 2 and 3 and generalizes to VN combinations that our analysis led us to add to the class of stereotypical VN combinations.

5. Conclusion and discussion

In this paper, we identified a hitherto unnoticed restriction on the indefinite readings of Mandarin BNs (Section 2). We argued that the restriction is related to stereotypicality (Section 3) and we developed an analysis of stereotypical VN combinations (Section 4.1) that – in combination with the independently motivated assumption that Mandarin *yī* is developing into an indefinite article – allowed us to derive the restriction we started out with and that generalized to new facts (Section 4.2). In this final section, we reflect on the implications of our analysis for BNs in Mandarin and cross-linguistically.

For Mandarin, the most important implications of our analysis are that Mandarin BNs do not freely take on indefinite readings and that Mandarin can no longer be characterized as a run-of-the-mill articleless language. Relevant follow-up questions are whether there are other factors than stereotypicality that influence the division of labor between BNs and nouns preceded by *yī* and how the role of number in their competition plays out. We tackle these questions in Liu, Dong and Le Bruyn (2022) on the basis of a corpus study based on *Harry Potter and the Philosopher’s Stone* and its translation to Mandarin. The English original gives

us an independent way to target indefinite singular and plural referential expressions in Mandarin, study the role of stereotypicality and number in the division of labor between BNs and nouns preceded by *yī*, and identify any other factors that come into play. At a more theoretical level, an important follow-up question of the analysis in the current paper is how a VN-level property like stereotypicality can insightfully be implemented in regular type-shifting analyses that are traditionally restricted to the level of the noun.

For our understanding of BNs across languages, two issues stand out. The first is that we should take a closer look at the role of numerals in languages that have standardly been classified as articleless and check in how far differences like those noted for Hindi and Russian (cf. Dayal, 2004; Borik, 2016) can be connected to the different roles their numerals play in the syntax-semantics interface of reference. As a first step in this exploration, we are currently preparing an extension of Liu et al. (2022) in which we add a Hindi translation of *Harry Potter and the Philosopher's stone* to our English-Mandarin translation corpus. The second issue that stands out in our analysis is the role we attribute to stereotypicality in the analysis of ‘regular’ VN combinations. Up till now, stereotypicality has only been hinted at as a relevant property of pseudo-incorporation (see, among others, Espinal and McNally, 2011; Dayal, 2011). We hope that our compositional analysis of stereotypicality leads to a better understanding of its role in the syntax-semantics interface of reference and allows future studies to develop new models of this interface that integrate analyses of ‘regular’ VN combinations with those of pseudo-incorporation.

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