Sub-Type Readings in Hindi Numerical Reduplication

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Introduction. Dependent indefinites (DIs) have been widely observed and analyzed in the world's languages, like in Hungarian, Romanian, Telugu, Kaqchikel, etc. (Farkas 1997, Brasoveanu & Farkas 2011, Balusu 2006, Henderson 2014). In Hindi, DIs take the form of numerical reduplication. As can be gleaned from the label 'dependent,' they induce "obligatory distributivity" (Balusu 2006, pg. 2) and are incompatible with wide scope existential readings.

(1) Hindi
Choohon-ne **ek** laddoo kutra
Mice- erg one sweet nibble.pst
'The mice nibbled a laddoo'
The same laddoo? ✓
Different laddoos? ✓

(2) Hindi
Choohon-ne **ek-ek** laddoo kutra
Mice-erg one-red sweet nibble.pst
'The mice nibbled a laddoo'
The same laddoo? ✖
Different laddoos? ✓

While (1) is compatible with both distributive and wide scope interpretations, (2) is necessarily distributive and covarying. DIs require two parts of meaning: something to be distributed over (the key) and something to distribute (the share) (Choe 1987; Kuno 1982). Generally, both are explicit in the sentence, but this does not have to be the case — languages like Korean, German, and Telugu can encode one part of the distributive dependency *implicitly*, from context (Choe 1987; Link 1987; Balusu 2006). For example, in (3), the German particle *je* marks the share, the apples, which are interpreted to come from a contextual (implicit) key: different baskets (Link 1987, pg. 175; Choe 1987, pg. 63). In (4), the distribution is over a different implicit key — time and space chunks rather than individuals (Balusu 2006, pg. 3; a similar pattern is found for Korean *-ssik*: Choe 1987).

(3) German
Je drei Äpfel waren faul
? three apples were rotten
'Three apples each were rotten
(from different baskets)'

(4) Telugu
Ram renDu renDu kootu-lu-ni cuus-ee-Du
Ram 2 2 monkey-pl-acc see-past-3psg
'Ram saw 2 monkeys in each time interval'
or 'Ram saw two monkeys in each location'

(2), (3), and (4) all establish dependency of the share on some plurality **external** and *outside* of the share — in (2), a plurality of mice, in (3) of baskets, and in (4), of time and space (Balusu 2006; Choe 1987). The externality of the key forms a crucial part of existing analyses, which rely on it to encode the distributive dependency. This may seem like the only possibility—how else could the distributive requirement be satisfied? This is where the current data comes in.

Data. In the absence of external plurality, Hindi number reduplication leads to 'sub-type' readings, where the dependent plurality and the plurality being depended on come from the **same** NP. In (5), the dependency of 'flowers' on itself (or on its sub-types) cannot be accounted for by current analyses: there is nothing external supporting covariation — be it explicit or implicit.

(5) Flower Shop Scenario: A flower shop has many different kinds of flowers: lilies, roses, tulips, chrysanthemums. Anu bought two stems from each kind. Her friend says:
Hindi
Anu-ne **do-do** **phool** mangaaye
Anu-erg two-red flowers order.pst
'Anu ordered two flowers (of each type)'

Account. Our account will make use of two different semantic tools: 1. A presupposition that ensures proper structure in discourse for reduplication to be used. And, 2. Economy considerations that rule out instances which this presupposition cannot account for.

The observation that the creation of plural meanings can depend on sub-types is not new. Dayal, Sanchez & Vengoa (in prep) notice the same for *-kuna*, a plural marker in Cuzco Quechua (see (6)):

(6) Cuzco Quechua
Quwi-(kuna)-n chiri-pacha-pi wañu-pu-chka-rqa-nku

guinea_pig-(pl)-evid/foc cold-time-loc die-reg-prog-pst-3.pl
'Guinea pigs (of different kinds) kept dying all winter.'

Dayal et al. (in prep) account for *-kuna* via a presupposition requiring that the *-kuna* marked noun set be partitionable along some salient property (such as size, color, subtype, etc). Following this, we propose a presupposition requiring *proper variation* in the discourse domain. Proper variation is realized via restrictions on the cover of individuals — a contextually defined domain variable (Cov) that has been used in analyses of distributivity and non-maximality (Schwarzschild 1996; Brisson 2003). Covers are sets of subsets of the domain of individuals. In reflecting context, they give us a way to set restrictions *on* context.

***Presupposition of proper variation*:** $\exists P\, \forall Z\, [\, [Z \in Cov \wedge Z \subseteq X] \rightarrow \exists P' \sim P\, [P' \neq P \wedge [\forall z' \in Z] \rightarrow P'(z')]]$, where P is the overarching property (and P' its instantiation [~]) & X is the NP that is modified by reduplication.

This *presupposition of proper variation* ensures a contextually-defined way of dividing the domain of individuals (based on a property P) such that each cell of the division is homogeneous (with respect to a sub-property, P'). To understand this further, let us apply it to the example in (5). The presupposition simply states all cells of the cover that are flowers have some instantiation of P (where P is the property of being a flower). This instantiation (P': the property of being a flower sub-type like a rose, tulip, chrysanthemum, etc.) should be homogeneous within each flower cell. We thus derive variation *across* cells (constrained by P), and homogeneity *within* (constrained by P'). Say (5) is uttered in the context of universe U in (7a) — then, the cover that passes will look something like (7b).

(7) Anu ordered 2-2 flowers

a. U = {🌻, 🌻, 🌻, 🌷, 🌷, 🌸, 🌸, 🌸, 🌻, 🌸, 🌷, 🌷, 🎴, 🎴, 🎴}

b. Cov = {{🌻, 🌻, 🌻, 🌻}, {🌷, 🌷, 🌷, 🌷}, {🌸, 🌸, 🌸, 🌸}, {🎴, 🎴, 🎴}}

The at-issue content of the reduplication then has the job of quantifying over these cells so that we can pick out two individuals from each. We can achieve this with a denotation for the reduplication-numeral complex as in (8a.), with the final truth conditions given in (8b.).

(8) a. **⟦2-red⟧:** $\lambda P\, \lambda Q\, \forall Z\, [[Z \in Cov \wedge Z \subseteq P] \rightarrow \exists y\, [|\lambda y'.\, y' \leqslant y \wedge AT(y')| = 2 \wedge y \leqslant \oplus Z \wedge Q(y)]]$

b. $\forall Z\, [[Z \in Cov \wedge Z \subseteq \text{Flowers}] \rightarrow \exists y\, [|\lambda y'[y' \leqslant y \wedge AT(y')]| = 2 \wedge y \leqslant \oplus Z \wedge order(y)(Anu)]]$

Economy considerations. What happens when there is no variation in context, with cover a like {{🌻, 🌻, 🌻, 🌻}, {🎴, 🎴, 🎴}}? We find ourselves in trouble: our presupposition has no stipulation about the number of sub-properties, and this cover passes. We have two options to resolve this: 1. Build in a requirement for two distinct sub-properties, or 2. Appeal to economy considerations. We propose that the former is not needed precisely because we can appeal to the latter. When a speaker uses reduplication, they choose a morphologically complex construction, and this morphological complexity must be justified. In a no-variation context, using reduplication or not would give the same result (two flowers: 🌻, 🌻) — suggesting that the simpler construction should be preferred due to economy considerations. A choice to use reduplication may already signal variation with *multiple* types, eliminating the need to require at least two sub-properties.

Conclusion. Our analysis, making use of covers, accounts for Hindi DI readings where the key and share seemingly come from the same NP. We will also present cases of sub-type based dependency in Yoruba and Loma numerical reduplication, and use that to discuss the broader cross-linguistic implications of the present proposal. The current analysis opens up possibilities for the reliance on covers to ensure, or impose, necessary structure in the discourse domain (here, proper variation), and adds to the typology of possible distributive keys in natural language.

Selected references. Brisson, C. (2003). Plurals,'all', and the Nonuniformity of Collective Predication. *Linguistics and philosophy*, *26*(2), 129-184. | Farkas, D. (1997). Dependent indefinites. In Francis Corblin, Danièle Godard & Jean-Marie Marandin (Eds.), *Empirical issues in syntax and semantics*, (pp. 243–267). Bern: Peter Lang.