

“and-a-half” Numeral Constructions in Hindi

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Introduction. There is much variation in how complex numerals are articulated across languages. Moreover, the same number can be expressed in various ways. Comprehensive exploration of the same has been explored in depth in Hurford (2011) while Ionin & Matushansky (2018) give a detailed account of Syntax & Semantics of cardinal expressions across languages. But there is a class of complex numeral expressions that is yet to be explored which patterns in many languages (Table 1) – present work introduces this class and focuses mainly on the Hindi data. These constructions typically feature an “and-a-half” component and thus will be referred to as such. Consider the following paradigm in English and Hindi where the numeral 3500 can be expressed in various ways. 1c and 2c correspond to ‘and-a-half’ expressions in the respective languages:

- | | |
|---|---|
| 1. a. three thousand
five hundred
b. thirty five
hundred
c. three and a half
thousand
'3 500' | 2. a. <i>tiin</i> <i>hazaar paanch sau</i>
three thousand five hundred
b. <i>paitiis sau</i>
five-thirty hundred
c. <i>SaaDhe tiin hazaar</i>
half three thousand
'3 500' |
|---|---|

The above paradigm shows that ‘and-a-half’ constructions are made using the regular syntactic rules for numerals but interestingly they cannot be part of more complex constructions:

- | | |
|---|--|
| 3. a. three thousand
five hundred and
twenty one
b. *three and a half
thousand twenty
one
'3 521' | 4. a. <i>tiin hazaar paanch sau ekkiis</i>
three thousand five hundred one-twenty
b. <i>paitiis sau ekkiis</i>
five-thirty hundred one-twenty
c. * <i>SaaDhe tiin hazaar ekkiis</i>
half three thousand one-twenty
'3 521' |
|---|--|

What could explain the contrast between 3 & 4? Why can't ‘and-a-half’ expressions be part of even more complex constructions? This is the central puzzle we want to consider. In fact we can make this precise by noting the following observation in Hindi:

- | | |
|--|---|
| 5. a. <i>SaaDhe tiin sau lakh</i>
half three hundred lakh
'350 00 000' | b. * <i>SaaDhe tiin hazaar ekkiis</i>
half three thousand one-twenty
'3521' |
|--|---|

Note that, *SaaDhe* does not block further multiplication as in 5a but it seems to block an additive element. It is precisely this fact we need to explain i.e. why do “and-a-half” expressions allow further multiplication but resist addition?

Syntax of Complex Numerals & Packing Strategy. Hurford's syntax involves the following phrase structure rules that sufficiently generate complex numerals across languages. The corresponding arithmetic operations are given as well. We assume that Numeral expressions denote numbers:

NUM → DIGIT | NUMP (NUM) [Addition]
NUMPHRASE → NUM M [Multiplication]

Here NUM represents the category of all possible numeral expressions, DIGIT stands for any single numeral word up to the value of the base number and M stands for noun-like numeral forms usable as multiplicative bases. To account for over-generation Hurford introduces a Linguistic universal named *packing constraint* which states that “*within any part of the Numeral structure, the sister of the NUM node must have the highest possible value given the denotation of the node that immediately dominates it.*” Interestingly, packing constraint cannot rule out 4c as ill-formed at all (Fig. 1 and 2).

Given that only the highest Num node has the same denotation (i.e. 3521); we compare the NumP nodes that are sisters to the respective Num nodes under highest Num node. Clearly NumP in Fig 1 has higher denotation (3500) than the one in Fig 2 (3000) which implies *SaaDhe tiin hazaar ekkiis* should be preferred over the licit expression *tiin hazaar paanch sau ekkiis*. This is clearly wrong showing that packing constraint cannot explain why 4c is ill-formed at all. Packing constraint is supported by large body of cross-linguistic evidence thus an explanation is in order. Moreover, the syntactic rules of Hurford do not generate *SaaDhe* either!

A Generalization for “and-a-half” expressions. Table 1 presents properties exhibited by ‘and-a-half’ expressions across some languages. Note that languages are selective with respect to possible M complement for NumX-and-a-half. Moreover, if there are part-referring expressions in the same language then the same set of multipliers can form complement of NumX-and-a-part constituent. This leads to the following generalization – *Given a language, if a multiplier can combine with NUM containing “and-a-half” then it can combine with other part-referring lexemes as well. If a multiplier cannot combine with NUM containing “and-a-half” then it cannot combine with other part-referring lexemes in that language.*

Analysis of *SaaDhe*. Present work addresses the following observations regarding *SaaDhe*-

- Hurford’s syntax does not explain how to generate *SaaDhe*.
- Table 1 lists the word order for NumX+and-a-half constituent which is fixed but in Hindi (and IA in general) *SaaDhe* precedes the Head Num.
- *SaaDhe* blocks further addition in the complex Numeral it is a part of. The pertinent observation regarding the first two of these problems is that *SaaDhe* does not occur as an independent word at all – it depends on the NumX it attaches to. Thus it does not really fit into the definition of DIGIT or NUM as given by Hurford. We note that combination of *SaaDhe* and a NUM is a NUM. in conjunction to this we can utilize the diagnostic provided by Zwicky (1977, 1983) and note the following behavior **A.** *SaaDhe* forms a prosodic unit with its host numeral. Stress/intonation modification reveals that *SaaDhe* cannot be stressed in a NumP **B.** as noted earlier; it’s bound to its host. **C.** word order for *SaaDhe* and its host is fixed. **C.** a single principle governs the distribution of *SaaDhe* i.e. it attaches to a (syntactically simplex) NUM where it shows extremely low degree of selectivity (Table 1.) **D.** it does not block further affixation or clitics from attaching to the host numeral (ex: *SaaDhe tiin-hii* three-and-a-half-EMPH). Thus we gather sufficient evidence to claim that *SaaDhe* in Hindi is actually a pro-clitic explaining the deviation from the word order pattern for ‘and-a-half’+NumX combination. We also observe that it falls in the distribution of syntactically simplex but morpho-phonologically complex numerals in Hindi (for ex: *ekkiis* one+twenty, *pacchiis* five+twenty, *SaaDhe tiin* half+three) wherein, Hindi Simplex numerals prefer this *small before big* order and *SaaDhe* satisfies this criterion. as for our main concern, Hurford(2007) notes that Packing constraint is justified by the need for practical task of counting objects and thus applies to numerals that are regular with respect to counting. Crucially, ‘and-a-half’ constructions in Hindi are marked for counting thus packing constraint cannot explain it as it falls outside of its explanatory domain. Now consider the following discourses: **Q:** *what’s the time?* **A:** *SaaDhe-baaraa* (12:30) **Q’:** *how much does this saree cost?* **A’:** *SaaDhe tiin hazaar* note that these contexts do not demand precision from the answerer at all and discourses such as these where ‘loose-talk’ is allowed are typically where *SaaDhe* figures in Hindi. Thus it is safe to claim that *SaaDhe* is an approximating element. In general speakers can employ round numbers to approximate values. Krifka (2007, 2011) states this as an empirical generalization called the **RNRI PRINCIPLE** which simply states that round numbers tend to get round interpretations. In contrast, non-round numbers always obligatorily get a precise interpretation. As for their semantics, it seems that “and-a-half” phrases indicate an interval/set of values around the Numeral computed in the phrase. Now, let ϕ be a sentence containing an “and-a-half” numeral expression α and let β be the actual value that α approximates then the desired truth/felicity condition is as follows: *ϕ is true/felicitous just in case when β is sufficiently close to $[[\alpha]]$. By sufficiently close we want the difference between the denotation of “and-a-half” expression $[[\alpha]]$ and β to be contextually ignorable* which is to say that β falls in this set of values associated with α . Thus the explanation for infelicity of expressions as in 4c can be chalked up to the clash between inherently approximating element (*SaaDhe*) and the fact that the number gets a precise interpretation owing to the additive component implying that approximating elements cannot inhabit precisifying contexts leading to a rejection based on semantic/pragmatic grounds.

Summary: • a class complex numerals labeled ‘and-a-half’ numerals is introduced which blocks addition • if a multiplier can occur with ‘and-a-half’ then it can occur with other part-referring expressions in a language • Hindi *SaaDhe* differs in word order on account of being a pro-clitic. • Hindi *SaaDhe* is inherently approximating and blocking of addition in ‘and-a-half’ expressions is explained based on purely semantic/pragmatic grounds – the exact details remain to be formalized.

Figures & Tables:

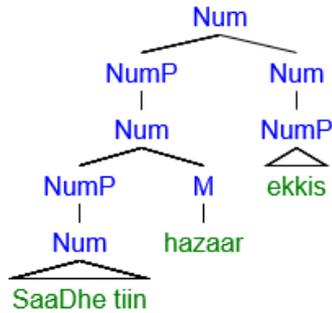


Fig. 1

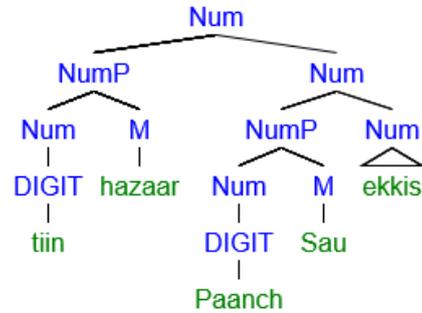


Fig. 2

	Hindi (<i>SaaDhe</i>)	English (<i>half</i>)	Russian (<i>s polov'inoj</i>)	Malayalam (<i>ara</i>)
Possible M for “and-a-half”	Hundreds, thousands, lakh, crore etc	Thousand, Million, billion etc not hundred	Thousand, Million, Billion etc but not hundred	Lakh, crore etc but not hundred, thousand
Possible Head Num for “and-a-half”	$2 < x < 20$	$1 < x < 100$.	$1 < x < 999$	$1 < x < 99$
Word order	Fixed: and-a-half NumX M	Fixed: NumX and-a-half M	Fixed: NumX and-a-half M	Fixed: NumX and-a-half M
Part-referring lexemes	savva ‘¼’, paun(e) ‘quarter-minus’, DeDh ‘1.5’, Dhahi ‘2.5’	Quarter ‘¼’	pol- ‘0.5’ and poltora- ‘1.5’	Kaal ‘¼’, mukkaal ‘¾’
Possible M for part-referring lexeme	Same as “and-a-half”	Ex: half a million, quarter million	Same as “and-a-half”	Same as “and-a-half”

	Bangla	Assamese	Kannada (<i>vare</i>)	Tamil (<i>arai</i>)
Possible M for “and-a-half”	Hundreds, thousands, lakh, crore etc.	Hundreds, thousands, lakh, crore etc	Hundreds, thousands, lakh, crore etc.	lakh, crore etc. but not hundred, thousand
Possible Head Num for “and-a-half”	$2 < x < 20$	$2 < x < 99$	$1 < x < 99$	$1 < x < 99$
Word order	Fixed: and-a-half NumX M	Fixed: and-a-half NumX M	Fixed: NumX and-a-half M	Fixed: NumX and-a-half M
Part-referring lexemes	DeR ‘1.5’, aRai ‘2.5’	DeDh ‘1.5’, aDhoi ‘2.5’	Khal ‘¼’, mukhal ‘¾’	Kaal ‘¼’, mukkaal ‘¾’
Possible M for part-referring lexeme	Same as “and-a-half”	Same as “and-a-half”	Same as “and-a-half”	Same as “and-a-half”

Selected reference

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