The *RigVeda* goes “universal”: annotation and analysis of equative constructions in Vedic and beyond

Erica Biagetti
University of Pavia
erica.biagetti01@universitadipavia.it

Abstract

By presenting a case study on Rigvedic equative and similative constructions, this paper demonstrates that treebanks constitute an important support for research in historical linguistics for two main reasons. First, by providing quantitative evidence on linguistic phenomena, they can confirm or dismiss hypotheses formulated on the base of qualitative data. Second, by capturing correlations among linguistic phenomena which could hardly be grasped by linguists’ naked eye, treebank-based analyses allow scholars to formulate new hypotheses. Since an analysis of Rigvedic equative constructions calls for a granular and informative annotation scheme, the Vedic Treebank implements the UD scheme for equative constructions with sub-relations; while some such extensions were specifically designed for a study on Rigvedic similes, others might be adopted by every treebank developer interested in representing equative strategies.

1 Introduction

Historical linguistics has always relied on collections of written texts, i.e., corpora, which constitute the only source of evidence available for ancient languages. Annotated corpora revolutionized historical linguistics because they allow scholars to automatically retrieve large quantitative evidence on linguistic phenomena whose account has been previously based on qualitative evidence and to capture correlations among them which could hardly be grasped by linguists’ naked eye (Eckhoff et al., 2018: 303; Biber, 2009; Anthony, 2013). Furthermore, morphosyntactically annotated corpora require automatic data selection through explicit query expressions, crucially making historical linguistic research replicable (Haug, 2015).

By presenting a case study on Rigvedic equative and similative constructions, in this paper I provide further evidence for the relevance of treebanks for the study of ancient languages. The *Rigveda* (RV) is a collection of 1028 hymns, dating back to the second half of the second millennium BCE (Witzel, 1995), which constitutes the oldest layer of Vedic literature and whose language is strongly conditioned by the poetic and ritual character of the text. The division of the collection into ten books reflects the internal chronology of the work. The core of the collection and its oldest part are books II to VII (the so-called “Family Books”), whereas book X is the most recent. Books I, VIII, and IX are generally younger than the Family Books.

The Rigvedic treebank was created as part of the larger Vedic Treebank (VTB; Hellwig et al., 2020; Biagetti et al., 2021), a corpus of selected passages from Vedic Sanskrit literature syntactically annotated according to the Universal Dependency (UD) standard.[1] The VTB is maintained within the Digital Corpus of Sanskrit,[2] which provides a web-based interface for collaborative dependency annotation. A first version of the treebank was published in occasion of the release of UD version 2.6

[1] Although the UD standard covers most of the syntactic phenomena found in Vedic texts, some constructions require special attention during annotation and their annotation scheme within the VTB may deviate slightly from the official UD scheme (see the annotation guidelies available at: https://github.com/OliverHellwig/sanskrit/tree/master/papers/2020lrec/paper). While some such deviations were removed in occasion of the treebank release within the UD platform, others remain and are fully documented in Hellwig et al. (2020).

[2] http://www.sanskrit-linguistics.org/dcs/index.php?contents=texte

(15 May 2020); a new version, revised and considerably expanded, is currently under development (Hellwig and Sellmer, forthc.).

The case study presented in this paper is part of a project devoted to the study of Rigvedic similes. Similes, which are the most frequent trope found in the RV, are explicit comparative constructions that owe their figurative meaning to the fact that the compared entities are felt as being fundamentally unlike each other, and therefore unlikely to be compared (Israel et al., 2004). While the language of the RV disposes of different strategies for the encoding of comparison, equative and similative constructions introduced by the particles *ná* 'as, like', *iva* 'as, like' and *yáthā* (*/yathā*) 'as, like' have specialized for the encoding of figurative comparison. The aim of this paper is to demonstrate that a treebank-backed study on the syntax of these constructions allows us not only to understand their synchronic distribution, but also to confirm previous hypotheses on their origin and development, as well as to formulate new ones. Such a study calls for a granular and informative annotation scheme, which is able to capture the different strategies employed in the RV for the expression of comparison of equality; therefore, a second, major purpose of this paper is to present a new annotation scheme based on the UD standard for comparative constructions implemented with sub-relations.

The paper is organized as follows: Section 2 introduces the main strategies employed in the RV for the encoding of comparison of equality, among which we find similes introduced by *ná*, *iva*, and *yáthā*. After summarizing UD guidelines for the annotation of equative constructions (3.1), Section 3.2 introduces the implemented annotation scheme adopted by the VTB for the analysis of such constructions. Section 4.1 shows that quantitative data extracted from the treebank can provide interesting insights about the syntax and origin of Rigvedic similes. Section 5 suggests extending part of the enhanced scheme to other languages and constructions. Section 6 contains the conclusions.

2 Comparison of equality in the RV

Equative and similative constructions encode similarity between a comparee (CPREE) and a standard (STAND) with respect to some action or property, called parameter (PAR), and by means of a standard marker (STM; Haspelmath and Buchholz, 1998; Treis, 2017). While equative constructions encode quantitative comparison of equality (e.g. *Peter is as tall as Susan*), similative constructions encode qualitative comparison, or comparison of manner (e.g. *Peter runs like a hare*.)

In the RV, constructions introduced by the STMs *ná*, *iva*, and *yáthā* constitute the main strategy for the encoding of comparison of equality. They are characterized by systematic ellipsis of the verb in the STAND and by case transparency (Haspelmath and Buchholz, 1998: 307), i.e., identity of case and function between CPREE and STAND (Bergaigne 1887; Jamison 1982; Pinault 1997). Quantitative and qualitative comparison are encoded by the same constructions and are therefore nearly impossible to distinguish (henceforth: equatives). Rigvedic equatives occur in three main configurations of CPREE(s) and STAND(s). Single equatives can take an adjectival predicate as PAR or a verbal one, as in (1).[3]

(1)	*ví*	*ślóka*	*etu*	***pathyā̀***	***iva***	*sūréḥ*
	LP	signal_call.NOM	go.IMPV.3SG	pathway.NOM	like	patron.GEN
	PAR-	CPREE-	-PAR	STAND	STM	-CPREE

'Let the signal-call of the patron go forth afar like a pathway.'[4] (RV 10.13.1)

Double equatives are characterized by the presence of two parallel elements in the CPREE and in the STAND, and thus have a gapping structure (2). Less often, equatives may be triple, with CPREE and STAND consisting of three elements each.

(2)	*matáyaḥ*	*rihánti …*	*índraṁ*	***vatsáṁ***	***ná***	***mātáraḥ***
	thought.NOM.PL	lick.PRS.3PL	Indra.ACC	calf.ACC	like	mother.NOM.PL
	CPREE$_i$-	PAR	-CPREE$_j$	STAND$_j$-	STM	STAND$_i$

[3] In glosses, the nominal number is specified only if it is plural or dual while gender is specified only if it is feminine or neuter (singular and masculine are not indicated). Among verbal categories, indicative mood and active voice are not indicated.

[4] Translations of Rigvedic passages are taken from Jamison and Brereton (2014).

‘Thoughts lick … Indra like mothers a calf.’ (RV 3.41.5)

Besides being employed in syntagmatic comparison, the accented particle *yáthā* also introduces comparative clauses, whose main clause often contains a correlative adverb such as *evá* ‘so, in this way’ in (3). Note that the difference between clausal and syntagmatic comparison is not limited to the presence vs. absence of a verb: while in the former *yáthā* functions as a subordinator and occurs in clause-initial position, in the latter *yáthā* (with its unaccented variant *yathā*), *ná*, and *iva* have a clitic behavior and follow the STAND.

(3)	***yáthā***	***jaghántha***	*dhr̥ṣatā́*	*purā́*	*cid*
	like	smite.PF.2SG	boldly	before	PTCL
	evā́	***jahi***	*śátrum*	*asmā́kam*	*indra*
	so	smite.IMPV.2SG	rival.ACC	1PL.GEN	Indra.VOC

‘Just as you also smote boldly before, so smite our rival, o Indra.’ (RV 2.30.4cd)

Finally, comparison of equality can be expressed in the RV by a number of other constructions, including comparative compounds as in (4), adjectives meaning ‘same’ (*samá-*), or less grammaticalized strategies involving a verb whose meaning is ‘reach’ (“reach equatives” in Haspelmath et al., 2017), as in (5). For comparison and gradation in Vedic, see Kulikov (2021).

(4)	***agní-bhrājaso***	*vidyúto*	*gábhastiyoḥ*
	fire-flash.NOM.PL	lightning_bolt.NOM.PL	fist(M/F).LOC.DU
	STAND-PAR	CPREE	

‘Lightning bolts flashing like fire (are) in your fists.’ (RV 5.54.11c)

(5)	*nákiṣ*	*ṭáṁ*	*kármaṇā*	***naśan***
	no_one	3SG.ACC	ritual_work.INST	reach.SUBJ.AOR.3SG
	CPREE	STAND-STM	PAR	PM

‘No one can equal [lit. reach] him (Agni) in his ritual work.’ (RV 8.31.17)

3 Annotating Rigvedic similes

3.1 UD annotation scheme for equative constructions

UD guidelines provide annotation schemes for both basic and clausal equatives. In the former, the standard is linked to the parameter via the relation `obl`, while the standard marker depends on the standard via `case` (Figure 1). In clausal equatives, the verb of the comparative clause is attached to the main verb through `advcl`, the standard marker depending on it via `mark` (Figure 2).

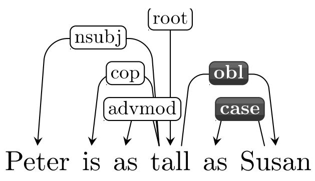


Figure 1. Basic equatives.

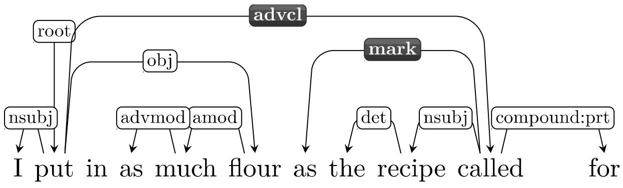


Figure 2. Clausal equatives.[5]

Gapping occurring in comparative constructions is treated in the same way as coordinate gapping. Thus, in the Swedish equative in (6), the promoted element *Joakim* takes the relation that the elided verb would otherwise bear (`advcl`), *tennis* takes the `orphan` relation, and the standard marker *än*, being a functional element, retains its relation `mark` (Figure 3).

(6)	*Dan*	*spelar*	*badminton*	*bättre*	*än*	*Joakim*	*tennis*
	Dan	play.PRS	badminton	better	than	Joakim	tennis

[5] https://universaldependencies.org/u/overview/specific-syntax.html#comparatives

‘Dan plays badminton better than Joakim (does) tennis.’[6]

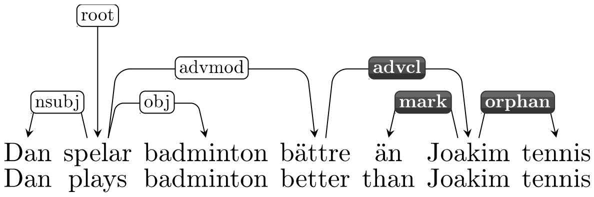

root
advmod
advcl
nsubj
obj
mark
orphan
Dan spelar badminton bättre än Joakim tennis
Dan plays badminton better than Joakim tennis

Figure 3. Annotation scheme for gapping in comparison.

3.2 Extending the scheme: language-specific relations

In UD, there are no relations designed specifically to mark equative constructions. First, UD adopts the same scheme for equality and inequality comparison. Furthermore, basic comparatives are simply assimilated to other obliques (`obl`), whereas clausal equatives are treated in the same way as other adverbial clauses (`advcl`). Similarly, standard markers take the same *deprel* as other function words such as adpositions (`case`) and subordinating conjunctions (`mark`). Take for instance the two trees in Figure 4, where the clausal comparative contained in the first sentence takes the same labels as the temporal clause contained in the second.

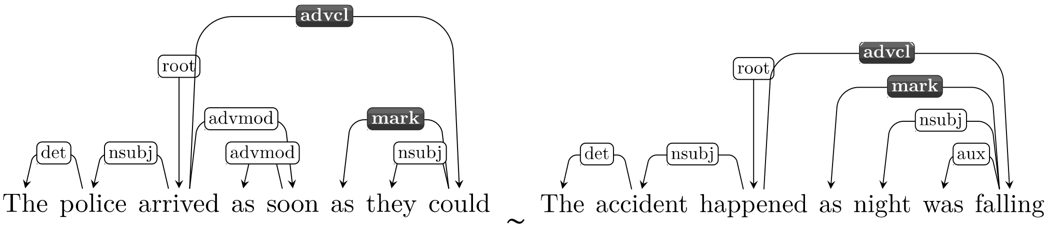
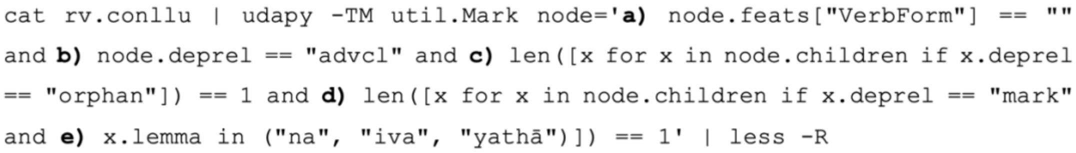

advcl
root
advmod
advmod
mark
det
nsubj
nsubj
The police arrived as soon as they could
~
advcl
root
mark
nsubj
det
nsubj
aux
The accident happened as night was falling

Figure 4. UD scheme for adverbial clause modifiers. L: comparative clause; R: temporal clause.[7]

In Early Vedic, the particles *ná*, *iva*, and *yáthā*/*yathā* have other functions beside that of standard marker of equative constructions: for instance, when employed as a subordinator, Vedic *yáthā* also introduces temporal, final, causal, and content clauses with verbs of knowing and saying (Delbrück 1888: 592-596). Furthermore, as we have seen in Section 2, Vedic has at its disposal several strategies for the encoding of comparison of equality.

Following the UD scheme, it would be possible to extract, e.g., all basic equatives featuring a gapping structure by retrieving all nodes a) that are not a finite verb, b) whose *deprel* is `advcl`, c) that have a child whose *deprel* is `mark` and d) that have at least another child whose *deprel* is `orphan`. In order to exclude other types of subordinate clauses characterized by gapping structure, it would also be necessary to specify e) the lemma of the former child. Even so, one would obtain all basic equatives introduced by *ná*, *iva*, and *yáthā* (and not subordinates introduced, e.g., by *yád* ‘that’), but also other subordinates introduced by *yáthā* that present an elided verb. Cf. Figure 5:



```
cat rv.conllu | udapy -TM util.Mark node='a) node.feats["VerbForm"] == ""
and b) node.deprel == "advcl" and c) len([x for x in node.children if x.deprel
== "orphan"]) == 1 and d) len([x for x in node.children if x.deprel == "mark"
and e) x.lemma in ("na", "iva", "yathā")]) == 1' | less -R
```

Figure 5. Udapi[8] query: ‘display all basic equatives with gapping structure’.

[6] https://universaldependencies.org/workgroups/comparatives.html
[7] https://universaldependencies.org/docs/u/dep/advcl.html
[8] https://udapi.github.io

Such query would also prevent one from detecting and isolating hybrid constructions such as the one in (7), whose standard has no verb, as in syntagmatic comparison, but in which *yáthā* precedes the standard, as in clausal comparison.

(7)

yáthā	*naḥ*	*pitáraḥ*	*párāsaḥ*	*pratnā́so ...*
like	1PL.GEN	father.NOM.PL	further.NOM.PL	ancient.NOM.PL

śúcī́d	*ayan*	*dī́dhitim*	*ukthaśā́saḥ*
blazing.ACC.N	come.SUBJ.3PL	vision(F).ACC	reciting_praise.NOM.PL

'Like our further forefathers of old […], those reciting solemn speech (now) will come to the blazing (udder of sacrifice [=Vala]), to visionary power.' (RV 4.2.16)

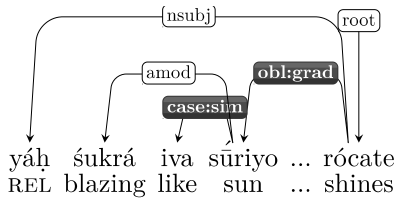
In order to represent the syntax of equatives in detail and to be able to make granular and targeted queries on different types of constructions, the VTB makes use of language-specific extensions that enrich the universal dependency taxonomy. Like language-specific extensions found in UD, extensions employed within the VTB are regarded as subtypes of existing UD relations and have the format `universal:extension`: for instance, `obl:manner` stands for `manner` extension of the UD relation `obl`. As in UD, extensions employed within the VTB are neither recursive nor multi-dimensional, which means that one node can instantiate at most one subtype of a universal relation. However, the VTB allows the user to employ a considerably high number of sub-relations for research-related purposes, provided that such extensions are fully documented in the guidelines.

Table 1 summarizes the scheme employed by the VTB for equative constructions.

Table 1. Equative constructions with their respective annotation.

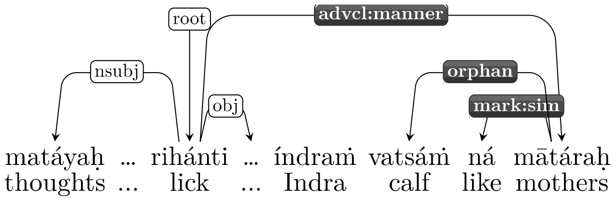
CONSTRUCTION	EXAMPLE	ANNOTATION (dependent → `relation` → head)
PREDICATIVE SIMILE	'Agni is like the sun.'	*sun* → `root` *sun* → `nsubj` → *Agni* *sun* → `case:sim` → *like*
SIMILE WITH ELLIPSIS	'Agni shines like the sun.'	*shines* → `obl:grad` → *sun* → `case:sim` → *like*
	'The lightning bellows like a cow.'	*bellow* → `obl:manner` → *cow* → `case:sim` → *like*
SIMILE WITH GAPPING	'Thoughts lick Indra like mothers a calf.'	*lick* → `advcl:manner` → *mothers* → `mark:sim` → *like;* *mothers* → `orphan` → *calf*
CLAUSAL SIMILE	'Just as you drank the previous soma drinks, so take a drink today.'	*drink* → `advcl:manner` → *drank* → `mark` → *as*; *drank* → `obj` → *previous drinks*; *drink* → `advmod` → *so*

As shown by Table 1, the VTB formally distinguishes simple, basic equatives (annotated with `obl` and `case`) from double equatives characterized by gapping structure (annotated with `advcl` and `mark`). As we have seen in Section 2, Vedic employs the same standard marker for equative and similatives; in order to be able to observe any syntactic difference in the expression of quantitative and qualitative comparison, for example in the order of constituents, the sublabels `:grad` and `:manner` are given on a lexical basis to dependents of gradable and non-gradable adjectives respectively.


nsubj
root
amod
obl:grad
case:sim
yáḥ śukrá iva sūriyo ... rócate
REL blazing like sun ... shines

‘He (Agni) who shines like the blazing sun.’ (RV 1.43.5)

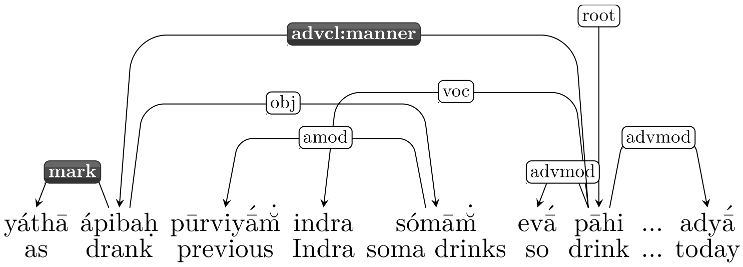
Figure 6. Extended scheme for simple equatives.


root
advcl:manner
nsubj
orphan
obj
mark:sim
matáyaḥ ... rihánti ... índraṁ vatsáṁ ná mātáraḥ
thoughts ... lick ... Indra calf like mothers

‘Thoughts lick Indra like mothers a calf.’ (RV 3.41.5)

Figure 7. Extended scheme for equatives with gapping structure.

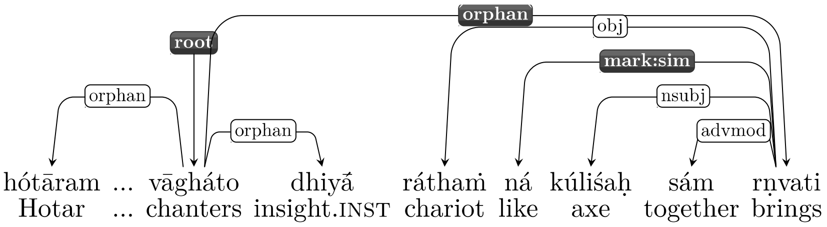
The sublabel `:sim`[9] attached to the relations `case` and `mark` allows the user to easily retrieve all particles that introduce basic equatives and to distinguish them from those that introduce clausal similes (which take `mark` alone). Compare for instance the annotation of basic equatives like those in Figure 6 and Figure 7 with that of a clausal equative like the one in Figure 8:


root
advcl:manner
voc
obj
amod
advmod
mark
advmod
yáthā ápibaḥ pūrviyā́m̐ indra sómām̐ evā́ pāhi ... adyā́
as drank previous Indra soma drinks so drink ... today

‘Just as you drank the previous soma drinks, Indra, so take a drink today.’ (RV 3.36.3cd)

Figure 8. Extended scheme for clausal equatives.

In some cases, the verb is exceptionally constructed with the standard rather than with the comparee. As shown by Figure 9, such cases are also captured by the annotation scheme.[10]


orphan
obj
root
mark:sim
orphan
nsubj
orphan
advmod
hótāram ... vāgháto dhiyā́ ráthaṁ ná kúliśaḥ sám rṇvati
Hotar ... chanters insight.INST chariot like axe together brings

‘As an axe brings together a chariot, the chanters **Ø** the Hotar with their insight.’[11] (RV 3.2.1)

Figure 9. Annotation of equatives whose verb is constructed with STAND.

[9] `:sim` stands for “simile”.

[10] In this example, we would expect a plural verb *sám rṇvati* in agreement with the comparee *vāghátas*.NOM.PL ‘chanters’; the verb *sám rṇvati*.PRS.3SG ‘brings’ agrees instead with the nominative singular *kúliśaḥ* ‘axe’ which constitutes the standard of the simile. As a whole, the sentence is treated similarly to a case of leftward gapping in coordination

4 Treebank-based analysis of Rigvedic similes

Despite employing different standard markers, Rigvedic comparisons introduced by *ná*, *iva*, and *yáthā*, constitute a coherent construction from the point of view of both syntax and semantics. Syntactically, they have a syntagmatic nature and present clitic standard markers; semantically, they are specialized for figurative comparison and can be defined as similes in all respects.

With the support of extant literature on the origin of Rigvedic similes, quantitative evidence provided by the treebank can help understanding how different particles came to be employed in the kind of constructions attested in the RV. In particular, four groups of queries run on a corpus of 857 similes[12] yielded interesting results in this regard. Queries employed in this study are reported in Appendix A. Before presenting the results, two premises are in order. First, due to his complex internal chronology, the RV constitutes a diachronic corpus, thus lending itself to the study of language change. Second, in presenting word-order patterns attested in similes, I will only take similes introduced by *ná* and *iva* into account: basic equatives introduced by *yáthā* occur only 76 times in the RV and thus do not lend themselves to quantitative studies on word order (Levshina et al., fortch.).[13]

1. Query: Factors determining the relative order of STAND - PAR in Rigvedic similes

Typological studies on equative and similative constructions have shown that the STAND - PAR order correlates with the OV order (Andersen, 1983; Haspelmath et al., 2017: 26). Rigvedic similes feature STAND - PAR order in 60% of cases, a result which is in line with the fact that Vedic shows a preference for OV while also allowing the opposite order.[14]

Besides a language word-order preferences, heaviness is also responsible for the relative order of standard and parameter. As show by Table 2, similes with gapping, whose standard consists of at least two arguments of the verb, have PAR - STAND order more frequently than simple similes (62% vs. 52%). In turn, Table 3 shows that the percentage of STAND - PAR order is especially high (68%) in those similes whose standard consists of a single element (e.g., *pitā́ iva* 'like a father', *putrám ná* 'like a son'), and it decreases to 57% in those similes whose standard has adjectival, participial, or genitive modifiers (e.g., *nítyaṁ ná sūnúm* 'like a dear son').

Table 2. Order of STAND and PAR in similes a) with ellipsis and b) with gapping.

ORDER	SIMILES WITH ELLIPSIS		SIMILES WITH GAPPING	
STAND-PAR	360	**62%**	151	**52%**
PAR-STAND	212	37%	134	47%
TOTAL	572		285	
p-value (χ^2 test)	**0.0064**			

Table 3. Order of STAND and PAR in a) similes with ellipsis and simple STAND, and b) similes with ellipsis and complex STAND.

ORDER	ELLIPSIS AND SIMPLE STAND		ELLIPSIS AND COMPLEX STAND	
STAND-PAR	197	**68%**	163	**57%**
PAR-STAND	91	31%	121	42%
TOTAL	288		284	
p-value (χ^2 test)	**0.0083**			

Finally, the percentage of PAR - STAND order is increased by the high frequency of thetic sentences (e.g. *The telephone's ringing*), which in Vedic have verb-initial order (Lambrecht, 1994: 143; Viti, 2008). Cf. example (8):

[12] The annotated portion of the RV is available at: https://github.com/EricaBiagetti/VTB_Rigveda.

[13] Differently from *ná* and *iva* similes, whose origin is disputed, we do not need quantitative evidence in order to confirm the emergence of *yáthā* similes from comparative clauses and the consequent cliticization of the subordinator.

[14] In the annotated portion of the RV in the VTB (24109 tokens in 3092 sentences) OV occurs in 63% of cases. However, Ryan and Gunkel (2015) have shown that, in metrically neutral contexts, non-imperative finite verbs display OV order in 78% of cases (37 in total) and imperative forms in 77% of cases (22 in total).

(8)

próthad	*áśvo*	*ná*	*yávase*	*aviṣyán*
snort.INJ.PRS.3SG	horse.NOM	like	pasture(N).LOC	eager.NOM

‘He has snorted like a hungry horse in his pasture.’ (RV 7.3.2a)

Knowing which factors determine the order of standard and parameter helps envisaging diachronic tendencies in the development of equative constructions as attested in the RV, presented in points 2 to 4 below.

2. Query: Frequency of STAND - PAR and PAR - STAND orders in *iva* e *ná* similes

Two main hypotheses have been proposed in the literature on the development of *ná* similes: a) according to Vine (1978), they derive from coordinate negative constructions with ellipsis of the verb in the second conjunct, (9); b) according to Pinault (1985), they stem from the so-called negative parallelism, i.e., a rhetorical device typical of Baltic and Slavic folk literature, consisting of two sentences, the first of which presents a negation and optional ellipsis of the negated verb (10).

Thus while, according to Vine, similes introduced by *ná* originate from constructions in which the PAR (verb) preceded the STAND, according to Pinault they stem from constructions with the opposite order of STAND and PAR:

(9) Coordinate negative constructions: PAR - STAND

ná	*ta*	*indra*	*sumatáyo*	*ná*	*rā́yaḥ*
NEG	3PL.NOM.N	Indra.VOC	favor(F).NOM.PL	NEG	rich.NOM.PL

saṁcákṣe	***pū́rvā***	***uṣáso***	***ná***	***nū́tnāḥ***
enumerate.DAT	earlier.NOM.PL.F	dawn(F).NOM.PL	NEG/like	recent.NOM.PL.F

‘Neither your favors nor your riches, o Indra, can be entirely surveyed, through the previous dawns, nor through the current ones.’ > ‘Neither your favors nor your riches, O Indra, can be entirely surveyed, just like the previous and the current dawns (cannot be entirely surveyed).’ (RV 7.18.20)

(10) Negative parallelism: STAND - PAR

vér	***ná***	*druṣác*
bird.NOM	NEG/like	wood_sitting.NOM

camúvor	*ā́*	*asadad*	*dháriḥ*
cup(F).LOC.DU	LP	seat.AOR.3SG	tawny.NOM

‘It is not a bird sitting in the wood, the tawny one (Soma) has taken his seat in the two cups.’ > ‘Like a bird sitting in the wood the tawny one has taken his seat in the two cups.’ (RV 9.72.5)

Observing the relative order of standard and parameter separately for *iva* and *ná* similes, we gain some important insights on the origin of these constructions. Table 4 shows that simple similes introduced by *ná* have STAND - PAR order more frequently than those introduced by *iva* (68% vs. 60%). While this difference is statistically only weakly significant (χ^2 test, p-value 0.06), the picture changes if we focus on similes whose standard is composed of one single element, with no modifiers: here, the percentage of STAND - PAR order reaches 78% with standards marked by *ná*, against 63% of standards marked by *iva* (p-value 0.013). On the contrary, no significant difference can be observed in word-order patterns of similes with gapping, since *ná* and *iva* similes of this type show STAND - PAR order in 54% and 52% of cases respectively.

Table 4. N. of STAND - PAR and PAR - STAND orders in simple similes and in simple similes whose standard consists of only one element.

SIMILE TYPE	ALL SIMPLE SIMILES				STANDARD = ONE ELEMENT			
STM ORDER	*iva* similes		*ná* similes		*iva* similes		*ná* similes	
STAND - PAR	114	**60%**	234	**68%**	65	**63%**	121	**78%**
PAR - STAND	76	40%	108	32%	37	37%	33	22%
TOTAL	190		342		102		154	
p-value (χ^2 test)	**0.06**				**0.013**			

If we assume that, in the absence of other syntactic and pragmatic factors presented under point 1, similes tend to retain the original relative position of standard and parameter, the fact that simple *ná* similes have a more marked preference for the STAND - PAR pattern than *iva* similes may constitute an important clue in favor of their origin from the negative parallelism (Pinault 1985), where the standard always precedes the verb. The fact that the preference for the STAND - PAR order is less marked for *iva* similes, on the other hand, may support the hypothesis of its origin as a marker for syntagmatic comparison, which does not tie the standard to any position with respect to the parameter (see points 2 and 3). Finally, the fact that *ná* and *iva* similes behave in the same way in the presence of gapping would be due to the heaviness of the standard in such constructions.

Turning to semantics, the origin of *ná* equatives from negative parallelism provides some interesting insights on their specialization for figurative comparison: in negative parallelism, the subject of the first clause usually represents a prototype participant of the action or quality expressed by the verb and thus lends itself to figurative readings.[15]

3. Query: equatives whose verb (PAR) is construed with the STAND, and not with CPREE

Query number 2 returns five cases in which the verb is constructed with a standard introduced by *ná* (as in Figure 9) and three cases in which *yáthā* occurs in a hybrid construction, as the one presented in (7). In contrast, the query does not return any case in which a standard marked by *iva* is clearly constructed with the verb. If we interpret such cases as remnants of a stage in which both the comparee and the standard clause could contain a verb, the presence of such evidence in *ná* similes confirms point 2 on the clausal origin of the latter; accordingly, the lack of such evidence in *iva* similes may suggest that *iva* has always introduced syntagmatic comparison.

4. Query: frequency of equatives with gapping structure

If, as suggested by point 3, *iva* similes were always syntagmatic, we can assume that they originally had simpler standards and that only later allowed gapping structure on the model of *ná* similes (which, as suggested by point 2 and 3, originally contained a verb). By dividing the corpus into the ten books that make up the RV, we can check whether similes with gapping became more frequent in younger books (I, VIII-X) than they were in older ones (II-VII). Table 5 reports the frequencies of simple similes and similes with gapping introduced by *iva* and *ná* throughout the ten books; note that, if the whole RV is considered (last raw), the ratio of simple and gapped standards is virtually the same for *iva* and *ná* similes.

Table 5. Percentage of simple similes and of similes with gapping in each book.

Book	*iva* similes				*ná* similes			
	Simple similes		With gapping		Simple similes		With gapping	
I	22	56%	17	**44%**	63	58%	45	**42%**
II	31	**76%**	10	24%	17	65%	9	**35%**
III	12	**75%**	4	25%	14	67%	7	**33%**
IV	7	**78%**	2	22%	16	**73%**	6	27%
V	19	**90%**	2	10%	13	**72%**	5	28%
VI	10	**67%**	5	33%	32	**70%**	14	30%
VII	10	**67%**	5	33%	27	64%	15	**36%**
VIII	25	62.5%	15	**37.5%**	30	**68%**	14	32%
IX	19	59%	13	**41%**	71	**74%**	25	26%
X	35	55%	29	**45%**	59	**71%**	24	29%
Total	190	**65%**	102	**35%**	342	**67%**	164	**32%**
p-value	**0.01**				**0.024**			

[15] Furthermore, Pinault (1985: 138-143) suggests that the comparative reading of *ná* must have spread thanks to the existence of comparative compounds (e.g. *vā́ta-jūta-* lit. 'wind-swift') and comparisons with an ablative STAND (e.g. *manáso.*ABL *jávīyas* 'swifter that thought'), which shared the STAND - PAR order with the negative parallelism. Comparative compounds are known cross-linguistically for their preference for generic comparisons (Haspelmath and Buchholz, 1998) and, at least within the IE domain, idiomatic ablative comparatives are also often employed in this function (cf. the type Latin *melle dulcior* 'sweeter than honey').

Table 5 suggests that gapping structure did indeed become more common for *iva* similes in younger books: a significant difference can be observed between, e.g., 9% of similes with gapping in book V and 43% in book I, or 45% in book X. Similes introduced by *ná* present a different picture: while book I has indeed the higher percentage of similes with gapping (41%), these were already frequent in old books such as II, III, and VII. In fact, Kruskal-Wallis tests suggest that older and younger books differ from each other in the frequency of *iva* similes with gapping (p-value 0.01) as well as in the frequency of *ná* similes with gapping (p-value 0.02). Due to the low absolute counts reported in Table 5, the tests do not point to clear diachronic differences in the structure of *ná* and *iva* similes and suggest that the issue should be investigated further on a larger data set.

To sum up, with the partial exception of point 4, results obtained from the four queries suggest that equative constructions introduced by *ná* and *iva* probably influenced each other: by systematic ellipsis of the negated verb in the negative parallelism, *ná* similes became syntagmatic and the standard marker *ná* developed a clitic behavior;[16] *iva* similes, on the other hand, specialized for figurative comparison and started to feature gapping structure.

5 Thinking big: cross-linguistic extensions

As anticipated above, the annotation scheme presented in Section 3.2 was developed within a project devoted to the study of Rigvedic similes. As showed in Section 4, the introduction of language-specific extensions made it possible to perform precise, quantitative analyses on the syntax of Rigvedic similes; however, some language-specific extensions would be superfluous if employed in analyses of more general interest or for languages other than Early Vedic.

This suggests that, in view of the next UD release, some extensions might be discarded whereas other might be considered for employment in other treebanks. For instance, the distinction between standard markers of clausal and phrasal equatives, which in the VTB are annotated as `mark` and `mark:sim` respectively, should be discarded as the difference between such constructions results in the presence vs. absence of a verb in the standard. Furthermore, the information stored in the `:manner` and `:grad` extensions should be moved to the MISC field of the CoNLL-U format and assigned on a lexical basis to the parameter, depending on whether it encodes a gradable or non-gradable quality.[17]

More interesting is the possibility of extending the relation subtype `:sim` to standard markers of equative and similative constructions in other languages and construction types. In many languages, standard markers of equative constructions can be identical with conjunctive particles and subordinators (Haspelmath et al., 2017): remaining within the Indo-European domain, cf. Latin *ut* 'as, how', which introduces several other kinds of subordinate clauses. Beside particles and conjunctions, standards of equatives and similatives can be marked by adpositions or by case markers. When the parameter marker is expressed by an adjective or verb, the standard is marked by a case selected by the governing adjective or verb: cf. the Latin adjective *consimilis* in (11) and the Ancient Greek participle *eidómenon* in (12), both governing a dative standard. Figure 10 shows the suggested annotation scheme for example (12).

(11)	*harum*	*est*	***consimilis***	***capris***	*figura*
	this.GEN.PL	be.PRS.3SG	similar.NOM	goat.DAT.PL	shape.NOM
			PM	STAND.STM	CPREE

'their shape (scil. of elks) is similar to [that of] goats' (Caes. *Gall.* 6.27.1; Ittzés 2021: 479)

(12)	*ēlthé*	*moi*	*phásma*	***eidómenon***	***Arístōni***
	come.AOR.3SG	1SG.DAT	phantom.NOM	resemble.PTCP.PRS.NOM	Ariston.DAT
			CPREE	PM	STAND.STM

'A phantom came to me that resembled Ariston.' (Herodotus 6.69.1; de Kreij 2021: 350)

[16] Note that negative *ná*, from which comparative *ná* derives (cf. Pinault, 1985), stands either in clause-initial position or before the predicate.

[17] Note that the CoNLL-U format adopted by the DCS does not include a MISC field. This determined the choice of extending the syntactic relations `obl` and `advcl` of the STAND with semantic information pertaining the whole construction such as `:manner` and `:grad`.

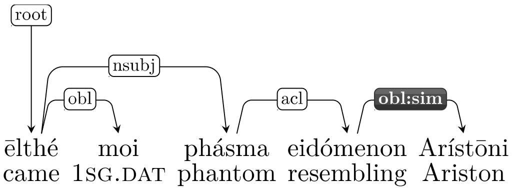
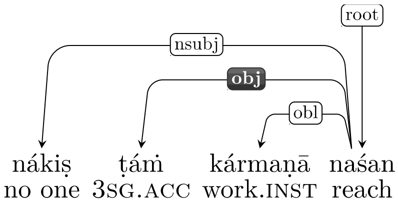


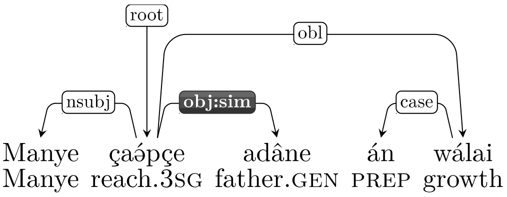
Figure 10. Annotation scheme for example (12).

Extending the relation subtype `:sim` would allow accounting for equative and similative constructions that are otherwise not covered by the UD taxonomy. This is the case, for instance, of reach equatives such as (5), which are tagged like usual transitive clauses in the UD scheme (Figure 11). While in Early Vedic such constructions are sporadic and scarcely grammaticalized (Biagetti 2021),[18] in some languages they constitute a major comparison strategy and extending their annotation scheme would enhance the possibility of studying equative constructions cross-linguistically.[19] The extended annotation for reach equatives is illustrated by Figure 12 from Malgwa (Chadic; Löhr, 2002: 107).



‘No one can reach him in his ritual work.’

Figure 11. UD scheme for reach equatives.



‘Manye reaches her father in growth.’

Figure 12. Extended scheme for reach equatives.

The reason for adding relation subtypes to standard markers and not to parameter markers of equative constructions is suggested by Haspelmath et al. (2017: 25) Generalization 1, according to which “[n]o language has only a degree-marker, leaving the standard unmarked”. In other words, while constructions such as “Kim is **Ø** tall **like** Pat” are cross-linguistically common, constructions such as “Kim is **equally/as** tall **Ø** Pat” are not attested; thus, marking only standard markers with relation subtypes would allow capturing all types of equatives while avoiding redundancy. Finally, assigning the label `:sim` to elements of equative constructions would allow distinguishing them from elements of comparative constructions proper, which encode comparison of inequality (Treis 2017) and are marked by the extension `:cmpr` in some treebanks.[20]

6 Conclusion

By presenting a case study on Rigvedic equative constructions, in this paper I argued that treebanks constitute an important support to research in historical linguistics because they allow to confirm or dismiss previously formulated hypotheses (see especially query 2) and to observe correlations between language phenomena that could hardly be grasped by the naked eye (queries 1, 3, and 4). However, the need to account for formal variations or hybrid constructions that may play a role in language change sometimes calls for more granular and informative annotation schemes. In the case of Rigvedic similes, I suggested implementing the UD scheme for equative and similative constructions with sub-relations; crucially, such extensions are not meant to be language specific and some of them might be adopted by every treebank developer interested in representing equative constructions.

[18] With Dixon (2012), we might say that they constitute comparative strategies rather than constructions proper.

[19] See for instance the examples from Malgwa (Chadic), Malian Tamashek (Berber), or Zay (Semitic) in Haspelmath et al. (2017: 21-22).

[20] Treebanks of Latin, Polish, and Tamil employ `obl:cmpr` for comparative oblique arguments and `advcl:cmpr` for comparative clauses. While the former is limited to comparison of inequality, the latter is instantiated with examples of clausal equatives. In order to increase consistency, I suggest limiting `advcl:cmpr` to proper comparative clauses and adding a new relation subtype (such as `:sim`) for clausal equatives. Note, in passing, that Telugu employs `obl:cmp` and Moksha `obl:comp` with the same purpose of `obl:cmpr`. Finally, Erzya employs `advmod:comp` for adverbs functioning as standard markers in comparatives proper. Cf. https://universaldependencies.org/ext-dep-index.html.

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Appendix A: Queries

This Appendix contains all the queries employed for the case study presented Section 4. All queries were written in Udapi query language (https://udapi.github.io).

Query 1:

a. N. of STAND - PAR and PAR - STAND orders in all similes

```
cat RV.conllu | udapy util.See node='node.deprel in ("advcl:manner",
"obl:manner", "obl:grad") and len([x for x in node.children if x.lemma in
("na", "iva", "yathā")]) == 1'
```

b. N. of STAND - PAR and PAR - STAND orders in all similes with ellipsis

```
cat RV.conllu | udapy util.See node='node.deprel in ("obl:manner",
"obl:grad") and len([x for x in node.children if x.lemma in ("na", "iva",
"yathā") and x.deprel == "case:sim"]) == 1'
```

c. N. of STAND - PAR and PAR - STAND orders in all similes with gapping

```
cat RV.conllu | udapy util.See node='node.deprel in ("advcl:manner") and
len([x for x in node.children if x.lemma in ("na", "iva", "yathā") and
x.deprel == "mark:sim"]) == 1'
```

d. N. of STAND - PAR and PAR - STAND orders in similes with ellipsis and simple STAND

```
cat RV.conllu | udapy util.See node='node.deprel in ("obl:manner",
"obl:grad") and len([x for x in node.children if x.lemma in ("na", "iva",
"yathā") and x.deprel == "case:sim"]) == 1 and len([x for x in node.children
if x.lemma not in ("na", "iva", "yathā")]) == 0'
```

e. N. of STAND - PAR and PAR - STAND orders in similes with ellipsis and complex STAND

```
cat RV.conllu | udapy util.See node='node.deprel in ("obl:manner",
"obl:grad") and len([x for x in node.children if x.lemma in ("na", "iva",
"yathā") and x.deprel == "case:sim"]) == 1 and len([x for x in node.children
if x.lemma not in ("na", "iva", "yathā")]) >= 1'
```

Query 2:

a. N. of STAND - PAR and PAR - STAND orders in similes introduced by *ná*:

```
cat RV.conllu | udapy util.See node='len([x for x in node.children if x.lemma
== "na" and x.deprel in ("case:sim", "mark:sim")]) == 1'
```

b. N. of STAND - PAR and PAR - STAND orders in similes introduced by *iva*:

```
cat RV.conllu | udapy util.See node='node.deprel in (len([x for x in
node.children if x.lemma == "iva" and x.deprel in ("case:sim", "mark:sim")])
== 1'
```

c. N. of STAND - PAR and PAR - STAND orders in *ná*-similes with ellipsis

```
cat RV.conllu | udapy util.See node='len([x for x in node.children if x.lemma
== "na" and x.deprel == "case:sim"]) == 1'
```

d. N. of STAND - PAR and PAR - STAND orders in *iva*-similes with ellipsis

```
cat RV.conllu | udapy util.See node='len([x for x in node.children if x.lemma
== "iva" and x.deprel == "case:sim"]) == 1'
```

e. N. of STAND - PAR and PAR - STAND orders in *ná* similes with ellipsis and simple STAND

```
cat RV.conllu | udapy util.See node='len([x for x in node.children if x.lemma
in ("na") and x.deprel == "case:sim"]) == 1 and len([x for x in node.children
if x.lemma not in ("na", "iva", "yathā")]) == 0'
```

f. N. of STAND - PAR and PAR - STAND orders in *iva* similes with ellipsis and simple STAND

```
cat RV.conllu | udapy util.See node='len([x for x in node.children if x.lemma
in ("iva") and x.deprel == "case:sim"]) == 1 and len([x for x in node.children
if x.lemma not in ("na", "iva", "yathā")]) == 0'
```

g. N. of STAND - PAR and PAR - STAND orders in *ná*-similes with gapping

```
cat RV.conllu | udapy util.See node='len([x for x in node.children if x.lemma
== "na" and x.deprel == "mark:sim"]) == 1'
```

h. N. of STAND - PAR and PAR - STAND orders in *iva*-similes with gapping

```
cat RV.conllu | udapy util.See node='len([x for x in node.children if x.lemma
== "iva" and x.deprel == "mark:sim"]) == 1'
```

Query 3:

a. STAND constructed with a finite verb

```
cat RV.conllu | udapy -TM util.Mark node='node.lemma in ("na", "iva",
"yathā") and node.deprel in ("case:sim", "mark:sim") and node.parent.upos ==
"VERB" and node.parent.feats["VerbForm"] == ""' | less -R
```

Query 4:

a. N. of *iva* similes with ellipsis in each book

```
cat rv1.conllu | udapy util.See node='node.deprel in ("obl:manner",
"obl:grad") and len([x for x in node.children if x.lemma == "iva" and x.deprel
== "case:sim"]) == 1'
```

b. N. of *ná* similes with ellipsis in each book

```
cat rv1.conllu | udapy util.See node='node.deprel in ("obl:manner",
"obl:grad") and len([x for x in node.children if x.lemma == "na" and x.deprel
== "case:sim"]) == 1'
```

c. N. of *iva* similes with gapping in each book

```
cat rv1.conllu | udapy util.See node='node.deprel == "advcl:manner" and
len([x for x in node.children if x.lemma == "iva" and x.deprel == "mark:sim"])
== 1'
```

d. N. of *ná* similes with gapping in each book

```
cat rv10.conllu | udapy util.See node='node.deprel == "advcl:manner" and
len([x for x in node.children if x.lemma == "na" and x.deprel == "mark:sim"])
== 1'
```