Degrees and scales of Kunbarlang

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This paper discusses novel data from the non-Pama-Nyungan language Kunbarlang in the domain of degree semantics. I show these data to be problematic for an influential typological account couched within the degree-based framework (Beck et al. 2009). I propose an alternative that builds on the delineation approach in the spirit of Klein (1980), and in partucular on recent developments employing measurement theory, such as van Rooij 2011b. The proposed solution both accounts for Kunbarlang data and offers a basis for an alternative semantic typology of comparison constructions.

1 A degree-based typology

There are two main types of approaches to semantics of comparative and other degree constructions, with an important difference lying in their ontological commitment.[1] One type, usually called *degree-based approaches*, includes analyses by Cresswell 1976 and von Stechow 1984, and much subsequent work. These analyses crucially rely on *degrees* as a primitive type in the semantic ontology: type d. The other type, known as *delineation approaches*, avoid positing a special semantic type for the degrees and treat gradable adjectives as *vague* predicates (e.g. Kamp

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1. I am very grateful to my Kunbarlang teachers who shared their language with me and were very patient in working on the complex constructions in this paper. In particular, I would like to acknowledge the contribution of Na-kangila Solomon Yalbarr and Ngal-ngarridj Sandra Makurlngu. I wish to thank Liz Coppock for getting me thinking about Kunbarlang comparatives and for helpful discussion at the outset of this work. Nick Sgro-Traikovsky made valuable suggestions to an earlier version of the paper. Last but not least, I am grateful to the audiences at the 2017 Australian Languages Workshop and AAA5 at Universität Konstanz, especially Vera Hohaus, for excellent feedback and discussion. This research was conducted with support from the ARC Centre of Excellence for the Dynamics of Language (Project ID: CE140100041).

1975, Klein 1980, van Rooij 2011a). I begin here by discussing the degree-based approach and a semantic typology that has been advanced within it. Delineation framework will take center stage in §3, after a discussion of Kunbarlang and the problems it poses for the degree-based typology in §2.

In the degree-based approaches, owing to the availability of the dedicated semantic type d, gradable adjectives are analyzed as binary relations between degrees on a scale and individuals. Generally, an expression of type τ will be treated as $\langle d, \tau \rangle$ if it is a gradable predicate, which takes a degree as an argument. By way of example, the English adjective *deep* receives semantics as in (1):

(1) $[\![deep]\!] = \lambda d \lambda x.\textsc{Depth}(x) \geq d$ type $\langle d, \langle e, t \rangle \rangle$

A comparative sentence like (2) may then be rendered along the following lines (3):

(2) Lake Baikal is deeper than Lake Tanganyika.

(3) $1\mathbf{d}[deep(\mathbf{d}, Baikal)] \succ 1\mathbf{d}[deep(\mathbf{d}, Tanganyika)]$

The logical representation (3) is intended to capture the intuition that what (2) says is that the (maximal) degree of depth that Baikal reaches is greater than the (maximal) degree of depth that Tanganyika reaches.

Recently Beck et al. (2009) have conducted a small-scale, but in-depth typological study that included 14 languages from the different types in Stassen's (1985)/Bobaljik's (2012) morphosyntactic classification.[2] These authors used a 19-item questionnaire, paying particular attention to the following 7 representative constructions:

- differential comparative (DiffC; *2in taller than*)
- comparison with a degree (CompDeg; *taller than 6ft*)
- degree phrase scoping above a modal verb (Scope)
- negative island effect (NegIs; negation in the *than*-clause)
- degree questions (DegQ; *how tall…?*)
- measure phrases (MP; *6'4" tall*)

2. That is, languages with

   - explicit comparatives (Bulgarian, Guaraní, Hindi-Urdu, Hungarian, Mandarin Chinese, Romanian, Russian, Samoan, Spanish, Thai, Turkish; they also refer to English and German)
   - 'exceed' comparatives (Yorùbá and Mooré)
   - implicit, or conjoined, comparatives (Motu)

- comparative subdeletion (SubC; *x is longer than y is deep*)

Based on the availability of the specific constructions in each given language, an interesting pattern emerges. Rather than choosing a random subset of the possible degree constructions, these languages group into four clusters, further motivating three clusters of constructions (to be explained presently). Moreover, the three clusters of constructions appear to be organized along an implicational hierarchy, suggesting some underlying hierarchy of the semantic devices that are required for a language to be able to "constructionalize" a particular type of meaning.

Table 1: Clusters of degree constructions after Beck et al. (2009)

	DiffC	CompDeg	Scope	NegIs	DegQ	MP	SubC
Motu	N	N	n/a	n/a	N	N	n/a
Yorùbá, Samoan	Y	Y	N	n/a	N	N	n/a
Russian, Guaraní	Y	Y	Y	Y	N	N	N
Thai, English	Y	Y	Y	Y	Y	Y	Y

One can notice from table 1 that there are three groups of constructions, such that (i) languages can have all or none of the constructions from a given group, and (ii) there is an implicational hierarchy to the effect that if a language has means to express constructions towards the right side of the table, it also has means to express what lies to the left. That is, in this 14 language sample there were no languages that would exhibit some of DegQ, MP and SubC, without also having a (lexicalized) way to express DiffC and CompDeg, or not showing Scope and NegIs effects.

Since in Motu there are no lexical resources (such as words or morphemes) to express any comparative/degree semantics, it is hypothesized to lack the d-type from its semantic ontology altogether. This concept of "degree-less" languages, or ones that have only implicit comparison constructions, has received further cross-linguistic support from work on such languages as Fijian (Oceanic; Pearson 2010), Washo (isolate/Hokan; Bochnak 2015) and Warlpiri (Pama-Nyungan; Bowler 2016).[3] The semanticists working on those languages have argued in favour of different approaches, both degree-based (e.g. Bochnak) and delineation (e.g. Bowler and Pearson).

Beck et al. 2009 offer a parametric solution to this emerging typology, which uses three privative parameters to capture the three clusters of constructions:

- Degree Semantics Parameter (DSP): does L have gradable predicates of type $\langle d, \tau \rangle$?
- Degree Abstraction Parameter (DAP): does L have binding of degree variables in the syntax?
- Degree Phrase Parameter (DegPP): can the degree argument position of gradable predicates be overtly filled?

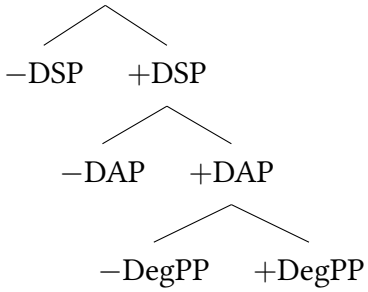
3. See Deal & Hohaus (2018) for a discussion of various senses of *degreelessness*.

In Beck et al.'s (2009: 28) own words,

> [t]he following are the dependencies between the parameter settings: It only makes sense to ask whether a language has abstraction over degree variables if that language has a degree ontology in the first place—i.e. only if we determine a setting [+DSP] need we inquire into the setting of the DAP. If we determine a setting [−DSP] we must have [−DAP] as well. Similarly, the phrases we call DegPs are operators over degrees. They can only occur if the language allows such operators, i.e. has the setting [+DAP]. In this way the parameters explain the dependencies between the data clusters.

Therefore, the parameters can be organized into a decision tree (4), which reflects the observed implicational hierarchy between the clusters in table 1, and thus defines the linearly increasing array of degree constructions available in the language.

(4)



Terminals in the tree (4) define the four classes of languages: from the ones that do not show any lexicalization of degree semantics expressions to those that exhibit the full range of relevant constructions. This analysis, which I shall refer to as the *DSP-approach*, makes a number of predictions that will be of crucial relevance for the ensuing discussion. As the authors point out, it is "very important for our theoretical reasoning that empirical properties can be seen as coming in clusters, and that there are dependencies between them in that some options appear to be prerequisites for others" (Beck et al. 2009: 29–30). Thus, on this view, we expect some sort of 'connectedness' among the parameters (as well as among their diagnostic constructions). We notice further that the "theory could be falsified by the discovery of a language that has degree questions and measure phrases, but an (otherwise unexpected) absence of scope mechanisms for degree operators, for instance… More concretely, according to our analysis it should not be possible for a language like Motu to develop degree questions, but not change in any other respect" (op.cit.: 30–31).

There is, of course, a certain logical independence between the parameters and the particular expressions that their positive setting enables: strictly speaking, while presence of a construction indicates the [+] setting of a parameter, absence does not necessarily entail the [−] setting. This is because there can be occasional gaps or other variation in lexicalization of a particular operator, such as equality or inequality operators. I shall explore the limits and consequences of

this independence after I have shown the empirical problems presented by Kunbarlang in the next section.

2 Kunbarlang

In this section I give the necessary background on Kunbarlang (§2.1) and then describe the expression of degree-semantics constructions in Kunbarlang (§2.2), showing that it does not fit into Beck et al.'s (2009) typology in a neat way. This will prompt me to explore a different solution to the observed diversity among the languages, one that is based on measurement scales (§4).

2.1 Language background

Kunbarlang is an indigenous Australian language spoken by approximately 40 people in central Arnhem Land. It belongs to the Gunwinyguan family (Alpher, Evans & Harvey 2003; non-Pama-Nyungan), and like other Gunwinyguan languages is highly polysynthetic. The verb is the core of morphosyntactic complexity in Kunbarlang, showing a templatic organization with nine prefixal and two suffixal slots, in addition to the root. Every verb obligatorily indexes person and number of its subject and (if transitive) object, and inflects for tense and mood (there are no non-finite forms); the subject prefixes also indicate tense/mood features.[4] Argument structure can be altered via derivational morphology, and some nominals and adverbials may be incorporated into the verb. In the nominal domain, morphology is noticeably simpler than in other Gunwinyguan languages, but there is a noun class (i.e. grammatical gender) system with five classes. Noun class is an agreement category in the noun phrase: the class is inherent for the nouns and all their modifiers agree in it.

Kunbarlang is an understudied language. Harris's (1969) tagmemic sketch and Coleman's (1982) unpublished honours thesis offer some important descriptive groundwork in the core areas of its grammar, but remain inaccessible to a wide audience, and moreover many aspects of the language have not been discussed in enough detail there. There is currently a full-scale documentation project that aims to expand on that previous work and produce a comprehensive reference grammar of this language (Kapitonov n.d.). All data in the present paper are from the author's original fieldwork in Warruwi, Northern Territory, in 2016–2018.

2.2 Kunbarlang comparative/degree constructions

Kunbarlang is interesting in that its specific array of degree constructions is not quite like any other attested so far. At the first glance, it resembles a degree-less language very much. There are no morphological comparatives or superlatives in Kunbarlang, and in that respect it falls within Stassen/Bobaljik's class of implicit comparison languages (which is a widespread type in Australia). In other words, it only has paratactic, but not hypotactic, constructions. The analogue

4. I do not separate tense/mood inflection from the verbal root in glossing examples here.

of a predicative phrasal comparative in Kunbarlang is most often expressed via conjunction of clauses with antonymous predicates (5a) or via conjunction of clauses one of which contains a semantically gradable predicate and the other—a predicative negator *karlu* 'not' (5b).[5] Moreover, inequality may be expressed by a conjunction of clauses with the same gradable predicate in each, where one instance is contrasted with the other through intensification with *ngemek* 'yet', as in the comparative of quantity example (5c).

(5) a. Kundulk bi-nungku man-**djurrkmi**, la mayi bi-ngaybu man-**kukkarlyung**.
tree DAT-you.GEN III-short CONJ NM.III DAT-I.GEN III-long
'My stick is longer than yours.' [lit. 'Your stick is **short** and mine is **long**.']
[IK1-160618_000-01]

b. Ngal-bangardi kin-**kukkarlyung**, la Ngal-ngarridj **karlu**.
II-skin.name II-long CONJ II-skin.name NEG.PRED
'Ngalbangardi is taller than Ngalngarridj.' [lit. 'Ngalbangardi is **tall** and Ngalngarridj is **not**.'] [IK1-160616_000-01]

c. Bedbe kadda-kalng na-**rleng**, la ngayi **ngemek** nga-kalng na-**rleng**
they 3PL.NF-get.PST I-many CONJ I yet 1SG.NF-get.PST I-many
bonj~bonj.
RDP~exactly
'I caught more [fish] than they did.' [lit. 'They got plenty, yet I got plenty, too.']
[sy_160802]

It is important to note that comparison is implied/inferred with the use of these conjoined constructions, rather than entailed. Consider example (6). It exhibits the crucial ambiguity between a literal and a comparative reading.

(6) Ninda nayi **djarrang** na-**wanjak** la ninda nayi **djaddi** na-**rlengbinbin**.
DEM.PROX.I NM.I horse I-little CONJ DEM.PROX.I NM.I frog I-big
LITERAL: 'The horse is little [for a horse], the frog is big [for a frog].'
COMPARATIVE: 'The frog is bigger than the horse.' [sy_160816]

The intuition is that the two readings correspond to the different ways to construe the comparison class against which the adjective is evaluated. On the literal (and plausible: the real-life horse is bigger than the real-life frog) reading, which one may call the *global* construal, the horse is evaluated against other horses, and the frog—against other frogs. The comparative reading (which I confirmed by showing the speaker a drawing of these implausibly-sized animals), on the other hand, construes the class as consisting of just those two animals, the mentioned horse and frog. Thus, I conclude that comparison is not constructionalized as the meaning

5. Abbreviations used here are: 1 first person; 2 second person; 3 third person; CONJ conjunction; DAT dative; DEM demonstrative; GEN genitive; I class I; II class II; III class III; IV class IV; NEG negative; NF non-future; NM noun marker; NP non-past; OBJ object; PL plural; PRED predicative; PROX proximal; PST past; RDP reduplication; SG singular.

of a conjunction. This will play a role in section 4 when I discuss the difference between the languages with implicit and with explicit comparatives.

This conjoined, or implicit, strategy is used for the vast majority of degree semantics constructions in Kunbarlang:

- predicative phrasal comparatives
- adverbial comparatives
- attributive comparatives
- comparatives of quantity
- clausal comparatives
- differential comparatives [with a measure phrase]
- comparison with a degree [with a measure phrase]
- comparative subdeletion

A systematic survey of the constructions from Beck et al.'s (2009) questionnaire reveals that only one of them has a lexicalized expression in Kunbarlang—namely, measure phrases (7). There is not enough diachronic information to conclude with certainty, but it is plausible that the construction is a recent borrowing from English; the numerals and measure units, such as *foot* or *meter*, are often loanwords (7b). Notice, however, that original Kunbarlang lexicon can be used as well (7a,c).

(7) a. Nga-karrme **kaburrk** **la** **kaburrk** **djanga** man-**kukkarlyung** **mayi**
1SG.NF-get.NP two CONJ two foot III-long NM.III
kundulk.
tree
'I've got a **four feet long stick**.' [IK1-170620_1SY-03]

b. Nginda ngunda **6** **foot** **kin-kukkarlyung**, karlu, nginda
DEM.PROX.II not 6 ft II-long NEG.PRED DEM.PROX.II
kin-djurrkmi, yimarne 4 foot.
II-short, like 4 ft
'She's not **6 feet tall**, no, she's short, maybe 4 feet.' [IK1-170616_1SY-01]

c. kun-**djorlok** **korro** **middjaba**=ngaybu
IV-deep at knee=I.GEN
'knee-deep' [ibid.]

Measure phrases are a [+DegPP] construction, since the syntactic phrase that expresses the measure is supposed to occupy the argument position of the gradable predicate. There are no constructions for differential comparatives or comparison with a degree, which are diagnostic of the [+DSP], on Beck et al.'s (2009) analysis, for the representations like (1) to be available. These are also *morphosyntactically* prerequisite for the [±DAP] diagnostics, so testing the scope and the negative island effects is trivially not applicable in Kunbarlang. Neither are there other DegPP constructions available: comparative subdeletion promts yield conjoined clauses, and the only way to form a question is pragmatic: that is, there is a general 'what kind of' question that could be interprered as referring to a kind, some property, or the quantity depending on context (8a). The manner interrogative pronoun for 'how' is not used for degrees and may not directly combine with a gradable predicate (8b).

(8) a. Birlinj nayi durduk ki-buddu-karrme?
how NM.I dog 2SG.NF-3PL.OBJ-hold.NP
'What have you got, dog-wise?' [given in response to promt: 'How many dogs do you have?'] [IK1-180606_1SM-01]

b. *Birlinj man-bakkarlyung manda kundulk?
how III-long DEM.PROX.III tree
intended: 'How long is that stick?' [IK1-170620_1SY-02]

This means that the only parameter that has the positive setting in Kunbarlang is the Degree Phrase Parameter. Moreover, even the DegPP cluster itself is not homogenous: we have MPs, but not DegQs or SubCs, as summarized in table 2. This picture is potentially inconsistent with the implicational hierarchy, viz. the prediction that [+DegPP] ⇒ [+DSP].

Table 2: Kunbarlang against the background of Beck et al.'s (2009) typology

	DiffC	CompDeg	Scope	NegIs	DegQ	MP	SubC
Motu	N	N	n/a	n/a	N	N	n/a
Yorùbá, Samoan	Y	Y	N	n/a	N	N	n/a
Russian, Guaraní	Y	Y	Y	Y	N	N	N
Thai, English	Y	Y	Y	Y	Y	Y	Y
Kunbarlang	N	N	n/a	n/a	N	**Y**	N

There are two main analytical possiblities: (i) try to modify and rescue the DSP-approach, or (ii) seek an alternative analysis. In the following section I begin by discussing the lexicalization solution to the presented problem. I shall conclude that this is not very desirable as it radically weakens the predictive value of the theory, and in its stead I shall propose an alternative analysis stemming from the delineation family of approaches.

2.3 A lexicalization quirk?

There is on-going cross-linguistic work within the degree-based paradigm, which indicates considerable variation in the inventories of degree operators, such as equative or comparative operators (e.g. Berezovskaya & Hohaus 2015). This gives us an insight into how the DSP-approach can be upheld. As I have mentioned above, absence of a particular construction in a given language does not per se count as evidence for the negative setting of the relevant parameter, strictly speaking. It remains a logical possibility that an underlying semantic device, such as the degree type, or the order relation, exists in this language, but an accidental lexicalization gap conceals it. For the sake of concreteness, absence of a morphological comparative operator (like the English *-er* or *more*), does not immediately indicate unavailability of the comparison operation ($x > y$) on a conceptual level. Rather, it can be an idiosyncrasy of the lexical inventory.

Following the above reasoning, one may say, in regards the Kunbarlang data, that the presence of the measure phrase construction validates not just the [+DegPP], but also the [+DSP], even in the absence of independent evidence for the latter. That is, perhaps unit names happened to be the only degree-related kind of expression that got lexicalized in Kunbarlang. This should be enough to resolve the contradiction outlined above.

I wish to argue, however, that such a move is highly undesirable. The main reason is that in this attempt to rescue the DSP-approach, one would render it unfalsifiable. As soon as negative evidence does not count for the negative setting of parameters, there remain no grounds to classify any language at all as degree-less, i.e. not even Motu, Washo or Warlpiri. As soon as lexicalization is allowed to explain away any puzzling gap in the data, all predictive power of the parameters is lost.

I venture that this also was the original intention of Beck et al., and adduce these two quotes to support my claim: "Perhaps [all languages] start with a $[-/-/-]$ setting and may then incorporate scales into the grammar, moving to $[+/-/-]$. This is a change that Samoan, perhaps, has just undergone" (op.cit.: 31). That is their conjecture about the directionality of language change. And further we read: "[m]ore concretely, according to our analysis it should not be possible for a language like Motu to develop degree questions, but not change in any other respect" (ibid.).

How can one remedy the situation instead? I shall argue now that one can preserve the typological insight and at the same time accommodate the Kunbarlang data, by using tools from the measurement theory within a delineation framework.

3 Delineation approaches and measurement theory

The main alternative to the degree-based approaches is the family of delineation approaches. Here the gradable adjectives are simple predicates (rather than relations between degrees and individuals), whose extension is crucially context-sensitive. Delineation approaches have a number of appealing features (see Klein 1980 for the original argument and more detail). One is that the meaning of the comparative form of an adjective is a function of the meaning of the

positive form, which is in accordance with the compositionality principle and is also plausible in view of the frequent morphosyntactic markedness of the comparative from w.r.t. the positive form across a variety of languages. This is unlike the degree-based approaches, where typically the positive and the comparative forms are derived independently from a common abstract representation (see e.g. an analysis of the abstract positive morpheme in Kennedy & McNally 2005: 350; but to the best of my knowledge, there are no known languages that have an overt POS morpheme). Another is that *nonlinear* adjectives, like the English *clever*, do not give rise to a total ordering, which is required on a degree-based analysis, but not under the delineation approaches.

I follow Klein's (1980) proposal here in assuming that every gradable adjective is interpreted with respect to a *comparison class*, i.e. a set of individuals. Thus, the truth of a sentence like *Lake Tanganyika is deep* is contingent on the contextually supplied comparison class: it is true in the comparison class c iff Tanganyika counts as deep in this class, as represented in (9).[6]

(9) $[\![\textbf{deep}(Tanganyika)]\!]^c = 1$ iff Tanganyika counts as deep in c

Thus, the truth of (9) depends not only on the physical depth of Lake Tanganyika, but on the context c in which it is evaluated.[7] However, a comparative sentence like *Lake Baikal is deeper than Lake Tanganyika* is context-independent, and is true just in case there exists a comparison class in which Baikal counts as deep, but Tanganyika does not.

3.1 Measurement theory

Measurement theory is a framework for mathematical reasoning about measurement and comparison originally developed by Krantz et al. (1971). It uses real numbers as a model of other ordering structures (e.g. scales). The rationale behind this is that the properties of real numbers are well studied and using them as a model could lead to a better understanding of scales in other, non-numerical, domains. The abstract scales can vary in their expressive power, corresponding to different types of natural phenomena. Crucially for our enterprise here, measurement theory can be used in degree semantics (see, a.o., Klein 1991, Sassoon 2010, van Rooij 2011b). For our purposes here, these are the important four types of scales:

- nominal (classification, e.g. eye colour)
- ordinal (ordering, e.g. competition outcomes)
- interval (difference, e.g. temperature in °F or ℃)
- ratio (proportions, e.g. length or age)

6. I shall use *context* as synonymous with *comparison class* in what follows.

7. Klein (1980), following Kamp (1975), formalizes the 'counts as' notion via the POSITIVE and NEGATIVE EXTENSION of each given predicate ζ, and the EXTENSION GAP that lies in-between accounts for the borderline cases phenomenon shown by vague predicates, i.e. the existence of objects to which it is not clear if the predicate applies (cf. Burnett 2017: 17).

These types of scales can all be represented as ordering structures of the form $\langle X, R\rangle$, where X is a set of individuals and R a relation on that set. The difference between the types of scales lies in the different properties of R. Expositions of this framework in its linguistic applications (e.g. Klein 1991, van Rooij 2011b) typically begin with the ordinal scales, since this is where explicit comparison starts. In this case the relation, let's call it R_O, is a *strict weak order*, i.e. it is irreflexive (IR), transitive (TR) and almost connected (AC).[8]

(IR) $\forall x : \neg R(x, x)$

(TR) $\forall x, y, z : (R(x, y) \wedge R(y, z)) \rightarrow R(x, z)$

(AC) $\forall x, y, z : R(x, y) \rightarrow (R(x, z) \vee R(z, y))$

We can use this class of structures, $\langle X, R_O\rangle$, to formulate the semantics for an (explicit) comparative, e.g. the English suffix *-er*. Writing c for a *context*, i.e. $c \subseteq (D_e)$, and P for a gradable adjective, which to each context c assigns its subset (i.e. the positive extension of that adjective):

(10) $[\![\mathbf{P}]\!]^c = \lambda x.P(c)(x)$

(11) $[\![-\mathbf{er}]\!]^c = \lambda x \lambda P \lambda y \exists c'.P(c')(y) \wedge \neg P(c')(x)$

We notice two things here. First, the formulation of the conditions in (11) renders the comparative adjective a (strict) weak ordering on the set of individuals exactly as defined above (i.e. a particular kind of R_O relation). We may alternatively say $y \succ_P x$, intending $\succ_P$ to be the ordering that the gradable adjective P imposes on its domain. Second, we have the desired result of the comparative being a function of the positive form of the adjective (10).

4 Towards a measurement-theoretic typology

As the natural next step from the analysis of the comparative, I observe, together with van Rooij (2011b), that ordinal scales are insufficient to accurately represent *more informative* ordering structures, i.e. some more complex comparative constructions. In particular, we need to be able to express addition for the differential comparatives, and multiplication—for the ratio comparatives (such as *Lake Edward is twice as deep as Lake Albert*).[9] Consequently, one has to make use of other classes of ordering structures, which yield the other scales: *algebraic difference structures* for the interval scales, and *closed extensive structures* for the ratio scales. For space considerations, I do not give full definitions here, but refer the interested reader to van Rooij

8. Note that IR and TR together imply *asymmetry*, i.e. the property that $\forall x, y : R(x, y) \rightarrow \neg R(y, x)$.
9. Notice that ratio comparatives are not part of Beck et al.'s (2009) questionnaire.

(2011b: 340–4). I just note informally that the former ones utilize a quaternary, rather than a binary, relation; and the latter ones involve a concatenation operation $\circ$ on X in addition to the strict weak order relation (so, $\langle X, R_O, \circ \rangle$).

I argue that the nominal scales, usually left out from the (Anglo-centric) linguistic discussion of the comparision, are directly relevant for the analysis of implicit comparatives. Arguably, at least some of the paratactic comparatives can be faithfully represented via nominal scales. I would like to propose that nominal scales can be captured by the ordering structures of type $\langle X, R_N \rangle$, where R_N is an *equivalence* relation, i.e. one that is reflexive (RF), transitive (TR above) and symmetric (SM).

(RF) $\quad \forall x : xRx$

(SM) $\quad \forall x, y : xRy \rightarrow yRx$

Equivalence relations in a structure $\langle X, R_N \rangle$ partition the set X into equivalence classes, i.e. subsets such that within each the R_N holds between all its members, but never between members of different subsets (Partee, ter Meulen & Wall 1990: §3.4).

A picture emerges along the following lines: languages differ with respect to which is the most complex type of a scale that they can refer to in their degree-semantics constructions. For instance, in Motu only nominal scales are available, and therefore we only find conjoined comparatives, and no other constructions, there. In Yorùbá or Samoan, on the other hand, the presence of DiffC indicates that interval scales must be available. What does it mean for a language to only have access to ordinal scales? One would expect to find morphological phrasal comparatives, but not any of the [+DSP] constructions. It seems that Nez Perce is exactly such a language (Deal & Hohaus 2018). Presence of ratio comparatives, e.g. in English, would attest to ratio scales being available.

- conjoined comparatives: nominal
- morphological comparatives: ordinal
- differential comparatives (*3in taller than*): interval
- ratio comparatives (*twice as tall as*): ratio

Let us now return to the Kunbarlang measure phrases, which served as the impetus for this investigation. van Rooij (2011b: 340–1) suggests that ratio scales are required to represent measure phrases, since they allow for multiplication. This is in line with Sassoon's (2010) compositional analysis of unit names. However, I propose that at least in some languages MPs can be analyzed as equivalence classes. That is, some languages treat them as non-decomposable, basic units.[10] If this is on the right track and Kunbarlang MPs are such non-decomposable units,

10. Cf. also Tiemann, Hohaus & Beck's (2012) degree individuals, i.e. pronominal measure phrases such as *this big* (accompanied by a gesture).

then nominal scales would suffice. This is precisely the purpose that nominal scales serve and the type of information they represent: classifying individuals into groups. Thus, I analyze the puzzling MPs in Kunbarlang as lexicalized unit names. An example rendition follows in (12) for the phrase *kaburrk djanga man-kukkarlyung* [two foot III-long] 'two feet long' (e.g., stick) from example (7a) above.

(12) $[\![\text{kaburrk djanga mankukkarlyung}]\!]^c = \lambda x.2\text{ft}_{\text{kukkarlyung}}(x)$

The representation in (12) suggests that semantically a measure phrase in Kunbarlang is simply a characteristic function of the '2ft' class, and not a ratio between the length degree of x and the length degree of a unit-object (say, foot; cf. Sassoon 2010).

Piecing the foregoing discussion together, I now make a concrete proposal which shows how the different types of scales can provide a framework for the cross-linguistic variation that we have seen. Table 3 summarizes it concisely:

Table 3: Beginnigs of a measurement-theoretic typology

Language	Highest available scale	Degree-based type
Motu, Washo	nominal without unit names	−DSP
Kunbarlang	nominal with lexicalized unit names	↯
Nez Perce	ordinal	↯
Samoan	interval	+DSP
English	ratio	+DegPP

The lightnings (↯) in the degree-based type column indicate that such a language does not have a natural place in the Beck et al.-style typology. At least to the extent that it allows inclusion of Nez Perce and Kunbarlang as subtypes of degree-less languages, the measurement-theoretic typology offers the benefits of a finer gradation than the DSP-approach, as it stands, has to offer.

The final point I want to touch on is the absence of degree questions in Kunbarlang. Intuitively—and indeed on Beck et al.'s analysis (ex. 15–16, pp. 7–8)—DegQ is a direct counterpart of the MP, differing only in that a question word is used in place of the measure unit phrase. I suggest that the reason why Kunbarlang has one but not the other is a genuine lexical gap. If this is true that the construction was borrowed from English and subsequently generalized to include original Kunbarlang numerals and units (7a,c), then it is not surprising that a question word is lacking. Recall that there is only one way to form a 'kind'-question, which may be interpreted as referring to degree, manner, quality or quantity, depending on context (8). An alternative hypothesis about the absence of DegQ in Kunbarlang would be that these questions and measure phrases are in fact underlyingly dissimilar; for instance, perhaps DegQ necessarily involves quantifier raising, while this can be avoided for MP. To determine whether this is a possibility, further analysis of the Kunbarlang syntax-semantics interface is required.

5 Conclusions and further directions

In this paper I have laid the beginnings of a measurement-theoretic typology of comparison constructions, building on the ideas of Klein (1980) and their recent development, e.g. by van Rooij (2011b). I have adduced data from the degree sematics domain in Kunbarlang, which prove problematic for the main typological framework in currency, namely the degree-based one of Beck et al. (2009). The measurement scales of increasing informativeness, I argue, may provide a basis for a typology that is both more fine-grained and empirically more adequate. Essentially, the different approaches make different predictions about which constructions would be more basic due to the inherent mechanics of these formalisms. That is, in a degree-based framework, differential comparatives require less complex representation. In delineation frameworks, on the other hand, equatives and DegQs are simpler to account for. I contend that we need to broaden our empirical basis beyond the 15–20 languages examined to date, before further-reaching conclusions can be made. That means that a formidable amount of work remains before this proposal can be fully evaluated.

Some of the pressing issues to be explored, as I see them, are these. I have suggested that the different scales form a natural progression, according to the information they can encode, but I have not shown it. In other words, a full formalization of the typology sketched here still needs to be done. Next, I have not discussed, nor indeed analyzed, some of the constructions that were crucial in Beck et al.'s (2009) questionnaire, in particular DegComp, SubC and the ones pertaining to the [±DAP] parameter. That is, part of the challenge that the present proposal has to meet, is to accurately capture the full range of the empirical findings in the previous work. It's relevant to note, however, that the empirical picture that we need to capture is not exactly that presented above, e.g. in (4). For one, Tiemann, Hohaus & Beck (2012) argue that DegPP can be set independently of DAP, and thus the implicational relations are somewhat more relaxed than in Beck et al.'s original formulation.

Finally, I would like to point out that the matters of concern here are most probably more intricate than a choice between a degree-based or measurement-based typology could decide. As has been pointed out by Beck et al. (2009), the principles underlying individual constructions may be more semantic or more syntactic (for instance, the [±DegPP] parameter is a syntactic parameter). Exploring the syntax/semantics interface as manifest in the realm of comparison is one of the overarching tasks in this research program.

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