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EXCEED Comparison and A/B Numeral Modifiers in Czech*

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1 Introduction

The research on comparatives is vast (e.g., von Stechow 1984, Heim 2000, Kennedy and McNally 2005, Pancheva 2006, Schwarzschild 2008, Rett 2008, Solt 2015), and yet, a class of constructions involving so-called EXCEED comparison still remains somewhat understudied (notable exceptions include, e.g., Stassen 1985, Beck et al. 2009, Howell 2013, Bochnak 2018), and is virtually neglected in the context of Slavic linguistics. In this paper, we intend to contribute to filling this gap by investigating semantic properties of two classes of Czech EXCEED verbs

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formed with the prefix *pře-* 'across, over' (approximate literal meaning), such as *převyšovat* 'to exceed (in height)', lit. 'to over-heighten' and *překračovat* 'to exceed', lit. 'over-step'. To this goal, we draw on two largely independent strands of research: the formal semantic treatment of Slavic prefixes and prepositions as expressions that are lexically associated with scales (e.g., Filip 2008, Kagan 2013), on the one hand, and an approach to numeral modifiers as degree quantifiers, on the other. Numeral modifiers can be divided into two types, as proposed by Nouwen (2010, 2015): (i) class A modifiers which are comparative modifiers that compare two definite cardinalities, e.g., *more/fewer than 100; under/over 100*, and (ii) class B modifiers which are maxima and minima indicators that relate a range of values to a certain boundary, e.g., *at least/at most/minimally/maximally/up to 100*.

Against this background, we propose that the prefix *pře-* 'across, over' which forms EXCEED verbs in Czech should be assimilated to the class A of comparative modifiers. We also argue that the properties of such EXCEED verbs in Czech point to a particular way in which comparatives are linked to numerical expressions, thus suggesting a promising research venue that has not so far received much attention in the semantic literature (but see, e.g., Kennedy 2013, Dočekal & Wągiel 2018, Gobeski & Morzycki 2018 for some insights). Finally, our results promise to shed new light on the interaction between comparison, modality, and quantification.[1]

The outline of this paper is as follows. First, in Section 2 we discuss the EXCEED comparison in general, and then in Section 3 Czech EXCEED comparatives in particular, as expressed by verbs prefixed with *pře-* 'across, over'. Next, in Section 4 we examine the distinction between class A/B numeral modifiers, and in Section 5 we present novel data

[1] Nouwen's (2010, 2015) work on class A/B modifiers induced some interesting responses, e.g., from Cohen and Krifka (2014) and Schwarz, Buccola and Hamilton (2012), among others. In this paper, we follow Nouwen's seminal framing of the distinction, since it is easier to capture scope interactions with modals than it is in, e.g., Cohen and Krifka's approach. This is because it is not trivial to obtain the low scope of superlative modifiers with respect to other logical operators in a sentence in their framework. A proper discussion of certain consequences of the data we bring with respect to other frameworks lies beyond the scope of the present study.

indicating its role in the semantic analysis of the relevant EXCEED verbs in Czech. In Section 6, we revise a standard semantic account relating Slavic verb prefixes and scalarity. In Section 7, we propose an analysis based on the idea that Czech EXCEED verbs have a built-in class A modifier. In Section 8, we discuss consequences of our approach with respect to degree arguments and the compatibility of scale orientation. Finally, Section 9 concludes the paper.

2 EXCEED Comparison

The EXCEED comparatives of interest here are constructions in which the standard of comparison is expressed by the DO of a transitive verb typically meaning something like 'to exceed' or 'to surpass' (Stassen 1985). Similar to standard comparatives, such verbs compare degrees related to certain entities with respect to some dimension. Examples are attested in a number of languages, including Thai, Vietnamese, Swahili, Hausa, and Luganda (e.g., Beck et al. 2009, Howell 2013, Bochnak 2018). For instance, Mandarin and Yoruba use an EXCEED verb as the main predicate of a comparative sentence; see (1) and (2), respectively (Kennedy 2005).[2]

(1) Ta bi ni gau. (Mandarin)
he exceed you tall
'He is taller than you.'

(2) O tobi ju u. (Yoruba)
he big exceed him
'He is bigger than him.'

Importantly, EXCEED comparatives can co-exist with other linguistic strategies for indicating comparison in a given language. For instance, English allows for both standard THAN comparatives and EXCEED comparisons expressed by a transitive verb, see (3).

(3) a. John is taller than Mary.
b. John's height exceeds Mary's height.

These two strategies are also available in Czech, as is illustrated in (4a) and (4b).

[2] Other types of EXCEED comparatives involve serial verb constructions and subordinate nominalized forms.

(4) a. Katedrála je vyšší než radnice o 20 m.
cathedral is higher than town.hall by 20 m
'The cathedral is higher than the town hall by 20 m.'
b. Katedrála pře-vyšuje radnici o 20 m.
cathedral over-heighten.3SG town-hall by 20 m
'The cathedral exceeds the town-hall in height by 20 m.'

Notice that the comparative nature of the Czech EXCEED verb in (4b) is corroborated by the fact that it is compatible with a differential. The EXCEED meaning component is here contributed by the prefix *pře-* 'across, over', which is added to the base derived from the root 'high'.

In the next section, we examine basic morphological properties of two types of such verbs in Czech.

3 Czech EXCEED Comparatives

From a descriptive perspective, Czech EXCEED verbs fall into two classes: namely expressions that seem to lexically encode a dimension of measurement, such as *převyšovat* (lit. 'over-heighten', as in (5a), and verbs that lack this property, such as *překračovat* lit. 'over-step', as in (5b). We refer to the first as 'dimensional EXCEED verbs', whereas the latter are called 'non-dimensional EXCEED verbs'. We assume that dimensional EXCEED verbs are derived from stems of gradable expressions and we contribute some morphosyntactic evidence below.

(5) a. vys-oký ⇒ pře-vyš-ovat
high-ADJ over-heighten-IPF
'high' 'to exceed/be taller/higher (than)'
b. (krok ⇒) kráč-et ⇒ pře-krač-ovat
(step$_N$) step-IPF over-step-IPF
('step') 'to step' ⇒ 'to exceed/overstep/transgress'

Morphophonological evidence indicates that Czech dimensional EXCEED verbs are derived either from comparative forms of gradable adjectives or from nominalizations naming gradable properties. This is manifested in the occurrence of specific consonantal alternations. In particular, as we see in (6a), the alveolar fricative *s* in the positive form alternates with the

post-alveolar *š* in the comparative form. Nevertheless, here, we will gloss the verb *převyšovat* as 'over-heighten', rather than as 'over-higher' for the sake of simplicity and comprehension, even if the *-vyš-* stem is arguably related to the comparative form *vyšší* 'higher, taller' of the positive form *vysoký* 'high, tall'.

(6) a. vy**s**-oký ~ vy**š**-ší
high-ADJ high-er
b. *pře-vy**s**-ovat ~ pře-vy**š**-ovat
over-high-IPF over-heighten-IPF

(6b) shows that the root of the EXCEED verb, formed with the prefix *pře-* 'across, over', contains the sibilant *š*, while the presence of *s* leads to an unattested form (ungrammaticality). Notice, however, that the same fricative is also found in nominal forms such as *výše* and *výška* (both 'height' which might suggest a denominal origin of the discussed EXCEED verbs. In any case, what is crucial is that such expressions are derived from forms lexically encoding a dimension of measurement.

Furthermore, the prefix *pře-* 'across, over' in EXCEED verbs appears to be an obligatory part of the derivation. As far as we can tell, all Czech dimensional EXCEED verbs are prefixed and, more importantly, primary unprefixed perfectives and imperfectives turn out to be ungrammatical, as we see in (7).

(7) a. *výš-it ~ pře-výš-it
higher-PFV over-heighten- PFV
b. *vyš-ovat ~ pře-vyš-ovat
higher-IPF over-heighten-IPF

Turning to non-dimensional EXCEED verbs, as in (5b) above, they are typically derived from verbs of motion, i.e., expressions that do not encode lexically any dimension of measurement. In this case, the prefix *pře-* 'across, over' is applied to a primary imperfective. Notice also that the resulting verb *překračovat* is ambiguous between a motion verb meaning of approximately 'to step over', 'to cross' and a comparative verb meaning of 'to exceed'. These two meanings could also be viewed as polysemous, the latter derived by a metaphoric extension.

In the next section, we will turn our attention to the distinction between class A/B numeral modifiers, a phenomenon seemingly unrelated to Czech EXCEED verbs under consideration here, but which in fact proves highly useful for capturing their meaning, as we show.

4 Class A/B Numeral Modifiers

The distinction between A/B numeral modifiers is now well-established (Nouwen 2010, 2015; see also, e.g., Brasoveanu 2012, Cohen & Krifka 2014). In a nutshell, class A consists of comparative modifiers that compare two definite cardinalities, whereas class B modifiers are maxima and minima indicators that relate a range of values to a certain boundary. As shown in Table 1, this distinction covers a number of expressions, including (i) class A modifiers, such as comparative modifiers and locative prepositions, and (ii) class B modifiers, such as superlative modifiers, directional prepositions, and adverbs like *maximally*.

Class A	**Class B**
more than *n*	at least *n*
less than *n*	at most *n*
fewer than *n*	up to *n*
over *n*	minimally *n*
under *n*	maximally *n*
between *n* and *m*	from *n* to *m*

Table 1: Class A and B modifiers

Although the class A/B distinction is robust, and supported by cross-linguistic data, it is still not entirely clear how to explain it theoretically. While here we follow the semantic approach of Nouwen (2010), we acknowledge that other, more pragmatic stances have also been suggested, e.g., by Mayr (2013) and Nouwen (2015). Be that as it may, there is a consensus in the literature regarding certain core properties of modifiers justifying the distinction presented in Table 1.

b. There were exactly 62 errors in the paper, #so that's at least 50.

To conclude, class A consists of comparative modifies that compare two definite cardinalities, whereas class B modifiers are maxima and minima indicators that relate a range of values to a certain boundary. In the next section, we demonstrate the relevance of the class A/B distinction for the discussed Czech EXCEED verbs.

5 Czech EXCEED Verbs and the Class A/B Distinction

Let us now apply the diagnostics introduced in the previous section to EXCEED verbs in Czech. The core observation of this paper is that both dimensional and non-dimensional EXCEED verbs pattern with class A modifiers. Consider a situation in which the speaker knows that a hexagon has exactly 6 sides. In such a context, there is a clear contrast between (12a) and (12b) on the one hand and (12c) on the other. What is crucial is that EXCEED verbs display the same behavior as standard class A comparative modifiers, which contrasts sharply with the infelicity of class B modifiers in an environment associated with epistemic competence.

(12) a. Počet stran šestiúhelníku pře-kračuje/pře-vyšuje 3.
number $\text{sides}_{\text{GEN}}$ $\text{hexagon}_{\text{GEN}}$ over-step/over-heighten 3
'The number of sides of a hexagon exceeds 3.'

b. Počet stran šestiúhelníku je víc než 3.
number $\text{sides}_{\text{GEN}}$ $\text{hexagon}_{\text{GEN}}$ is more than 3
'The number of sides of a hexagon is more than 3.'

c. #Počet stran šestiúhelníku je aspoň/přinejmenším 3.
number $\text{sides}_{\text{GEN}}$ $\text{hexagon}_{\text{GEN}}$ is at.least/at.least 3

(12a) contains an EXCEED comparative verb taking a numeric value as its direct object argument and the whole sentence is perfectly natural and acceptable. The EXCEED verb here expresses a relation to definite cardinalities, as is expected on the assumption that it patterns with class A modifiers, and the whole sentence is used to assert a weak proposition similar to that in (12b). In contrast, in (12c) the occurrence of a class B modifier is infelicitous.

Another contrast corroborating the class A nature of Czech EXCEED verbs concerns ignorance inferences. Unlike class B modifiers, verbs such as *překročit* and *převýšit* do not show any ignorance effects, as demonstrated in (13). Specifically, similarly to class A modifiers, EXCEED verbs are compatible with epistemic competence, whereas class B modifiers (though referentially determined) imply epistemic uncertainty, and thus lead to the inference that the speaker is ignorant with respect to the numerical value in question.

(13) a. Cena toho bytu byla 120.000 €,
price this$_{GEN}$ flat was 120.000 €
takže pře-kročila 100.000 €.
so over-stepped$_{PFV}$ 100.000 €
'The price of this flat was 120.000 €, so it exceeded 100.000 €.'

b. Cena toho bytu byla 120.000 €,
price this$_{GEN}$ flat was 120.000 €
#takže byla aspoň 100.000 €.
so was at.least 100.000 €

For instance, as witnessed by the felicity of (13a), the EXCEED verb *překročit* 'to exceed'; lit. 'to overstep' can occur in a context in which the speaker knows the exact price of the relevant flat and compares it with the value denoted by the direct object of the verb in the second clause. This behavior is on par with the effect observed in (11a). On the other hand, as demonstrated in (13b), Czech class B modifiers are odd in a context that is similar to the corresponding English sentence in (11b).

Given the evidence presented above, we conclude that Czech EXCEED verbs are in fact class A modifiers which differ from class B such as superlative expressions and directional prepositions in that they compare definite values and are always compatible with the epistemic competence of the speaker. Before we move on to our proposal, in the next section we will briefly summarize the treatment of Slavic verb prefixes as expressions inherently associated with scales.

6 Slavic Verb Prefixes and Scalarity

Our proposed analysis of EXCEED verbs in Czech, which are formed with the prefix *pře-* 'across, over' is predicated on the assumption that they can be assimilated to the class A of comparative modifiers, and as such share the core semantics with comparative numeral modifiers, which can be analyzed by means of the device of a scale. A scalar-based approach to the semantic analysis of Slavic verbal prefixes is now well-established in event semantics, and specifically related to grammatical aspect.

Filip (1992, 2004, 2005) argues that Slavic verbal prefixes as a whole class cannot be analyzed as morphological exponents of the semantic perfective operator, which is characterized in terms of notions such as telicity, completion/culmination, and the like. The main reason for this is that adding prefixes to verb bases does not uniformly yield verbs denoting telic predicates or predicates of completed/culminated events, and prefixes also form imperfective verbs that denote atelic predicates. What is of main interest here is that many Slavic verbal prefixes developed from prepositions and adverbs used for the expression of directed path structures in space and time, and it is one of their common functions to add spatial/directional meanings to verbs they form (Filip 2004). Other meanings commonly lexicalized by verbal prefixes are related to cardinality and measures. Directed path structures, cardinality, and measurement notions are precisely the type of meaning components that introduce ordering relations, which, on independent grounds, are also commonly represented by means of scales.

Filip (1992, 2004, 2005) proposes that Slavic verbal prefixes are best analyzed as derivational morphemes that semantically function as modifiers of eventuality types expressed by "aspectless" base predicates. Their common semantic core can be reduced to an ordering on a set of entities (alternately a scale), be they time points/intervals, path segments, or ordinary individuals, all of which are structured by the algebraic device of a join-complete semi-lattice, following Krifka (1989, 1990).

Also inspired by Krifka, Filip takes as fundamental the insight that there are complex predicates and grammatical constructions that rely on systematic correspondences (structure-preserving mappings or

homomorphisms) between the ontological structure of eventualities and entities of various types bearing a relation to eventualities. This in turn motivates a general phenomenon that can be characterized as the extension of ordering relations from one domain to another.

Set against this background is the idea that a part of the meaning of Slavic verbal prefixes can be characterized in terms of orderings on eventualities (denoted by predicates to which prefixes are applied), which are induced by orderings on objects (bearing a relation to such eventualities). So rather than being "markers" of telicity or perfectivity, Slavic prefixes provide a prerequisite for the application of the maximalization operator MAX$_E$, as Filip and Rothstein (2005) and Filip (2008) argue. MAX$_E$ is at the intersection of the semantics of perfectivity in Slavic languages and the semantics of telicity in Germanic languages. MAX$_E$ is a monadic operator, such that MAX$_E$ ($\mathcal{E}$) $\subset$ $\mathcal{E}$. It maps sets of eventualities $\mathcal{E}$, (partially) ordered by an ordering criterion for objects on a scale, onto sets of maximal eventualities. In Germanic languages, MAX$_E$ applies at the level of VP (or V') denotations. In Slavic languages, it applies at the level of V denotations, and if V is formed with a prefix, what counts as 'one' maximal eventuality in the denotation of a MAX$_E$(P) will be calculated based on an ordering on eventualities in the denotation of P induced by that prefix.

When it comes to the Czech prefix *pře-,* which is of main interest here, we observe that it has a number of contextually related meanings, which can be related by metonymic and metaphoric extensions to its basic spatial meaning of 'across/over, from one side *x* to the other side *y* of some area', as in (14):

(14)	plavat^{I}	$\Rightarrow$	pře-plavat^{P}	(přes)	řeku
	swim		across-swim	(across)	river
	'to (be) swim(ming)'		'to cross the/a river by swimming'		

In (14), *pře-* is attached to the simple imperfective (I) intransitive verb *plavat* 'to (be) swim(ming)', a verb of manner of motion, and derives the perfective (P) verb *přeplavat*, a two-place predicate, where the non-subject argument must be realized either as the DO 'to cross X by swimming' or as an obligatory PP 'to swim across X'. The denotation of

the imperfective base *plavat* 'to (be) swim(ming)' consists of overlapping eventualities of swimming of various sizes; i.e., *plavat* is cumulative. The prefix *pře-* denotes a function from such an overlapping set to a set of disjoint eventualities of swimming, each of which to the 'amount of one crossing of X'. Applied to this set, MAX$_E$ yields a quantized predicate, because it picks the largest culminated eventuality-unit of swimming that is true of an individual at a given context, and what it is in (14) is determined with respect to moving from one side of the river to the other.

Extending the basic spatial meaning of the prefix *pře-* of roughly 'across/over, from one side *x* to the other side *y* of some area', to non-spatial meanings, it is easy to see that moving from one boundary point to another and exceeding it can naturally be extended to the scalar domains like comparison, as in *pře-kroč-it* pf. 'to exceed/overstep/ transgress', *pře-krač-ovat* ipf. 'to (be) exceed(ing)/overstep(ping)/ transgress(ing)' (see (5b) above) or excess, as in *pře-jíst se* pf. 'to overeat', *pře-jídat se* ipf. 'to tend to overeat; to overeat as a rule, sporadically, frequently'. Arguably, *pře-* in all its uses introduces a relation between two variables *x* and *y*, which in the case of comparison/excess is instantiated as the 'higher than' relation between two degrees on a scale, where the standard of comparison may be implicit and contextually provided. A detailed scalar approach to Russian prefixes is offered in Kagan (2013, and references therein).

7 Proposal

7.1 Assumptions

In this section, we introduce the theoretical tools we employ to account for the meaning of EXCEED verbs. The core of our proposal is the following. On the basis of the evidence presented in Section 5, we posit that EXCEED verbs are in fact class A expressions and as such share a core semantics with comparative numeral modifiers. We argue that this novel perspective allows us not only to explain the data we have already presented but it also has some additional advantageous consequences.

We assume an ontology with degrees, i.e., objects of a primitive type *d* ordered on a scale. We take the scale to be a triple ⟨*D*, >, DIM⟩ where *D*

is a set of degrees, > represents an ordering relation on *D*, and DIM is a dimension of measurement, e.g., height, temperature, and the like. Second, we adopt an interval-based approach to degrees (e.g., Kennedy 2001, Schwarzschild & Wilkinson 2002) and assume that in gradable adjectives individuals are associated with scales via measure functions (e.g., Solt 2015). Third, we assume standard comparative semantics involving the > relation as a relation between degrees corresponding to the standard and correlate of comparison (e.g., von Stechow 1984, Heim 2000, Schwarzschild 2008).

Furthermore, we posit degree predicates labeled as *M*. For instance, *M* can be a predicate, such as *being a degree d such that Mary is tall to degree d*. Notice also that we embrace here a degree treatment of numerals, an assumption which is empirically motivated by the fact that standard comparatives can take numbers as their arguments (cf. Kennedy 2013). Thus, *M* can be also filled with something like *being a number n such that n people visited Mary*. Following Nouwen (2010), we write $M(d)$ and $M(n)$ to indicate an internal degree variable.

Next, we presuppose a maximization operation MAX, which yields a maximal degree from a set it is applied to. Its workings are utilized, e.g., in the semantics of the comparative, as presented in (15). The minimization operation MIN does the opposite, i.e., returns the minimal degree from a set.

(15) $[\![\text{-er than } d]\!] = \lambda M.\text{MAX}(M(d')) > d$

Finally, in order to account for comparative quantifiers such as *more than 100*, we assume a phonologically null quantifier MANY, i.e., a generalized-quantifier style expression of type $\langle d, \langle\langle e, t\rangle, \langle\langle e, t\rangle, t\rangle\rangle\rangle$, as defined in (16) (Hackl 2001).

(16) $[\![\text{MANY}]\!] = \lambda n \lambda P \lambda Q.\exists x[\#(x) = n \wedge P(x) \wedge Q(x)]$

With these tools in place, we now proceed to the analysis.

7.2 Implementation

Let us now explain in more detail our key idea that EXCEED verbs are essentially class A comparative modifiers. In effect, this amounts to the claim that, despite different lexical material and compositional properties, sentences such as (17a) and (17b), have the same truth conditions.

(17) a. Počet lidí na tom koncertě převýšil 1000.
number people at this concert over.heightened 1000
'The number of people at the concert exceeded 1000.'
b. Na tom koncertě bylo více než 1000 lidí.
on this concert was more than 1000 people
'There were more than 1000 people at the concert.'

Intuitively, both (17a) and (17b) are true only if the value corresponding to the cardinality of the people who visited the concert is greater than 1000. In order to capture this intuition and render the desired truth conditions, we follow Nouwen's analysis of class A modifiers. Since they often involve comparative morphology, they are analyzed as standard comparative expressions involving either the maximization operator MAX or the minimization operator MIN and the ordering relation >. As already indicated in Section 7.1, we assume here the phonologically null quantifier MANY and that cardinalities can be modeled as degrees of sort.

The formal representation of (17b) is given in (18). Notice that the comparative is analyzed as taking two arguments, i.e., a number (a type of degree), in our case 1000, and a property, which results from λ-abstraction over the cardinality of visitors in (18a). In the resulting truth-conditions in (18c), the MAX operator is applied to a predicate (such as *being a number n such that n people visited the concert*) and requires the cardinality of that property to exceed 1000.

(18) a. [[more than 1000] [λ*n* [[*n* MANY] people] visited the-concert]]]
b. [λ*M*.MAX(*M*(*n*)) > 1000](λ*n*.∃!*x*[#(*x*) = *n* ∧ PERSON(*x*) ∧ VISITED(*x*, THE-CONCERT)])
c. MAX(λ*n*.∃!*x*[#(*x*) = *n* ∧ PERSON(*x*) ∧ VISITED(*x*, THE-CONCERT)]) > 1000

In (18a), the modified numeral is assumed to be an argument of MANY. However, since it is treated as a degree quantifier, due to its type, it has to raise, leaving a degree trace. As a result of λ-abstraction, a degree property is generated to which the degree quantifier is applied, see (18b). Finally, an interpretable result of the composition is obtained in (18c), which states that the maximal number of the visitors at the concert was greater than 1000. Notice that following Nouwen (2010) in (18), we use ∃!*x*, which stands for 'there is exactly one group'. Thus, the maximal group is assigned to *x*, since no smaller group would be unique. It might seem that such an elaborate derivation is rather superfluous, but the motivation behind the mechanism described above has to do with the scopal behavior of class A modifiers (for details, see Nouwen 2010).

Now, we are ready to propose the semantics for Czech EXCEED verbs. We assume that the core semantic component of such expressions is the suffix *pře-* 'across, over', which, as we propose, is a subtype of class A modifier, specifically a comparative degree quantifier with a built-in MAX operator, as we see in (19). Hence, the prefix takes two arguments, i.e., a degree *d*, e.g., 1000 in (18), and a property *M*, and requires that property to exceed the degree *d* on a supplied dimension, e.g., cardinality in (18). Notice that MAX applies to the predicate *M* in a way that is parallel to a standard comparative construction.

(19) $[\![\textit{pře-}]\!] = \lambda d \lambda M.\text{MAX}(M(n)) > d$

In dimensional EXCEED verbs such as *převyšovat*, *pře-* combines with a gradable stem, which contributes a dimension of measurement DIM, such as height, weight, temperature, and the like. The comparative form introduces the MAX operator in order to yield a definite description of a maximal degree as well as the > relation. On the other hand, in the case of non-dimensional EXCEED verbs, such as *překračovat*, DIM needs to be supplied by an additional element in the sentence, e.g., a degree nominal. We assume that the MAX operator introduced by the prefix *pře-* operates "on top of" the comparative semantics, so to speak.

Let us now consider the semantics of a sentence such as (20a), i.e., a simple example of an EXCEED comparative construction. Intuitively, the

EXCEED verb simply compares the values corresponding to the heights of the cathedral and the town hall. The semantic composition of (20a) proceeds similarly as in (17). In particular, in (20b), the variable abstracted over comes from the degree associated with the object NP and the gradable stem provides the dimension of height. After β-reduction in (20c), we obtain the following truth conditions. (20a) is true only if the maximal degree corresponding to the height of the cathedral exceeds the maximal degree corresponding to the height of the town hall. Notice that a proper syntactic implementation would require the constituency of the prefix with the object slot, which does not appear to us as a controversial assumption (e.g., Ramchand 2008 for Russian prefixes).

(20) a. Katedrála pře-vyš-uje radnici.
cathedral over-heighten-s town.hall
'The cathedral exceeds the town hall in height.'
b. [λ*M*.MAX(*M*(*d*)) > MAX(λ*d′*.HEIGHT(TOWN HALL, *d′*))]
(λ*d*.MAX(λ*d″*.HEIGHT(CATHEDRAL, *d″*))
c. MAX(λ*d*.MAX(λ*d″*.HEIGHT(CATHEDRAL, *d″*)) >
MAX(λ*d′*.HEIGHT(TOWN HALL, *d′*))

Recall that one of the empirical arguments supporting our analysis of EXCEED verbs as expressions of class A modifiers is their compatibility with differentials, as already illustrated in (4b), repeated here as (21a). In order to account for differential comparatives, we assume an additional degree argument in such cases, as well as the ≥ relation instead of standard > (cf. von Stechow 1984, Beck 2011; see also Dočekal & Wągiel 2018 , Gobeski & Morzycki 2018 for similar treatments of different types of factor phrases). In particular, we posit that the additional degree indicates the gap between the maxima corresponding to the standard of comparison and the correlate. Despite this slight extension, in principle nothing changes with respect to the semantic composition compared to (20). As a result, (21c) delivers the following truth conditions. (21a) is true only if the maximal degree to which the cathedral is tall is greater or equal to the maximal degree to which the town hall is tall plus 20 meters. Notice that the ≥ relation in (21c) can be further pragmatically strengthened to the equality relation =. Intuitively, the result seems to be what we expect.

(21) a. Katedrála pře-vyšuje radnici o 20 m.
cathedral over-heighten.3SG town.hall by 20 m
'The cathedral exceeds the town hall in height by 20 m.'
b. [λM.MAX($M(d)$) $\geq$ MAX($\lambda d'$.HEIGHT(TOWN HALL, d')) + 20 M] (λd.MAX($\lambda d''$.HEIGHT(CATHEDRAL, d''))
c. MAX(λd.MAX($\lambda d''$.HEIGHT(CATHEDRAL, d'')) $\geq$ MAX($\lambda d'$.HEIGHT(TOWN HALL, d')) + 20 M

For class B modifiers, realized as prepositions and prefixes with inherent directional semantics, we follow again Nouwen (2010) in treating them as minima/maxima indicators. The formulae in (22) with some additional assumptions, such as the range requirement on the set of modified degrees, can then explain the speaker's ignorance inferences and the defining property of class B modifiers being that they do not express relations to definite amounts/degrees.

(22) a. $[\![minimally]\!] = \lambda d \lambda M.\text{MIN}_n(M(n)) = d$
b. $[\![maximally]\!] = \lambda d \lambda M.\text{MAX}_n(M(n)) = d$

A broader discussion of the properties of class B modifiers lies beyond the scope of this paper (for more details, see Nouwen 2010 and the relevant references therein). However, we provide the denotations of class B modifiers to delimit EXCEED verbs and explicitly demonstrate that they are subsumed under class A modifiers.

In the next section, we discuss some welcome predictions of our analysis of EXCEED verbs.

8 Consequences

8.1 EXCEED Verbs and Degree Arguments

One straightforward prediction concerns the arguments of EXCEED verbs. The semantics of class A modifiers requires a value on a scale to be ordered by the > relation. In the cases like those in (23), where the subject (a degree-denoting NP) supplies the scale/dimension, both dimensional and non-dimensional verbs are acceptable.

(23) a. Teplota pře-vyš-uje 20°C.
temperature over-heighten-s 20°C
'The temperature exceeds 20°C.'
b. Teplota pře-krač-uje 20°C.
temperature over-step-s 20°C
'The temperature exceeds 20°C.'

However, in cases such as those in (24), where the subject is a common noun, only dimensional EXCEED verbs yield grammatical sentences. This follows naturally from the morphological composition of EXCEED verbs. While dimensional EXCEED verbs have an inherent degree semantics and can supply degree/dimension on their own, non-dimensional EXCEED verbs do not, which eventually leads to ungrammaticality, as in (24b).

(24) a. Katedrála pře-vyš-uje radnici.
cathedral over-heighten-s town.hall
'The cathedral exceeds the town hall in height.'
b. *Katedrála pře-krač-uje radnici.
cathedral over-step-s town.hall

A variation on this is presented in (25), where a degree nominal (see Morzycki 2009) is in object position. In such cases, even non-dimensional EXCEED verbs are grammatical since the dimension of measurement required by the semantics of the prefix is supplied by the semantics of the degree nominal. Unlike (24b), where the dimension is missing since the stem does not contribute any, which in turn leads to ungrammaticality, (25a) and (25b) are normal Czech sentences.

(25) a. To pře-krač-uje moje očekávání.
this over-step-s my expectations
'This exceeds my expectations.'
b. To pře-krač-uje všechny meze.
this over-step-s all limits
'This exceeds all limits.'

To conclude, an important advantage of the proposed treatment is that it explains the otherwise mysterious behavior of dimensional and non-dimensional EXCEED verbs reported above.

8.2 Compatibility of Orientation

Another welcome consequence of our approach is that we correctly predict that there should not be EXCEED verbs with negative class A prefixes. As the ungrammaticality of the verbs in (26) shows, a prefix such as *pod-* 'under' cannot combine with a gradable stem in order to form an EXCEED verb.

(26) *pod-výš-it ~ *pod-vyš-ovat
under-heighten-PFV under-heighten-IPV

This follows from our account in a straightforward way. The comparative element *vyš-* encodes the ordering relation >. However, the prefix *pod-* reverses the scale by introducing the < relation, which conflicts with the semantics of the gradable stem. This leads to a contradiction, and hence to the oddity of the forms in (26) (see also Gajewski 2002).

The discussed evidence supports our claim and suggests that the generalization is robust. We conclude that the class A treatment of Czech EXCEED verbs explains several seemingly unrelated aspects of their behavior, including different distributions of dimensional and non-dimensional EXCEED verbs.

9 Conclusions

In this paper, we provided novel data concerning the typology of the grammar of comparison. In particular, we focused on the understudied phenomenon of EXCEED comparison in Slavic. Based on the evidence from Czech, we distinguished between two classes of EXCEED verbs formed with the prefix *pře-* 'across, over': namely, dimensional and non-dimensional. We showed that both classes pattern with class A numeral modifiers in that they can relate to definite cardinalities and do not give rise to ignorance effects. The data presented here provide further empirical support for the cross-linguistic validity of the class A/B distinction.

Based on the analogy with numeral modifiers, we have proposed that the Czech prefix *pře-* found in EXCEED verbs is best subsumed under class A; i.e., it is a degree quantifier with a comparative meaning. Such a treatment has several welcome consequences. First, we showed that the observed contrasts between the semantics of the two classes of EXCEED verbs can be predicted from different interactions between the prefix *pře-* on the one hand and stems that either lexically encode a dimension of measurement or not on the other. Second, we argued that the proposed approach explains the non-existence of EXCEED verbs involving negative class A prefixes. We believe that both the novel data and the proposed analysis provide a new exciting perspective on the nature of comparison and numeral modification. Further research will test the cross-linguistic validity of our claims both within and outside Slavic.

References

Beck, Sigrid. 2011. Comparison Constructions. In *Semantics: An International Handbook of Natural Language Meaning*, ed. Claudia Maienborn, Klaus von Heusinger and Paul Portner, 1341-1389. Berlin: De Gruyter Mouton.

Beck, Sigrid, Sveta Krasikova, Daniel Fleischer, Remus Gergel, Stefan Hofstetter, Christiane Savelsberg, John Vanderelst and Elisabeth Villalta. 2009. Crosslinguistic Variation in Comparison Constructions. *Linguistic Variation Yearbook* 9(1): 1-66.

Bochnak, Michael Ryan. 2018. Two-place Exceed Comparatives in Luganda. In *African Linguistics on the Prairie: Selected Papers from the 45th Annual Conference on African Linguistics*, ed. J. Kandybowicz, T. Major, H. Torrence and P. T. Duncan, 361-375. Berlin: Language Science Press.

Brasoveanu, Adrian. 2012. Modified Numerals as Post-suppositions. *Journal of Semantics* 30(2): 155-209.

Cohen, Ariel and Manfred Krifka. 2014. Superlative Quantifiers and Meta-speech Acts. *Linguistics and Philosophy* 37(1): 41-90.

Dočekal, Mojmír and Marcin Wągiel. 2018. Event and Degree Numerals: Evidence from Czech. In *Advances in Formal Slavic Linguistics 2016*, ed. D. Lenertová, R. Meyer, R. Šimík and L. Szucsich. Berlin: Language Science Press.

Filip, Hana. 1992. Aspect and interpretation of nominal arguments. In *Papers from the 28th Regional Meeting of the Chicago Linguistic Society*, ed. C. P. Canakis, G. P. Chan and J. M. Denton, 139-158. Chicago: University of Chicago.

Filip, Hana. 2004. Prefixes and the Delimitation of Events. *Journal of Slavic Linguistics* 11(1): 55-101.

Filip, Hana. 2005. Measures and Indefinites. In *References and Quantification: The Partee Effect*, ed. Gregory N. Carlson and F. Jeffry Pelletier, 229-288. Stanford: CSLI Publications.

Filip, Hana. 2008. Events and maximalization: The case of telicity and perfectivity. In *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect*, ed. S. Rothstein, 217-256. Amsterdam: John Benjamins Publishing.

Filip, Hana and Susan Rothstein. 2005. Telicity as a Semantic Parameter. In *Formal Approaches to Slavic Linguistics (FASL 14). The Princeton University Meeting*, ed. James Lavine, Steven Franks, Hana Filip and Mila Tasseva-Kurktchieva, 139-156. Ann Arbor, MI: University of Michigan Slavic Publications.

Gajewski, Jon. 2002. *L-analycity in Natural Language*. Ms., Massachusetts Institute of Technology.

Hackl, Martin. 2001. *Comparative Quantifiers*. PhD thesis, Massachusetts Institute of Technology.

Heim, Irene. 2000. Degree operators and scope. In *Proceedings of Semantics and Linguistic Theory 10*, ed. B. Jackson and T. Matthews, 40-64. Ithaca, NY: CLC Publications.

Gobeski, Adam and Marcin Morzycki. 2018. Percentages, Relational Degrees, and Degree Constructions. In *Proceedings from Semantics and Linguistic Theory 27*, ed. D. Burgdorf, J. Collard, S. Maspong and B. Stefánsdóttir, 721-737. Ithaca, NY: CLC Publications.

Kagan, Olga. 2013. Scalarity in the Domain of Verbal Prefixes. *Natural Language & Linguistic Theory* 31(2): 483-516.

Kennedy, Chris. 2001. Polar Opposition and the Ontology of "Degrees". *Linguistics and Philosophy* 24(1): 33-70.

Kennedy, Chris. 2005. Variation in the Expression of Comparison. Paper resented at Cornell University, November 11, 2005.

Kennedy, Chris. 2013. A Scalar Semantics for Scalar Readings of Number Words. In *From Grammar to Meaning: The Spontaneous*

Logicality of Language, ed. I. Caponigro and C. Cecchetto, 172-200. Cambridge: University Press Cambridge.

Kennedy, Chris and Beth Levin. 2008. Measure of change: The adjectival core of degree achievements. In *Adjectives and Adverbs: Syntax, Semantics and Discourse*, ed. L. McNally and C. Kennedy, 156-182. Oxford: Oxford University Press.

Kennedy, Chris and Louise McNally. 2005. Scale Structure, Degree Modification, and the Semantics of Gradable Predicates. *Language* 81(2): 345-381.

Krifka, Manfred. 1989. Nominal Reference, Temporal Constitution and Quantification in Event Semantics. In *Semantics and Contextual Expression*, ed. R. Bartsch, J. van Benthem and P. von Emde Boas, 75-115. Dordrecht: Foris Publication.

Krifka, Manfred. 1990. Four Thousand Ships Passed Through the Lock: Object-Induced Measure Functions on Events. *Linguistics and Philosophy* 13: 487-520.

Mayr, Clemens. 2013. Implicatures of modified numerals. In *From Grammar to Meaning: The Spontaneous Logicality of Language*, I. Caponigro and C. Cecchetto, 139-171. Cambridge: Cambridge University Press.

Morzycki, Marcin. 2009. Degree Modification of Gradable Nouns: Size Adjectives and Adnominal Degree Morphemes. *Natural Language Semantics* 17(2): 175-203.

Nouwen, Rick. 2008. Directionality in Numeral Quantifiers: The Case of *up to*. In *Proceedings from Semantics and Linguistic Theory 18*, ed. T. Friedman and S. Ito, 569-582. Ithaca, NY: CLC Publications.

Nouwen, Rick. 2010. Two Kinds of Modified Numerals. *Semantics and Pragmatics* 3: 1-41.

Nouwen, Rick. 2015. Modified Numerals: The Epistemic Effect. In *Epistemic Indefinites*, ed. L. Alonso-Ovalle and P. Menéndez-Benito, 244-266. Oxford: Oxford University Press.

Pancheva, Roumyana. 2006. Phrasal and Clausal Comparatives in Slavic. In *Formal Approaches to Slavic Linguistics 14: The Princeton Meeting 2005*, ed. J. Lavine, S. Franks, M. Tasseva-Kurktchieva and H. Filip, 236-257. Ann Arbor, MI: Michigan Slavic Publications.

Ramchand, Gillian. 2008. *Verb Meaning and the Lexicon: A First Phase Syntax*. Cambridge: Cambridge University Press.

Rett, Jessica. 2008. *Degree Modification in Natural Language*. PhD thesis, State University of New Jersey.

Schwarz, Bernhard, Brian Buccola and Michael Hamilton. 2012. Two Types of Class B Numeral Modifiers: A Reply to Nouwen 2010. *Semantics and Pragmatics* 5(1): 1-25.

Schwarzschild, Roger. 2008. The Semantics of Comparatives and Other Degree Constructions. *Language and Linguistics Compass* 2(2): 308-331.

Schwarzschild, Roger and Karina Wilkinson. 2002. Quantifiers in Comparatives: A Semantics of Degree Based on Intervals. *Natural Language Semantics* 10(1): 1-41.

Solt, Stephanie. 2015. Q-adjectives and the Semantics of Quantity. *Journal of Semantics* 32(2): 221-273.

Stassen, Leon. 1985. *Comparison and Universal Grammar*. Oxford: Basil Blackwell.

Svenonius, Peter. 2004. Slavic prefixes inside and outside VP. In *Nordlyd 32.2: Special Issue on Slavic Prefixes*, ed. Peter Svenonius, 205-253. Tromsø: CASTL.

von Stechow, Arnim. 1984. Comparing Semantic Theories of Comparison. *Journal of Semantics* 3(1): 1-77.

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