

NUMERAL NPs, TO A DEGREE
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1. INTRODUCTION

Pesetsky 1982, Neidle 1988, Franks 1994, 1995, etc.: cardinal-containing NPs in Russian can fail to trigger agreement on the verb:

- (1) a. Pjat' krasivyx devušek prišli.
five beautiful-GEN.PL girls-GEN.PL arrived-PL
Five beautiful girls arrived.
- b. Prišlo pjat' krasivyx devušek.
arrived-NSG five beautiful-GEN.PL girls-GEN.PL
There arrived five beautiful girls.

[The word order indicated is the preferred one, both options are possible for both patterns.]

Possible analyses:

- agreeing and non-agreeing NPs have different internal syntax (DPs vs. QPs, e.g., Pereltsvaig 2006b)
- agreeing and non-agreeing NPs have different external syntax (in [Spec, TP] vs. in [Spec, vP], e.g., Stepanov 2001)

Pesetsky 1982 and Franks 1994 adopt both hypotheses at once.

Explored here is the hypothesis that **numeral NPs can denote degrees**

The categorial status and landing site of non-agreeing numeral NPs is secondary.

2. THE SEMANTICS OF NON-AGREEING NUMERAL NPs

Pereltsvaig 2006b identifies a number of **properties of non-agreeing numeral NPs** (2)-(9). NPs containing vague numerals such as *malo* 'few' pattern with numeral NPs, whereas other weak indefinites, like *nekotorye* 'some', do not.

2.1. Non-individuated interpretation

The semantic intuition behind the non-individuated interpretation is difficult to express:

- (2) Rol' Džejsma Bonda ispolnjali /#ispolnjalo [pjat' izvestnyx aktërov].
role James Bond-GEN performed-PL/#-NSG five famous actors
Five famous actors performed the role of James Bond.

A non-agreeing subject must be interpreted as participating in the event as a whole, yet the NP cannot be interpreted as a group (Pesetsky 1982:85):

- (3) a. Šest' matematikov razlucilis' na mostu.
six mathematicians parted.company-PL on bridge
Six mathematicians parted company on the bridge.
- b. #Šest' matematikov razlucilos' na mostu.
six mathematicians parted.company-NSG on bridge
Six mathematicians have separated (from someone else) on the bridge.

The non-agreeing numeral NP subject can only give rise to the non-collective interpretation with an elided second participant argument, showing that it is interpreted distributively.

If non-agreeing numeral NPs denote degrees, they clearly do not denote pluralities or groups and therefore cannot combine with collective predicates

2.2. Lack of specific or referential interpretation

Specificity-forcing adjectives in the numeral NP trigger obligatory subject agreement:

- (4) V Mariinskom teatre tancevali/*tancevalo [opredelënnye pjat' balerin].
 in Mariinsky theater danced-PL/*-NSG certain five ballerinas-GEN
A certain five ballerinas danced in the Mariinsky Theater.

A numeral NP referring to a subset of a previously introduced set likewise has to agree:

- (5) V naš gorod {priexala gruppa balerin / priexali baleriny} iz Peterburga.
 in our town came group ballerinas-GEN/came ballerinas from Petersburg
(A group of) ballerinas from St. Petersburg came to our town.
- a. Vo včerašnem koncerte tancevali [pjat'ero iz nix].
 in yesterday's concert danced-PL five from them
Five of them danced in yesterday's concert.
- b. *Vo včerašnem koncerte tancevalo [pjat'ero iz nix].
 in yesterday's concert danced-NSG five from them

Pereltsvaig 2006b proposes that agreeing numeral NPs are categorially DPs and therefore can be referential, while non-agreeing numeral NPs are categorially QPs.

Under the assumption that, not being generalized quantifiers, numeral NPs obtain non-surface scope only by being referential, **obligatory surface scope** is predicted:

- (6) a. Každyj raz [pjat' xirurgov] operirovali Bonda. ✓∀>5, ✓5>∀
 every time five surgeons operated-PL Bond
Every time five surgeons operated on Bond.
- b. Každyj raz [pjat' xirurgov] operirovalo Bonda. ✓∀>5, *5>∀
 every time five surgeons operated-NSG Bond
Every time five surgeons operated on Bond.

Pereltsvaig does not detail what semantic type non-agreeing numeral NPs have

If non-agreeing numeral NPs denote degrees, then they are clearly non-referential, correctly predicting (4)-(5)

The obligatory surface scope is predicted by the Heim-Kennedy generalization:

- (7) **Heim-Kennedy generalization** (Heim 2000 on the basis of Kennedy 1999):
 If the scope of a quantificational DP contains the trace of a degree operator, it also contains that degree operator itself.

The Heim-Kennedy generalization does not rule out scoping over negation:

- (8) a. I must be a horrible teacher. Even if a thousand people register for a course, −20
 na èkzamen ne prixodit bolee 20 studentov.
 on exam NEG come-PRES-3SG mo-er 20 students-GEN
At the exam there are never more than 20 students.
- b. Never schedule an exam just before Christmas. For any course 20 −
 na èkzamen ne prixodit bolee 20 studentov.
 on exam NEG come-PRES-3SG mo-er 20 students-GEN
More than 20 students fail to come to the exam.

Note: the sentence-final position of the numeral NP is compatible with its right extraposition to a landing site from where it c-commands negation. However, the fact that post-verbal numeral NP subjects cannot outscope quantifiers (except with a very marked "bridge" intonation placing contrastive topic stress on the quantifier and forcing it to reconstruct) suggests that overt movement is not to blame.

2.3. Pronominalization

As observed by Pereltsvaig 2006b, non-agreeing numeral NPs can be replaced by *skol'ko* 'how much/many' and *stol'ko* 'that much/many'; no other pronominal element is possible:

(9) pronominalization

- a. [Oni] tancevali / *tancevalo tango.
 they danced-PL/*-NSG tango
They danced tango.
- b. Emu [stol'ko] ne nužno / *nužny.
 he-DAT that-much not needed-NSG/*-PL
He doesn't need that much.

Extending assumption that non-agreeing numeral NPs can denote degrees to vague numerals *malo* 'little/few' and *mnogo* 'much/many' and their wh- and demonstrative counterparts above is supported by their declension patterns: like cardinal numerals, they assign genitive case to the lexical NP in direct case positions and agree with the lexical NP in oblique case positions (cf. Babby 1985, 1987):

- (10) a. Ja znaju šest' / mnogo / neskol'ko učenyx.
 I know-1SG six-ACC=NOM/many-ACC=NOM several-ACC=NOM scientists-GEN
I know six/many/several scientists.
- b. Ja znakoma s šest'ju / so mnogimi / s neskol'kimi učenyimi.
 I familiar-F with six-INS with many-INS.PL with several-INS.PL scientists-INS
I am familiar with six/many/several scientists.

Adger 1996: measure phrases (i.e., unambiguous degrees) cannot be DPs (cf. (9))

Therefore, pronouns, including PRO, cannot have a degree interpretation

Non-agreeing numeral NPs **cannot control PRO**:

- (11) [Pjat' banditov]_i pytalis' /*pytalos' [PRO_i ubit' Džemsa Bonda].
 five thugs-GEN tried-PL/*-NSG to.kill James Bond
Five thugs tried to kill James Bond.

Non-agreeing numeral NPs **cannot bind independent reflexives and reciprocals**:

- (12) [Pjat' banditov] prikryvali /*prikryvalo sebja ot pul' Džejmsa Bonda.
 five thugs-GEN shielded-PL/*-NSG self from bullets James Bond
Five thugs shielded themselves from James Bond's bullets.

Proposal: it's because pronouns cannot denote degrees.

2.4. Approximation

Approximative Inversion (see Mel'čuk 1985, Fowler 1987, Franks 1994, 1995, Billings 1995, Yadroff and Billings 1998, Pereltsvaig 2006b, 2006a, Zaroukian to appear) consists of the reversal of the normal linear order between a cardinal and a noun, with the semantic effect of imprecision (see Pereltsvaig 2006a for details):

- (13) a. tri časA
 three hour-PAUC
three hours
- b. časA tri
 hour-PAUC three
about three hours

Approximative Inversion in the numeral NP subject **blocks verbal agreement** (Yadroff and Billings 1998):

- (14) V ètom restorane obedalo/*obedali [čelovek desjat']. Pereltsvaig 2006b
 in this restaurant dined-NSG/*-PL person-PL-GEN ten
In this restaurant dined approximately ten people.

Assuming that delimitation, approximation and precision are defined for degrees, but not for individuals or predicates, predicts default verbal agreement with Approximative Inversion, as well as with other quantity modifiers, such as *vsego* 'all in all' and *rovno* 'exactly':

- (15) Vsego pribylo/*pribyli sorok pisem.
 all-GEN arrived-NSG/*-PL forty letters-GEN
All in all, there arrived 40 letters.

Pereltsvaig 2006b also notes that the approximative prepositions *okolo* 'around' and *s* 'off', as well as classifier-like elements in the numeral NP subjects allow plural agreement on the verb only very marginally, as expected.

Plural agreement seems possible for numeral NPs introduced by the distributive preposition *po* (Borik 1995, Schoorlemmer 1995, Kuznetsova 2005, Harves 2006):

- (16) Každij den' po pjat' turistov smotreli fil'my.
 every day po five-NOM tourists-GEN watched-PL films
Five tourists watched films every day.

This is unexpected, if *po*-PPs are subjects, but perhaps they're not.

2.5. Summary

The hypothesis that non-agreeing numeral NPs do not denote entities explains why they can be **neither referential nor specific**.

The hypothesis that non-agreeing numeral NPs denote degrees explains why they **undergo Approximative Inversion**, are interpreted as **non-individuated**, **fail to pronominalize** and **cannot outscope quantifiers**.

The reason they fail to trigger agreement is that they **do not denote pluralities**.

3. MEASURE NPs

Claim: the properties collected by Pereltsvaig characterize degree-denoting NPs, which are not limited to numeral NPs but include also **pseudo-partitives**

3.1. Accumulative direct objects

Pereltsvaig 2006b: direct objects appearing with the **accumulative verbal prefix** *na-* show the same properties as non-agreeing subjects

Obligatory non-individuation: verbs that select individuated objects are incompatible with the accumulative prefix *na-*:

- (17) *Džejms Bond naljubil [krasivyx ženščin].
 James Bond ACM-loved beautiful women
 intended: *James Bond loved many beautiful women.*

Non-referentiality: strong determiners and specificity-inducing adjectives are incompatible with the accumulative prefix *na-*:

- (18) Džejms Bond nasobiral [(*)opredelënnuju) oxapku cvetov].
 James Bond ACM-picked particular armful flowers-GEN
James Bond picked an armful of flowers.

Non-partitivity: (19b) cannot be taken as the continuation of (19a):

- (19) a. Deti vymyli vse griby...
 children washed all mushrooms-ACC
The children washed all the mushrooms...
 b. #a potom papa našinkoval korzinu gribov.
 and then daddy ACM-chopped basket-ACC mushrooms-GEN
*and then Daddy chopped a whole basket of (*the) mushrooms.*

Note: intuitively, the direct object of the accumulative verb represents the result of the action and therefore has to be a novel discourse entity

Lack of non-isomorphic wide scope:

- (20) Každýj agent nakopiroval [džužinu čertežej]. $\forall > 12, *12 > \forall$
 every agent ACM-copied dozen-ACC blueprints-GEN
Every agent copied a (whopping) dozen blueprints.

Inability to control PRO:

- (21) a. Džeјms Bond_j priglasil [džužinu krasotok]_k [PRO_{*j/k} vypit' po martini].
 James Bond invited dozen-ACC babes-GEN drink-INF DIST-P Martini
James Bond invited dozen babes for a Martini.
 b. Džeјms Bond_j napriglašal [džužinu krasotok]_k [PRO_{*j/*k/√j+k} vypit' po martini].
 James Bond ACM-invited dozen-ACC babes-GEN drink-INF DIST-P Martini
James Bond invited for a (separate) Martini with him a whopping dozen of babes.

Note: The availability of **partial control** (cf. Martin 1996, Landau 1999, 2004), not noted by Pereltsvaig, shows that a further qualification of this constraint is needed

The **inability to bind independent reflexives** cannot be verified because Russian reflexives are strictly subject-oriented. While Pereltsvaig claims that accumulative direct objects cannot bind reciprocals, counterexamples are available.

Approximative Inversion is likewise possible:

- (22) Každýj raz v knižnom magazine ja nabiraju [knig desjat']. $\forall > 10, *10 > \forall$
 every time in book store I ACM-pick-1SG books-GEN ten
Every time I go to a book store, I pick a pile of about 10 books.

Pereltsvaig 2006b suggests that accumulative direct objects, like non-agreeing NP subjects, are "small nominals", i.e., QPs without a DP layer.

However, accumulative direct objects include bare partitives (17), vague measure partitives (19) and numerical nouns (21), in addition to numeral NPs (22)

3.2. Other degree-denoting expressions

Graudina, Ickovič and Katlinskaja 1976: partitives can give rise to three agreement patterns:

Syntactic agreement: the head of the partitive is a lexical noun with its core meaning (*series*):

- (23) V izmenenijax pravil dopuščen rjad nedostatkov.
 in changes rules-GEN allow-PPT-MSG series.M drawbacks-GEN
A series of drawbacks was allowed in the changes of the rules.

Plural agreement: the head is interpreted as 'a number of', with no ordering

Note: Graudina et al. 1976 assert that passive past participles cannot take plural agreement, but counterexamples can be found on Google

- (24) Rjad žirondistskix oratorov prodolžali nastaivati' na neprikosnovennosti korolja.
 series [Girondist orators]-GEN continued-PL insist-INF on inviolability king-GEN
A number of Girondist orators continued to insist on the inviolability of the king.

Default agreement (neuter singular): considered substandard; the head is likewise interpreted as 'a number of':

- (25) Bylo namečeno rjad konkretnyx voprosov.
was-NSG sketch-PPT-NSG series [concrete questions]-GEN
There was sketched a series of concrete questions.

The plural and the default agreement correlate with the interpretation of the head noun *rjad* as denoting a certain, limited quantity, rather than a limited ordered set.

In other words, agreement distinguishes a true partitive (23) from pseudo-partitives (24), (25)

In English this three-way distinction is obscured by the lack of lexical gender, resulting in the otherwise puzzling plural agreement patterns:

- singular for partitives; plural for pseudo-partitives: Akmajian and Lehrer 1976, Dodge and Wright 2002, among others
- singular for measure expressions; plural for individuals: Gawron 1995, Solt 2007

Note: the formation of pseudo-partitives is not restricted to container nouns

Conclusion: pseudo-partitives have precisely the same agreement options as numeral NPs

3.3. Passivization of accumulative verbs

If accumulative verbs only combine with degrees, when passivized they are predicted to give rise to default agreement only

In fact, all three options are possible, but with clearly distinct truth-conditions

3.3.1. The real partitive: syntactic agreement

Syntactic agreement with the number and the gender of the head:

- (26) Vsego byla nakopirovana djužina/?tysjača/*pjat' čertežej.
all-in-all was-FSG ACM-copy-PPT-FSG dozen.F/thousand.F/five blueprints-GEN
Overall, a dozen/thousand of blueprints was copied in abundance.

⇒ This is a real partitive:

- gender agreement with a numeral is impossible for independent reasons
- the subject is interpreted as the input to the photocopying activity (a pre-existing object), to which the activity was **distributively** applied to a great degree

Going back to the prior examples shows that they also have this interpretation

3.3.2. Degree interpretation: default agreement

With a numerical noun or vague measure head this corresponds to pseudo-partitive:

- (27) Vsego bylo nakopirovano ?djužina/tysjača/pjat' čertežej.
all-in-all was-NSG ACM-copy-PPT-NSG dozen.F/thousand.F/five blueprints-GEN
Overall, a whopping dozen/thousand of blueprints was copied.

⇒ This is the true degree interpretation of the subject:

- it's slightly marked with pseudo-partitives, but perfect with numerals
- the subject is preferentially interpreted as the output of the photocopying activity; it can only be interpreted as its input if we're measuring the extent of the activity by how much its input was

3.3.3. Individuated interpretation: plural agreement

Once again, plural agreement requires the subject to be interpreted as the input to the activity

- (28) Vsego byli nakopirovany djužina/tysjača/pjat' čertežej.
 all-in-all was-PL ACM-copy-PPT-PL dozen.F/thousand.F/five blueprints-GEN
Overall, a dozen/thousand/five blueprints were copied in abundance.

The predicate is interpreted distributively; the abundance is about the result, not the input

If the source interpretation is excluded by the pragmatics of the predicate, plural agreement becomes ungrammatical (many thanks to Masha Polinsky for the suggestion and examples):

- (29) a. Vsego u nix bylo nažito tysjača rublej.
 all-in-all at them was-NSG ACM-live-PPT-NSG thousand.F rubles-GEN
Overall, they had saved a thousand rubles.
 b. #Vsego u nix byla nažita tysjača rublej.
 all-in-all at them was-FSG ACM-live-PPT-FSG thousand.F rubles-GEN
Overall, they had saved a thousand of rubles.
 c. *Vsego u nix byli nažity tysjača rublej.
 all-in-all at them was-PL ACM-live-PPT-PL thousand.F rubles-GEN

Note: (29b,c) are acceptable to the extent that a pre-existing thousand rubles can be viewed as a result of saving

A similar effect can be achieved with the sequential/repetitive prefix *pere-*:

- (30) a. Xuntoj bylo perevešano tysjača povstancov.
 junta-INS was-NSG SEQ-hang-PPT-NSG thousand.F rebels-GEN
There was a thousand rebels hanged by the junta one by one.
 b. ?Xuntoj byla perevešana tysjača povstancov.
 junta-INS was-FSG SEQ-hang-PPT-FSG thousand.F rebels-GEN
A[?] the thousand of rebels was hanged by the junta one by one.
 c. #Xuntoj byli perevešany tysjača povstancov.
 junta-INS was-PL SEQ-hang-PPT-PL thousand.F rebels-GEN
A thousand rebels was re-hung by the junta.

Summary: when the subject, be it the underlying internal argument or the external argument of the verb, expresses the measure to which the predicate holds, it triggers default agreement

3.4. Further evidence: animacy

Mel'čuk 1980a, 1980b: numeral NPs whose nominal head is lexically specified as [animate] can behave as inanimate:

- after certain prepositions in "quantity" readings
- optionally with nouns denoting animals and the noun *suščestvo* 'creature' (see also Vinogradov 1952:369)

Hypothesis: animate numeral NPs functioning as inanimates denote degrees

3.4.1. Background: the category of animacy in Russian

Russian exhibits accusative syncretism for masculine nouns ending in a consonant (a.k.a. the second declension class) and all plurals: animate nouns are marked with surface genitive case and inanimate nouns are marked with surface nominative case:

- (31) a. uvidet' London/Lenina
 see-INF London-ACC=NOM/Lenin-ACC=GEN
to see London/Lenin
 b. uvidet' tri čexla/trëx čelovek
 see-INF three-ACC=NOM cover-PAUC/three-ACC=GEN persons-ACC=GEN
to see three people/covers

In the standard case the surface case of the so-called paucal cardinals depends on the animacy of the lexical noun

Higher cardinals do not inflect for animacy (syncretic with nominative), but are transparent for higher adjectives

3.4.2. Quantity readings

When the numeral NP complement of an accusative-assigning preposition denotes a quantity, the numeral NP declines as if it were inanimate:

- (32) a. [siloj rovno] v tri medvedja Mel'čuk 1980b
 strength-INS exactly in three-ACC=NOM bears-GEN
as strong as exactly three bears
- b. [bol'se] na dva mal'čika
 more on two-ACC=NOM boys-GEN
two boys more
- c. [Apel'siny končilis'] za četyre čeloveka [do menja].
 oranges finished for four-ACC =NOM person-PAUC until me
Oranges ran out four people before my turn.
- d. [stojal v očeredi] čerez četyre čeloveka [ot menja]
 stood in queue across four-ACC =NOM person-PAUC from me
He was standing in the queue four people away from me.
- e. po troe bol'nyx [v palatu]
 over three.COLL-ACC =NOM patients-GEN in ward
three patients per ward
- f. dve ženy tomu nazad
 two-F-ACC =NOM wives-GEN DEM-DAT back
two wives back

Mel'čuk 1980b crucially demonstrates that the lexical noun retains its inherent (in)animacy

3.4.3. Numeral NPs denoting animals

Hypothesis: accusative-nominative syncretism is only possible if the numeral NP in question denotes a degree

Question: why do numeral NPs denoting human beings behave differently?

4. SUMMARY

Independent evidence for the availability of degree denotation for NPs:

- direct objects of accumulative verbs: quantity-denoting expressions; share all the semantic properties of non-agreeing NP subjects; when passivized, require default agreement (except if the verb meaning is shifted); pseudo-partitives behave just like numeral NPs
- lexically animate numeral NP complements of prepositions specifying quantity

Crucially, both of these environments **semantically select** for measure-denoting NPs.

For the differential argument of the comparative in (31b) degree denotation is required by the standard semantic treatments of comparatives. In other words, independent factors necessitate that numeral NPs can denote degrees.

The scopal behavior of measure-denoting NPs matches that of degrees, up to and including the Heim-Kennedy generalization for modals.

5. QUESTIONS FOR FUTURE RESEARCH

Rullmann 1995, Carston 1998, Kennedy 2010: **numerals under modals can have *at least*, *at most* or *exactly* readings:**

- (33) a. In Britain, you have to be 18 to drive a car. minimal
 b. Once you have your degree, you can have a salary of \$100,000 a year.
 (34) a. She can have 2000 calories without putting on weight. maximal
 b. You may attend six courses per semester.

Oda 2008, Beck 2009: ***exactly*-NPs can have an *at least* reading** under modals:

- (35) You are allowed to write exactly 5 pages.
 a. writing exactly 5 pages is permitted (but you can write more than that, too)
 b. the maximum you are allowed to write is exactly 5 pages

Hackl 2000: **comparative numerals** interact with intensional predicates:

- (36) John is required to read **fewer than 6 books**.
 a. the number of books that John reads is not allowed to exceed 5
 b. the minimal number of books that John should read is less than 6

If numeral NPs can denote degrees, their behavior under modals is expected

Heim 2000: **comparative** ambiguity under modals:

- (37) The draft is 10 pages long. The paper is required to be exactly 5 pages longer than that.
 a. the paper cannot be longer or shorter than 15 pages
 b. the minimal length of the paper is 15 pages; it can also be longer than that
 (38) The draft is 10 pages long. The paper is allowed to be less long than that.
 a. it is possible for the paper to be shorter than the draft
 b. it is required that the paper be shorter than the draft

Comparative ambiguity under modals has been shown using (a) **numeral NP differentials**, which can themselves denote degrees and (b) downward-entailing comparatives of inferiority (*less than*)

Research hypothesis: all instances of comparative ambiguity under modals involves QR of degree-denoting NPs rather than QR of the comparative morpheme.

If correct, this hypothesis will allow us to get rid of the syntactically dubious mechanism of QR of the comparative morpheme.

Further extension: can all downward-entailing "determiners" (*few*, *little*, *less than five*, etc.) have **degree denotation only**?

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