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ON THE SYNTAX OF MEASURE
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## 1. Introduction

Measure nouns in plural NPs may give rise to agreement failures on the potentially agreeing material before the cardinal, on the measure noun itself and on the predicate:
(1) \% Deze/*dit vijf pond/*ponden bonen ligt/liggen me zwaar op de maag. this-PL/SG five pound beans lie-SG/PL me heavy on the stomach These five pounds of beans are hard for me to stomach.
Different languages give rise to different agreement failure patterns.
Outline of the talk:
> empirical generalization: agreement with measure nouns can fail due to their low position on individuation/prominence scales
> proposal: conditioned phi-feature agreement on the lexical NP is structural
$>$ tentative investigation: the role of semantic agreement and feature hierarchy

## 2. Measure phrases and agreement cross-LINGuistically

Puzzle: measure phrases, while apparently plural, can give rise to singular agreement on the predicate or on the determiner:
(2) a. That/those five gallons of milk came in handy.

Gawron 2002
b. 10 miles separate(s) the castle from the dragon lair. Ionin and Matushansky 2006
c. Hiru litro ardo edan du/ditu. Basque, Etxeberria and Etxepare 2008, 2012 three liter wine drunk AUX-SG/AUX-PL He/she drank three liters of wine.

In some languages and some contexts the singular agreement is obligatory:
(3) a. That five gallons of wine was/*were superb.
b. Er staat/*staan drie liter water op tafel. Dutch there stand-SG/PL three liter-SG water on table There are three liters of water on the table.
c. Dlja piroga nužno/*nužny pjat' kilogrammov jablok. Russian for pie necessary-SG/PL five kilograms-GEN apples-GEN Three kilograms of apples are necessary for the pie.
Though sometimes plural agreement is required:
(4) èti/*èto pjat' kilogrammov jablok Russian DEM-SG/PL five kilograms-GEN apples-GEN
these three kilograms of apples
In addition, measure nouns may fail to show plural marking NP-internally:

[^0](6) Er staat drie liter/*liters water op tafel.

Dutch there stand-SG three liter-SG/PL water on table There are three liters of water on the table.

Intuition: number agreement depends on referentiality/individuation/prominence hierarchies (Aissen 1999, 2003, Bickel 2008, Comrie 1981, Silverstein 1976)

## 3. DUTCH

Measure nouns are the only nouns that fail to bear plural marking with cardinals higher than one:
N.B.: the classifier stuk requires plural marking; like man, not a measure noun, since it can combine with mass NPs only
a. drie/vijf/dertig kilo/*kilo's three/five/thirty kilo-SG/PL three/fivelthirty kilos
b. drie/vijf/dertig dozen/*doos three/five/thirty box-PL/SG three/five/thirty boxes
...despite being plural, as shown by adjectival agreement:
Dutch attributive agreement surfaces on definite, plural or common NPs, indicating that (8), which is indefinite and has a neuter lexical head, is plural
(8) een dikke/*dik vijf pond
a fat-AGR/fat five pound.NSG
a good five pounds
The morphological plural exists (but cannot be used with cardinals as a measure noun):
(9)
a. kilo's en kilo's zand
kilo-PL and kilo-PL sand
kilos and kilos of sand
b. Die kilo's die ik ben aangekomen zitten voornamelijk op mijn heupen. the kilo-PL that I am gained sit-PL mostly on my hips The kilos that I have gained are mostly on my hips.
c. Kilo's zijn zwaarder dan ponden. kilo-PL are heavier than pound-PL Kilos are heavier than pounds.
N.B.: In both respects measure nouns therefore pattern with multiplicands in complex cardinals (cf. Ionin and Matushansky 2006)
The presence of the indefinite article does not indicate singularity in Dutch:
(10) a. die schatten van een kinderen those darlings of a children those darling children
b. Wat een jongens!
what a boys Such boys!/So many boys!
Indefinite measure phrases must trigger singular agreement on the verb:
(11) a. Er werd/*werden vijf pond uitgegeven aan kleren. there AUX-SG/PL five pound.NSG spend-PPP on clothes $£ 5$ were spent on clothes.
b. Er liggen/*ligt drie boeken op tafel. there lie-PL/SG three books on table There are three books on the table.
c. Er lopen/*loopt daar een meisjes! there walk-PL/SG there a girls That there should be so many girls walking there!
Definite measure phrases may allow plural agreement for some speakers:
(12) \% Deze vijf pond bonen ligt/liggen me zwaar op de maag. this-PL five pound beans lie-SG/PL me heavy on the stomach These five pounds of beans are hard for me to stomach.
Major (though not the only) facilitating factor: plural complement

## 4. RUSSIAN

NP-internally Russian measure nouns do not differ from others:
(13) vse èti sem' gnomov/metrov
all-PL DEM-PL seven dwarf/meter-PL-GEN
all these seven dwarves/meters
Indefinite measure NPs obligatorily trigger singular agreement on the predicate; the presence of plural marking indicates definiteness, specificity, referentiality or partitivity (cf. Mel'čuk 1985:373-374 for approximative NPs):
a. Prošlo pjat' let.
pass-PAST-NSG five years-GEN
Five years passed.
b. Prošli pjat' let. pass-PAST-PL five years-GEN The five years passed.

Matushansky and Ruys 2012, 2013: agreement failure indicates that the subject is a measure Independent evidence:
$>\quad$ animacy switch for NPs headed by lexically animate nouns (Mel'čuk 1980)
$>$ passivization of accumulative verbs
$>$ derived measures in approximative inversion (Matushansky 2013b)
Russian has derived measures, Dutch very nearly doesn't:
(15) a. Vijf ballen is moeilijk om mee te jongleren. five balls is difficult COMP with to juggle-INF It is difficult to juggle five balls.
b. Vijf ballen zijn moeilijk om mee te jongleren. five balls are difficult COMP with to juggle-INF Five (specific) balls are difficult to juggle.
NP-internal and NP-external agreement patterns diverge here: regular nouns must be marked for number

## 5. ENGLISH

Plural measure phrases may combine with a singular determiner and a singular predicate:
(16) a. That five gallons of milk is/*are going to be handy.
b. Those five gallons of milk are/*is going to be handy.

For a discussion of English measure phrases in unexpected places see Gawron 2002

## 6. PROPOSAL: PLURAL MARKING WITH CARDINALS IS AGREEMENT THROUGHOUT

Ionin and Matushansky 2006: cardinals combine with semantically singular lexical NPs
> lexical plural marking is a result of agreement with the semantic plurality of the entire cardinal-containing NP
$>$ predicate singular marking arises from syntactic agreement on the assumption that the cardinal itself is syntactically singular (or unspecified for number)
$>$ predicate plural marking is a result of semantic agreement with a semantically plural NP
Evidence: languages with obligatory singular marking on the lexical NP under a cardinal:
(17) Yhdeksän omena-a puto-si maa-han. Finnish, Nelson and Toivonen 2000 nine-NOM apple-PART.SG fall-PAST.3SG earth-ILL
Nine apples fell to earth.
(18) a. Luin kirjan/kirjaa.

Finnish read-1SG book-ACC/PART I read a book/the book. ( $\neq$ I read (the) books)
b. Luin kirjat/kirjoja.
read-1SG book-PL-ACC/PART
I read the books/books. $(\neq$ I read a/the book)
Further support from Dutch: NP-external plural marking conditioned by the same factors as plural marking on the lexical NP: measure nouns vs. all others
a. Jan heeft twee kilo(*'s) pruimen gekocht.

Dutch, Doetjes 1997
Jan has two kilo (PL) plums bought
Jan bought two kilos of plums.
b. Jan heeft twee zak*(ken) pruimen gekocht.

Jan has two bag (PL) plums bought
Jan bought two bags of plums.
Similar data from Miya (Schuh 1989, 1998), where plural marking is conditioned by animacy If this view is right, singular agreement with measure NPs can be derived by assuming that measures, having the semantic type of degrees, are not semantically pluralities
Problem: does not predict pre-cardinal plural marking:
(20) deze/*dit vijf pond sterling/ brood/ bonen
this-PL/SG five pound.nsG sterling/ bread.NSG/ beans
these five pounds sterling/pounds of bread/pounds of beans
Problem: does not predict optionality in NP-external plural marking for measure NP:
(21) \% Deze vijf pond bonen ligt/liggen me zwaar op de maag. this-PL five pound beans lie-SG/PL me heavy on the stomach These five pounds of beans are hard for me to stomach.

Problem: does not predict obligatory plural agreement for definite/specific/referential, etc., measure NPs in Russian:
(22) a. Kakix-to pjat' let prošlo/*prošli.
some-PL-GEN five years passed-NSG/PL
A mere five years passed.
b. Èti pjat' let prošli/*prošlo.
these-PL five years passed-PL/NSG These five years passed.

Existence presupposition does not change semantic type!
Hypothesis to develop: agreement failure conditioned by prominence hierarchies

## 7. MEASURES AND INDIVIDUATION HIERARCHIES

Differential subject and object marking is known to be sensitive to specificity, definiteness, etc., as in Turkish (Enç 1991; example (23) from von Heusinger and Kornfilt 2005), or in the Estonian example (24), from Metslang 2012:

[^1]b. (Ben) kitab-1 oku-du-m. definite
I book-ACC read-PAST-1SG
I read the book.
c. (Ben) bir kitap oku-du-m.
indefinite non-specific
I a book read-PAST-1SG
I read a book.
d. (Ben) bir kitab-1 oku-du-m. indefinite specific I a book-ACC read-PAST-1SG
I read a certain book.

| a. Peenra-l kasva-vad lille-d. | generic |
| :--- | :--- | :--- |
| flowerbed-ADE grow-3PL flower-PL-NOM |  |
| Flowers are growing on the flowerbed. |  |

b. Peenra-1 kasva-b lill-i. indefinite non-specific flowerbed-ADE grow-3SG flower-PL-PART There are flowers growing on the flowerbed.

Measure phrases can be reasonably assumed to be very low on any prominence hierarchy and especially on individuation hierarchies.

The fact that there are languages setting measure phrases apart from all other NPs suggests that they are a recognizable semantic or syntactic category (which does not preclude them from being grouped with other such categories)
Question: the mechanism

### 7.1. The functionalist view (syntagmatic)

Aissen 1999, 2003, Bossong 1983-1984, 1991, etc.: subjects and objects are marked in order to distinguish them from each other: marking is required for NPs that are less prototypical in their role
Problems for this functionalist view from Turkish (von Heusinger and Kornfilt 2005), etc.
Plural marking (failure) cannot be taken to distinguish subjects and objects! And NP-internal variation is not expected at all.

### 7.2. Movement-based approaches (paradigmatic)

Diesing 1992: specific NPs are attracted to higher positions

It is in the higher position that more prominent NPs can agree with the verb or receive case (cf. López 2012)
Problem: NP-internal number marking can also be sensitive to specificity!

### 7.3. Conditional realization (paradigmatic)

The choice of the marker is determined by the properties of the target (e.g., the realization of accusative in Russian depends on animacy for certain declension classes)

Unintuitive here: why should the plural marker be realized as zero for measure phrases (and then only in a numeral NP)? And it is still necessary to account for the effects of specificity

## 8. IMPLEMENTING CONDITIONAL AGREEMENT

### 8.1. NP-internal agreement patterns for measure phrases

Dutch: only measure nouns themselves fail to agree
Core assumption: the feature [individuated] selecting an interval on the following hierarchy:
(25) measures $\rightarrow$ derived measures $\rightarrow$ nonspecific indefinites $\rightarrow$ partitive, etc., indefinites...

Intuition: lexical plural marking conditional on agreement for another feature:


The number feature on the NP is uninterpretable and unvalued, and cannot probe. However, when Card ${ }^{\circ}$ agrees with $\mathrm{N}^{\circ}$ for the [individuated] feature, the [number] feature is valued as a free-rider in the newly established agreement relation
Measure nouns do not have the [individuated] feature and so do not agree for number
Agreement failure leads to default realizations (Preminger 2011)
Higher functional projections and modifiers in the extended NP agree unconditionally, since their phi-features can simply probe the number feature on the cardinal
Russian: obligatory lexical and pre-cardinal plural marking inside a plural NP:
(27) vse èti celyx sem' gnomov
all-PL DEM-PL whole-PL-GEN seven dwarfs-PL-GEN all these no fewer than seven dwarves
No hierarchy effects NP-internally:


Since Card ${ }^{\circ}$ agrees with $\mathrm{N}^{\circ}$ for the feature [nominal], the [number] feature is always valued (and case is always assigned)
N.B.: Placing the [plural] feature on the cardinal is a simplification: most cardinals in Russian are detectably morphologically singular. Semantically, what is plural is not the cardinal itself but its combination with the NP, and what we need is a dynamic view of features, calculated as the derivation proceeds
English: singular agreement is a result of group formation (cf. every five gallons of milk)

### 8.2. NP-external agreement patterns for measure phrases

Issue: both in Dutch and in Russian NP-external agreement patterns differ from NP-internal agreement patterns
> Dutch: only measure phrases fail to agree (except in tough-constructions, which we set aside here)
$>$ Russian: all and only weak indefinite (derived) measure phrases fail to agree
Unlike in Dutch, in Russian specificity, partitivity, etc., render an NP "agreeable" irrespective of the semantic type, while in Dutch they mostly don't

## Problems:

$>$ The [number] feature on $\mathrm{T}^{\circ}$ is supposedly both uninterpretable and unvalued, so it can probe and the subject is in its domain. Why should agreement be conditional?
$>$ How can optional number agreement on the predicate for definite measure NPs in Dutch be accounted for? Why is it subject to so much speaker variation?
Intuition: if the [number] feature is a dependent of the [individuated] feature (cf. Harley and Ritter 2002), then the lack of the latter entails agreement failure
NP-internally, once the plural feature is introduced (on Card ${ }^{\circ}$ ), the constituent (CardP) has to be [individuated]
What we want is for the feature [individuated] to be calculated for the entire NP on different grounds than NP-internally:
$>$ Russian: specificity, etc., and/or [-measure] $\rightarrow$ [individuated $]_{\mathrm{NP}}$
$>$ Dutch: [-measure] or [?] $\rightarrow$ [individuated $]_{\mathrm{NP}}$
Russian therefore is relatively simple: individuation is established by two dimensions rather than one (cf. Aissen 2003)
For Dutch the value of the feature [individuated] is not the same inside and outside of an NP; NPs that are internally plural may (and generally do) end up [-individuated] if the lexical NP is headed by a measure noun

Solution: distinguish between syntactic and semantic agreement for the [individuated] feature

### 8.3. The phenomenon of mixed agreement

Both concord and agreement can be determined by the semantic properties of the referent of a DP rather than by the formal features of the DP itself:
(29) U nas byla ocen' xorošaja zubnoj vrač. Russian, Crockett 1976 with us was-FSG very good-FSG dental-MSG doctor.M We had a very good dentist.
(30) Ego korolevskoe vysočestvo nedovolen/?nedovol'no. his royal-NSG highness.n dissatisfied-MSG/NSG His Royal Highness is dissatisfied.
HPSG: CONCORD vs. INDEX features (see Wechsler and Zlatic 2003):
$>$ CONCORD: reflects the morphological properties of the noun
> INDEX: reflects the semantic properties of the NP
Both sets of features can determine concord or agreement

Problem (Wechsler and Zlatic 2003): the Agreement Hierarchy (Corbett 1979) not predicted
(31) Agreement Hierarchy

DP-internal < predicate < relative pronoun < personal/possessive pronoun
The likelihood of semantic agreement increases rightwards in (31), both within one language and cross-linguistically, and there are no reversals
Can the hypothesis be salvaged by assuming that semantic features replace syntactic ones (as the hierarchy suggests)?
> should various phi-features be able to function independently and not as a bundle (CONCORD/INDEX)?
> if NP-internal number marking in cardinal-containing NPs is agreement, cardinals themselves should be specified as plural, despite their morphology, and this looks like INDEX (semantic features) rather than CONCORD, so the hierarchy would still not be obeyed

More mainstream proposals (mostly for gender):
> Sauerland and Elbourne 2002: two separate phi-features: the syntactic [number] and the semantic [mereology]
> Sauerland 2004: all phi-features are interpretable only on the dedicated functional head $\phi$ (which is the highest functional head in the extended NP projection)
> Neeleman 2008, Matushansky 2013a: while normally phi-features are interpreted only on nouns, under some circumstances they can be on other elements
> Steriopolo and Wiltschko 2010: gender can be introduced on the root (for nouns that lexically encode gender), on $\mathrm{n}^{\circ}$ (for grammatical gender) or on $\mathrm{D}^{\circ}$ (for mixed agreement)
$>$ Pesetsky 2013: an interpreted [feminine] feature is introduced on the functional head $Ж$ in the extended NP projection
None of these proposals can deal with the apparent reversal of semantic number agreement in Dutch and Russian measure phrases

## 9. Conclusion

Big picture: number agreement is conditioned by prominence scales, which measure phrases are at or near the bottom of.
A principled mechanism of conditioned agreement needs to be developed; one possible way to go is via phi-feature hierarchy, where individuation is a top node.

To account for different patterns of agreement (failure) in function of the probe, an appeal to semantic agreement is necessary, and a dynamic view of feature valuation.

## 10. ApPENDICES

The failure of plural marking in cardinal-containing measure phrases requires an explanation Possible hypotheses dealing with similar phenomena are not straightforwardly applicable to it

### 10.1. General number

Corbett 2000: in a number of languages, an unmarked NP can denote both singular and plural entities:
Alternative term: transnumeral NPs (Acquaviva 2005, Schroeder 1999, Wiese 2003)
(32) a. lúban foofe

Bayso, Corbett 2000:11
lion watch-PAST-1SG
I lion-watched.
b. lubán-titi foofe
lion-SG watch-PAST-1SG
I watched a lion.
c. luban-jaa foofe
lion-PAUC watch-PAST-1SG
I watched a few lions.
d. luban-jool foofe
lion-PL watch-PAST-1SG
I watched (a lot of) lions.
Reference to general number has been made in order to explain singular marking in cardinalcontaining NPs denoting pluralities in Hungarian (Farkas and de Swart 2010) and in Western Armenian (Bale et al. 2011):
a. három gyerek (*-ek)

Farkas and de Swart 2010
three child -PL three children
b. sok gyerek (*-ek)
many child -PL
many children
(34) Mari verset olvasott ma délután.

Farkas and de Swart 2003:101
Mari poem-ACC read-PAST today afternoon
Mary read a poem/poems/poetry this afternoon.
Problems:
> Why should general number be limited to measure nouns?
> How can it be achieved if general number is a semantic property?

### 10.2. Phi-feature deficiency

The failure of cardinal-containing NPs to trigger plural agreement on the predicate in Slavic languages has been attributed to their structural deficiency
Franks 1995, Pereltsvaig 2006, Pesetsky 1982: Russian cardinal-containing NPs can be DPs (triggering full agreement) or QPs (failing to do so)
Klockmann 2013: Polish higher cardinals are phi-deficient in that they have no gender feature (unlike the paucal cardinals two, three and four, which combine with a plural NP in Polish) This analysis cannot be extended to Russian, where the paucal cardinals can also trigger agreement failure even though they appear to be marked for gender and number, and specificity plays a decisive role
Problems:
> phi-deficiency of cardinals is not expected to block number agreement of measure phrases only
$>$ the lack of number agreement failure NP-internally is not expected
a. kakie-to/*kakoe-to/*kakaja-to pjat' rublej
what-PL-PRT/*what-NSG-PRT/*what-FSG-PRT five rubles-GEN
some (particular) five rubles
b. kakix-to/*kakogo-to/*kakoj-to pjat' rublej
what-PL-GEN-PRT/*what-NSG-GEN-PRT/*what-FSG-GEN-PRT five rubles-GEN a meager five rubles
Possibility: the pre-cardinal genitive-marked plural adjective is derived by movement -- can be done on the assumption that modification of a derived measure NP does not give the same result as simple modification

## 11. OTHER SPECIAL FEATURES OF MEASURE NOUNS

Measure nouns may also exhibit special case-assigning properties, not requiring a preposition to introduce its complement (in Dutch, also a property of group/container nouns):
a. drie liter (*van) water three liter of water three liters of water
b. sidzi bərčəqwa əүoši

Agaw, Hetzron 1967
four glassful milk
four glasses of milk
In classifier languages nouns denoting units of measure do not need classifiers to be counted; that this property is related to their denotation rather than the presence of an internal argument is shown by the fact that the same is frequently true for nouns denoting units of time as well as the noun 'person', which take no complement and therefore cannot be classifiers themselves (Simpson 2005). In Malay, the special bound form of the cardinal one only attaches to classifiers, measure nouns and the nouns 'type', 'kind', etc. (Nomoto 2013):
(37) tu nam
four year
four years

In Dene languages, nouns denoting units of measure require the possessive suffix in order to combine with numerals; in Tłịchọ Yatù the numeral also exceptionally precedes the noun; in Russian a number of measure nouns as well as the noun 'person' have a special adnumerative form (Mel'čuk 1985):

| a. | shi nàke <br> bird two |
| :--- | :--- |
| two songs |  |
| b. | nàke dzę̀ |
| two day.PNS |  |
| two day |  |

Complex measure phrases (five feet three inches) often do not require an overt conjunction
Many of the properties above are shared with cardinals (cf. Ionin and Matushansky 2006)

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[^0]:    a. xamiša kilo kemax

    Hebrew, Rothstein 2009
    five kilo flour
    five kilos of flour
    b. šloša dolar

    Glinert 2003:114 three dollar three dollars

[^1]:    a. (Ben) kitap oku-du-m.

    I book read-PAST-1SG
    I was book-reading.

