ABSTRACT: It has often been argued that functional individuating classifiers and plural count nouns ought to be in complementary distribution (e.g. Borer 2005; Chierchia 2010). This apparently works neatly for Chinese and English. Russian, however, is an interesting case. On the one hand it has count nouns which can be directly modified by numerals. On the other hand it has three classifiers, štuka ‘item’, čelovek ‘person’ and golova ‘head’, which optionally occur in numeral constructions with plural nouns and look very much like functional individuating classifiers (cf. Sussex 1976; Yadroff 1999). I show that a closer look at the data reveals that apparently count constructions using these optional classifiers have properties of measure constructions such as five liters of water. Based on that I argue that these classifiers are not individuating classifiers but are measure words which measure mass denotations in terms of natural units in the sense of Krifka (1989, 1995).

1. INTRODUCTION

The literature on the semantics of counting and mass/count distinction commonly distinguishes between classifier and non-classifier languages. In classifier languages, for example Mandarin, all nouns, even those which refer to clearly distinguishable individuals, cannot be counted directly and require a classifier (1). Such classifiers are referred to as individual, sortal (Chao 1968; Lyons 1977; Cheng & Rint 1998), natural unit or object unit classifiers (Krifka 1989, 1995).

(1) a. wu *(ge) jidan five CL egg ‘five eggs’ 
b. wu *(wei) gongren five CL worker ‘five workers’ 
c. wu *(zhi) niu five CL cow ‘five cows’

Classifier languages are contrasted with non-classifier languages such as English, which have count nouns that can be directly modified by numerals (2).

(2) a. five eggs 
b. five workers 
c. five cows

The proposed terminology is misleading. Non-classifier languages also use individuating classifiers to count (cf. Rothstein 2009, in press, this volume and Landman 2004, this volume). Some illustrative examples of counting constructions with classifiers are shown in (3). In (3a) individual pieces of furniture are counted, in (3b) individuated objects are counted, in (3b) individuals bottles filled with cognac are counted and (3c) refers to individual chocolate bars.

(3) a. We bought five amazing pieces/items of furniture. 
b. To our utmost surprise we found five bottles of cognac of different sizes in our mini-bar. 
c. The shopkeeper put five bars of fine Belgium chocolate with different flavorings in front of me.

However, English individuating classifiers in (3) and Mandarin classifiers in (1) are very different. Tang (1990); Cheng & Sybesma (1999) and Li (2013) have shown that individual classifiers in Mandarin form a
separate grammatical category. These are functional expressions at type $<k, \langle e, t \rangle>$ which denote functions from kinds to sets of instantiations of the kind (Krifka 1995; Chierchia 1998; Li 2013). Sortal classifiers do not contribute any novel truth-conditional content to sentences in which they occur (although they presuppose that the individuals they pick out have certain properties), and perform a purely grammatical function of mapping a mass noun onto a count predicate (Li 2013). In contrast, Rothstein (2009; in press) has shown that English count classifiers are a lexical category. They are count relational nouns at type $\langle \langle e, t \rangle, \langle e, t \rangle \rangle$ which take mass or plural count predicates as arguments and map them onto count plural predicates with a different lexical meaning.

Some theories of the mass/count distinction suggest that count nouns and sortal classifiers ought to be in complementary distribution (e.g. Borer 2005; Chierchia 2010). If a language has a category of count nouns it will not need a separate functional category of individuating items and, conversely, a language which has only mass nouns will require a separate syntactic category of individuators. This apparently works neatly for English and Mandarin. Recent studies, however, reveal that some languages do not fit the proposed dichotomy. Hungarian, for example, has both count nouns and sortal classifiers (Schvarcz 2014, in press; Schvarcz & Rothstein in press).

Against this background, Russian is an interesting case. On the one hand it has count nouns (4) which can be counted directly and used as individuating classifiers (5).

(4) a. pjat’ predmetov kotorye dolžny byt’ v dome u každogo five object$^{\text{GEN.PL}}$ which must be in house at every ‘Five things that everyone must have in his house.’
   b. pjat’ pustyx butyloks s šumom skatilis’ na pol five empty bottle$^{\text{GEN.PL}}$ with noise rolled down on floor ‘Five empty bottles rolled down on the floor making much noise’

(5) a. pjat’ neobyčnych predmetov mebeli five unusual object$^{\text{GEN.PL}}$ furniture$^{\text{GEN.SG}}$ ‘five unusual items of furniture’

b. pjat’ butylok vina razbilis’ vдребезgi five bottle$^{\text{GEN.PL}}$ wine$^{\text{GEN.SG}}$ crush to pieces ‘(The) five bottle of wine crushed to pieces.’

On the other hand it has a small class of classifiers which optionally occur in counting constructions. This class includes three items: štuka, čelovek and golova (6) (Sussex 1976). These classifiers apparently designate countable units (Ožegov & Švedova 2008) and do not add lexical content to the expressions in which they appear and, therefore, look very much like sortal classifiers.

(6) a. pjat’ (štuk) jaic five item$^{\text{GEN.PL}}$ egg$^{\text{GEN.PL}}$ ‘five eggs’
   b. pjat’ (čelovek) stroitelej five person$^{\text{GEN.PL}}$ builders$^{\text{GEN.PL}}$ ‘five builders’
   c. pjat’ (golov) korov five head$^{\text{GEN.PL}}$ cow$^{\text{GEN.PL}}$ ‘five cows’

Given the assumption that the only function of sortal classifiers is to map non-count denotations onto count, why would they occur with plural nouns as in (6) which are count in the first place? More specifically there are at least three questions to be asked: (i) Are these classifiers nominal or functional? (ii) What kind of complements do they take? (iii) What is their semantic function?

In this paper I address these questions in turn and claim that: (i) While predmet and butyloka in (5) are lexical nouns, štuka, čelovek and golova in (6) are, as observed in Sussex (1976) and Yadroff (1999), functional expressions, like sortal classifiers in Mandarin; (ii) However, štuka, čelovek and golova, unlike sortal classifiers in Mandarin and like nominal classifiers in English, take predicates and not kind-denoting terms as their complements; (iii) Apparently count expressions with štuka, čelovek and golova have properties of measuring expressions. Based on that I propose that these classifiers are not individuating expressions but are a closed set of functional measure expressions at type $\langle n, \langle e, t \rangle \rangle$ analogous to liter, which measure quantities of entities in

The paper is structured as follows. In the following section we briefly discuss the semantics of counting constructions in Mandarin and English, focusing on the differences between functional and nominal classifiers. In section 3 I show, following Yadroff (1999) that štuka, čelovek and golova are not lexical nouns. In section 4 I bring evidence that these classifiers do not operate on kinds but take predicates as their complements. In section 5 we discuss the differences between counting and measuring expressions and I will show that štuka, čelovek and golova are best analyzed as measure words referring to natural units. Section 6 presents the central conclusions.

2. BACKGROUND

2.1. Counting Classifiers in Classifier Languages (Mandarin) are Functional Expressions at type \(<k,\tau_{e,t}^k>\)

Linguists agree that Mandarin classifiers such as in (1) have properties of functional heads rather than of nominal (lexical) expressions (Tang 1990; Cheng & Sybesma 1999; Li 2013). Firstly, as seen in (1) individual classifiers, unlike lexical expressions, do not add any “descriptive content” (Li 2013). They presuppose certain properties of nouns which they select (e.g. ge is a general classifier, ke is a classifier for plants, zhi is used with nouns denoting animals). Secondly, many classifiers cannot be used as nouns (Li 2013). For example, a classifier zhi cannot be used to make reference to an animal, even if preceded by another sortal classifier (7).

(7) a. yi zhi dou
one Cl dog
‘a dog’

b. *yi ge zhi
one Cl Cl
Intended: ‘an animal’

Li (2013) points out that some classifiers (especially container classifiers) may have a nominal use. But then they behave differently when used as classifiers and as nouns. For example, when xiang ‘box’ is used as a classifier, it is directly preceded by one (8a), whereas as a sortal classifier it requires a sortal classifier to be counted (8b).

(8) a. yi xiang pingguo
one Cl_box apple
‘a box of apples’

b. *yi *(ge) xiang
one Cl_general box
‘one box’

Thirdly, Mandarin classifiers form a closed class. “Each subtype of classifier has stable and conventionalized members” [Li 2013:23]. This is a characteristic of functional expressions (cf. Abney 1987).

It has been argued extensively that all nouns in Mandarin are non-countable mass expressions which denote kinds (Krifka 1995; Chierchia 1998; Yang 2001; Li 2011, 2013). Individuating classifiers then serve to derive countable predicates from these non-countable kind-denoting terms. Formal compositional analyses of Mandarin classifiers as operators on kinds are found in Krifka (1995); Chierchia (1998); Li (2011, 2013); Li & Rothstein (2012); Rothstein (in press). The interpretation in (9) is a simplified version of the analysis proposed in Li & Rothstein (2012) and Rothstein (in press). Classifiers are operators at type \(<k,\tau_{e,t}^k>>\) applying to a kind denoting mass noun at type \(k\) and producing a predicate which denotes the set of individual (atomic) instantiations of that kind which can be counted (9). The proposed interpretation reflects the fact that the classifier presupposes that nouns with which it can combine have certain properties. For example, zhi is a classifier for animals (e.g. yi zhi mao ‘one Cl cat’) and tiao is a classifier for long-shaped entities (e.g. yi tiao he ‘one Cl river’). If a classifier is used in such a way that the presupposition is not satisfied the whole expression will be infelicitous (\# yi tiao mao).

(9) The interpretation of count classifiers in Mandarin:

\[ ||Cl|_{<k,\tau_{e,t}^k>} = \lambda x. x \in \tau_{k} \]

Presupposition: \(\tau^k \subseteq \{x : x \in P\}\)

Cl applies to a kind denoting term and generates the set of individual atomic instantiations of \(k\). It is presupposed that every individual in this set has a property \(P\)
The proposed interpretation is developed on the basis of the following assumptions about the semantics of counting expressions: (i) Counting is a cardinal operation on atoms. For a plural individual, \( x, |x| = |\{y : y \subseteq x \land y \in \text{ATOM}\}| \) and, therefore, countable predicates ought to have clearly specified atoms in their denotation (cf. Link 1983, 1984; Landman 1991; Chierchia 1998, 2010; Rothstein 2010 among others); (ii) Singular count predicates denote sets of atoms \( |\text{cow}| = \{a,b,c\} \). Plural predicates denote sets of sums of atoms derived via applying the operation of closure under sum to sets of atoms, \( |\text{cows}| = \{a,b,c,a \cup b, a \cup b \cup c, a \cup b \cup c \} \) (Link 1983); (iii) Numerals are intersective predicative modifiers which denote sets of sums of atoms (pluralities) with \( n \) number of atomic parts, \( \lambda x. |x| = n \) (Landman 2003, 2004).

\( \text{Wu zhi niu} \) in (1) is then interpreted as follows in (10). \( \text{Zhi} \) combines with the mass \( niu \) denoting the COW kind and produces a count predicate denoting the set of atomic individual instantiations of this kind (10a,b). The presupposition of \( zhi \), that the units denoted by \( zhi \) \( N \) are units of animals, is satisfied. This count predicate is then pluralized (10c) (notice that in Mandarin the pluralization is not expressed morphologically) and modified interiectively by a numeral \( \text{wu} \) denoting the set of all pluralities (sums of atoms) with 5 atomic parts (10d). The derived expression is a plural predicate denoting the set of pluralities of individuals instantiating the COW kind where each plurality contains five atomic parts (10e).

\begin{equation}
\text{(10) } \text{wu zhi niu} \text{ ‘five Cl cow’}
\end{equation}

\begin{enumerate}
\item \( |\text{zhi}|_{\text{e,t}, <e,t>} = \lambda k \lambda x. x \in ^i k \quad \text{Presupposition: } ^u k \subseteq \{x : x \in \text{ANIMAL}\} \)
\item \( |\text{zhi niu}|_{\text{e,t}} = \lambda x. x \in ^i \text{COW}_{\text{kind}} \quad \text{The set of atomic individuals instantiating the COW kind} \)
\item \( |\text{zhi niu}|_{\text{e,t}} = \lambda x. \text{PL}(x \in ^i \text{COW}_{\text{kind}}) \quad \text{The set of sums of atomic instantiations the COW kind} \)
\item \( |\text{wu}|_{\text{e,t}} = \lambda x. |x| = 5 \quad \text{The set of sums of atomic individuals s.t. each sum has 5 atomic parts} \)
\item \( |\text{wu zhi niu}|_{\text{e,t}} = \lambda x. \text{PL}(x \in ^i \text{COW}_{\text{kind}}) \land |x| = 5 \quad \text{The set of sums (pluralities) of atomic instantiations of the COW kind s.t. each sum consists of 5 atomic parts.} \)
\end{enumerate}
on which they apply to mass or plural count predicates and produce a count predicate.\(^4\)

\[
\begin{align*}
(14) \quad a. & \quad \| N \|_{<e,\top>} = \lambda x. N(x) \\
& \quad \| N \|_{\langle e,\top, \langle e,\top \rangle \rangle} = \lambda x. N(x) \land \exists y. [P(y) \land \text{RELATION}(x,y)]
\end{align*}
\]

Five glasses of milk, for example, is compositionally interpreted as shown in (15). A classifier glass applies to a mass predicate milk and generates a count predicate denoting the set of individual glasses containing milk (15a). This predicate is pluralized\(^5\) and modified by a numeral five (15b) resulting in a plural count predicate denoting the set of pluralities of individual glasses with milk, each of which consists of five atomic parts (15c).

Expressions with plural count complements such as five glasses of berries are interpreted analogously (16).

\[
\begin{align*}
(15) \quad \text{five glasses of milk} & \\
& \quad a. \quad \| \text{glass of milk} \|_{<e,\top>} = \lambda x. \text{GLASS}(x) \land \exists y. [\text{MILK}(y) \land \text{CONTAIN}(x,y)] \\
& \quad b. \quad \| \text{five} \|_{<e,\top>} = \lambda x. |x| = 5 \\
& \quad c. \quad \| \text{five glasses of milk} \|_{<e,\top, \langle e,\top \rangle \rangle} = \lambda x. \text{PL(GLASS)}(x) \land \exists y. [\text{MILK}(y) \land \text{CONTAIN}(x,y) \land |x| = 5] \\
(16) \quad \text{five glasses of berries} & \\
& \quad a. \quad \| \text{glass of berries} \|_{<e,\top>} = \lambda x. \text{GLASS}(x) \land \exists y. [\text{PL(BERRY)}(y) \land \text{CONTAIN}(x,y)] \\
& \quad b. \quad \| \text{five} \|_{<e,\top>} = \lambda x. |x| = 5 \\
& \quad c. \quad \| \text{five glasses of berries} \|_{<e,\top, \langle e,\top \rangle \rangle} = \lambda x. \text{PL(GLASS)}(x) \land \exists y. [\text{PL(BERRY)}(y) \land \text{CONTAIN}(x,y) \land |x| = 5]
\end{align*}
\]

Thus count classifiers in English are relational nouns at type \(\langle e,\top, \langle e,\top \rangle \rangle\) which map mass or plural count predicates onto count plural predicates. In the proposed framework counting classifiers in English are not individuating operators per se like they are in Mandarin. Counting classifier constructions are count because classifiers which head them are themselves count nouns.

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2.3. An Attempt for a Unified Analysis of Counting Classifier Expressions in English and Chinese

In the previous two sections we saw that counting numeral classifier constructions in English and Mandarin are plural count predicates. However, the internal semantic structures of such expressions are different in the two languages. Krifka (1989, 1995) pursues a different idea, arguing that numeral constructions in English and Chinese are interpreted via the same mechanisms and that the difference between the two languages is only in the morphosyntax. The two papers are not identical. Here I first focus on the 1995 version.

Krifka (1995) argues that nouns in both types of languages are born as mass, kind-denoting terms and require classifiers in order to combine with numerals. In Chinese classifiers are always syntactically overt, as in (17), whereas in English they are overt in some cases, as in (18a,b), and lexically concealed in other cases, as in (18c).

\[
\begin{align*}
(17) & \quad \text{five } \ast (\text{zhi}) \text{ niu} \\
& \quad \text{five Cl}_{\text{animal}} \text{ cow} \\
& \quad \text{‘five cows’} \\
& \quad b. \quad \text{wu } \ast (\text{sheng}) \text{ shui} \\
& \quad \text{five Cl}_{\text{liter}} \text{ water} \\
& \quad \text{‘five liters of water’} \\
(18) & \quad \text{five } \ast (\text{liters}) \text{ of water} \\
& \quad b. \quad \text{five } \ast (\text{head}) \text{ of cattle} \\
& \quad c. \quad \text{five cows}
\end{align*}
\]

In particular Krifka proposes that \text{wu zhi niu} in Mandarin and \text{five cows} in English are semantically equivalent to \text{five object units of cow} \(\text{mass}\). The OBJECT UNIT is a classifier (‘natural unit’ NU in the 1989 version). It is overt in Mandarin (\text{zhi}) but lexically concealed in English. This classifier is a measure expression analogous to \text{liter}. It combines with a numeral and a kind-denoting term and produces a measure predicate denoting the set of quantities of instantiations of the kind which measure \(n\) number of object units (19).\(^6\)

\[
\begin{align*}
(19) & \quad \| \text{zhi} \| = \land n \land k \land \lambda x. x \in \langle k \land \text{OU}_{\text{kind}}(x) = n \rangle \\
& \quad \| \text{wu } \text{zhi} \| = \land k \land \lambda x. x \in \langle k \land \text{OU}_{\text{kind}}(x) = 5 \rangle \\
& \quad \| \text{wu } \text{zhi niu} \| = \land x. x \in \langle \text{COW}_{\text{kind}} \land \text{OU}_{\text{kind}}(x) = 5 \rangle
\end{align*}
\]
The set of quantities of instantiations of the cow kind which measure 5 object units.

For five cows in English, Krifka (1995) proposes two possibilities for a compositional interpretation. One option is that OU classifier is built into the structure of count nouns. Krifka assumes that all count nouns are derived from root nouns which have a mass denotation and that mass nouns in English, like all nouns in Mandarin, are kind denoting terms. The OU operator applies to a kind term to give a count noun at type <n,<e,t>> (20).

(20) \[
\begin{align*}
\text{a. } OU &= \lambda k \lambda n \lambda x. x \in \{ k \wedge OU_k(x) = n \} \\
\text{b. } \text{cow} &= OU(COW_{\text{kind}}) = \lambda n \lambda x. x \in \{ COW_k \wedge OU_{\text{cow kind}}(x) = n \} \\
\text{c. } \text{five cows} &= \lambda x. x \in \{ COW_k \wedge OU_{\text{cow kind}}(x) = 5 \}
\end{align*}
\]

The set of quantities of instantiations of the cow kind which measure 5 object units.

Another possibility is that the OU classifier is built into the structure of a numeral (21). Then numerals are interpreted at type <k,<e,t>> and denote relations from kinds to sets of quantities of individual instantiations of the kind.

(21) \[
\begin{align*}
\text{a. } OU &= \lambda n \lambda k \lambda x. x \in \{ k \wedge OU_k(x) = n \} \\
\text{b. } \text{five} &= OU(5) = \lambda k \lambda x. x \in \{ 5 \wedge OU_k(x) = 5 \} \\
\text{c. } \text{five cows} &= \lambda x. x \in \{ COW_k \wedge OU_{\text{cow kind}}(x) = 5 \}
\end{align*}
\]

The set of quantities of instantiations of the cow kind which measure 5 object units.

In either case, five cows is a measure predicate which denotes the set of quantities of instantiations of the cow kind to the amount of 5 object units.

In the proposed framework nouns in the two types of languages are mass expressions denoting kinds, and counting involves measuring quantities of instantiations of a kind. The shift from a kind to instantiations of the kind occurs by means of the object unit operator. In Chinese the OU operator is expressed by a lexical item, the classifiers. In English, the OU operator is built into another lexical item, either a numeral or a count noun. In the earlier version of the analysis from 1989, Krifka suggests that the individuating operator, which he then calls ‘natural unit’ operator, is incorporated in the structure of count nouns in English. In that version he treats mass denotations in languages of both types as predicates and not as kinds. Thus natural unit classifiers take predicates and not kind denoting terms as arguments.

Both versions of Krifka’s analysis face problems. One problem is that it treats counting as a form of measuring, implying that counting constructions such as five cows/five items of furniture and measuring expressions such as five liters of water have the same semantics. Recent studies, however, have shown that measuring and counting expressions in English, and many other languages including Chinese, have different denotations and, therefore, counting and measuring ought to be different operations (Landman 2004, this volume; Rothstein 2009, 2011, in press, Khrizman et al. 2015–for English; Li 2011, 2013–for Chinese). The details will follow in section 5 where I will also show that the semantic contrast between counting and measuring is attested in Russian.

The second problem concerns specifically the proposal in (21). If numerals in non-classifier languages involved a concealed unit classifier in their structure they would be expected to combine felicitously with mass nouns denoting entities which naturally come in clearly distinguishable units (‘naturally atomic’ mass nouns (cf. Rothstein 2010), for example furniture. As shown in (22) this holds neither for English nor for Russian.

(22) \[
\begin{align*}
\text{a. } #five \text{ furniture(s)} \\
\text{b. } #five \text{ footwear(s)} \\
\text{c. } #pjat’ \text{ mebeli} / \text{ mebelej} &\quad \text{five furniture}^{SG} / \text{furniture}^{PL} \\
\text{d. } #pjat’ \text{ obuvi} / \text{ obuvej} &\quad \text{five footwear}^{SG} / \text{footwear}^{PL}
\end{align*}
\]

The conclusion is then that counting constructions such as five cows in English or pjat’ korov in Russian cannot be analyzed as involving measuring in natural units. But, Russian, unlike English, has the option of using classifiers štuka, čelovek and golova in its counting expressions. In this paper I will argue that constructions using these classi-
fiers are indeed best analyzed as instantiating such an operation. More specifically, I shall claim that these classifiers are neither count relational nouns, as piece/glass in English are (see sec. 2.1), nor functional operators from kinds to sets of atomic individuals, as Mandarin classifiers are (see sec. 2.2). Instead, they are measure operators measuring mass predicates in natural units.

3. ŠTUKA, ČELOVEK AND GOLOVA ARE NOT LEXICAL NOUNS

We will now see that, as observed in Sussex (1976) and Yadroff (1999), the classifiers štuka, čelovek and golova behave as functional expressions rather than as nouns. I will show that they contrast with counting classifiers such as predmet/kusok ‘item/piece’ or butylka ‘bottle’ which are indeed nominal.

i. Descriptive content

Štuka, čelovek and golova do not contribute any novel lexical content to expressions in which they appear. This is seen in the data in (23) showing that sentences with and without a classifier do not create a contrast in meaning.

(23) a. ja prosila'jaic #a on kupil 'jaic pjat' štuk 'jaic
  I asked five egg but he bought five item egg.
  ‘I asked for five eggs, but he bought five items of eggs.’
 b. my prosily 'jaic stroitelej, '#a oni nanjali 'jaic
  we asked hire five builder but they hired five
  čelovek stroitelej person builder
  ‘We asked to hire five builders, but they hired five persons
  of builders.’
 c. fermer dolžen byl zakupil 'jaic korov, '#a zakupil 'jaic
  farmer must buy five cow, but bought five
  golov korov head cow
  ‘The farmer was supposed to buy five cows, but he bought
  five head of cows.’

ii. Presuppositional vs. truth-conditional

Similarly to sortal classifiers in Mandarin, štuka, čelovek and golova are restricted to certain types of nouns. Štuka picks out inanimate nouns, čelovek occurs with nouns denoting humans and golova takes nouns denoting farm animals (Sussex 1976). Crucially, if these restrictions are not satisfied the resulting constructions are infelicitous and not false (24), which shows that the restrictions are presuppositional and not truth-conditional.

(24) a. #pjat' štuk korov/ stroitelej
  five item cow builder
  ‘One shepherd can graze up to 20 cows.’
 b. #pjat' čelovek korov/ jaic
  five person cow egg
  ‘One shepherd can graze up to 20 cows.’
 c. #pjat' golov stroitelej/ jaic
  five head builder egg
  Intended: ‘The shepherd is grazing cattle.’

Yadroff (1999) points out that štuka classifier does not have any “‘encyclopaedic’ meaning” [Yadroff 1999:151] but is used to refer to inanimate units. We observe that štuka can be used as a content item. How-
ever, as such it has a very narrow, restricted meaning. In particular it may be used to refer to an unusual or interesting object or a pattern of behavior (27).

(27) a. kakaja interesnaja štuka
    what interesting item
    ‘What an interesting item/thing.’

b. ty eti svoi štučki brot!
    you these your thing drop
    ‘Stop with your tricks!’

c. #na stole ležali štuki
    on table lay item
    Intended: ‘There were some objects on the table.’

As a classifier štuka is not restricted in the same way and, as mentioned, can be used to talk about any inanimate object.

Čelovek also shows differences between the classifier and nominal uses. In particular, Yadroff (1999) shows that čelovek as a noun and as a classifier have different paradigms in morphological case (28)-(29).9

(28) čelovek NOM SG - ljudi NOM PL / čeloveki NOM PL - ljudje GEN PL / čelovek GEN PL

(29) a. pjabat čelovek stroiteljej / *ljudjej
    five person builder / people
    stroitelje builder
    ‘five builders’

b. v komnate ne bi ležalo štuk
    in room not were item
    ‘There were no people in the room.’

iv. Adjectival modification

Another argument showing that štuka, čelovek and golova are not full lexical nouns is the observation that they cannot be modified by adjectives. Yadroff (1999) shows this for štuka and čelovek (30). We observe the same with golova (31).

(30) a. *pjatat štuk bol’six/ispornčennyx štuk
    five big/rotten item
    jaice egg
    Intended: ‘five rotten eggs’

b. *pjatat sil’nyx čelovek rabočix
    five strong person workers
    Intended: ‘five strong builders’

(31) *pjatat krunpnyx golov furaznyx korov
    five big head forage cow
    Intended: ‘five big forage cows’

v. Syntactic dependency

Functional heads have been shown to require complements (Abney 1987). Yadroff shows that štuka and čelovek cannot appear without a numeral (32a, b). We show the same for golova classifier (32c). Assuming that numerals are selected by these classifiers, the latter observation is another argument for treating these items as functional heads.

(32) a. *an kupil štuk/i jaic
    he bought item egg
    Intended: ‘He bought some eggs.’

b. *ja vstrtila čelovek stroitelej
    I met person builder
    Intended: ‘I met a few builders.’

c. *na pole pasliš golovy oveč
    on field grazed head sheep
    Intended: ‘Sheep grazed in the field.’

vi. Closed set

Finally, these classifiers, just like sortal classifiers in Mandarin, are a closed class. Sussex (1976) observes that they cannot be replaced by nouns with a similar meaning (33).

(33) a. *pjatat veščej karandaše
    five thing pencil
    Intended: ‘five pencils’

b. *pjatat mužčin stroitelej
    five man builder
    Intended: ‘five builders’

Crucially, constructions with štuka, čelovek and golova contrast with classifier constructions with predmet/kusok and butylka. The latter have
a nominal use and express the same meaning when used as nouns and as classifiers (34). Furthermore, they have the same morphosyntactic properties as classifiers and as nouns. In particular, (35) shows that they can be modified by adjectives and (36) shows that these classifiers can be used without numerals.

(34) a. na stole stojali butylki/ ležali različnye predmety on table stood bottleNOM PL / lay different objectNOM PL
‘There were bottles/different objects on the table.’

b. ne xvataj kuski sjad’ normal’no poeš not grasp pieceACC PL sit normally eat
‘Don’t take pieces here and there. Sit down and have a proper meal.’

(35) a. pjat’ bol’six butylok vody five bigGEN PL bottle waterGEN SG
‘five big bottles of water’

b. pjat’ samyx staryx butylok vina v mire five mostGEN PL old GEN PL bottleGEN PL wineGEN SG in world
‘the five world’s oldest bottles of wine’

c. pjat’ ogromnyx kuskov mjasa five hugeGEN PL pieceGEN PL meatGEN
‘five huge pieces of meat’

(36) a. na polkax ležali butylki vina on shelves lay bottleACC PL wineGEN SG
‘There were some bottles of wine on the shelves.’

b. mama predložila kotu kus’ček mjasa no on mother offered cat pieceACC DIM SG meatGEN SG but he refused him to eat
‘My mother offered our cat a small piece of meat, but he refused to eat it.’

Further, counting classifiers are an open category. Sortal nouns which are usually not used as relational may shift to a classifier use (37).

(37) ... k čemu snitsja čemodan deneg to what dreamREFL caseACC SG moneyGEN SG

Given all the above arguments we conclude that štuka, čelovek and golova are different from nominal counting classifiers such as item, piece and bottle. While the latter are nouns, the first have properties of functional expressions. Therefore we cannot analyze these classifiers as count relational nouns in the sense of Rothstein (2009, in press).

4. ŠTUKA, ČELOVEK AND GOLOVA ARE NOT OPERATORS ON KINDS

In the previous section we saw that štuka, čelovek and golova pattern with sortal classifiers in Mandarin in a variety of respects. However, unlike in Mandarin, in Russian these classifiers occur with plural count nouns. Given that Russian plural nouns can be interpreted as referring to kinds as well as predicates denoting sets of individuals (38) (cf. Dayal 2004) we could suggest that plural complements in constructions with štuka, čelovek and golova are also kind terms and the classifiers are functions from kinds to predicates just like sortal classifiers in Mandarin are.

(38) a. včera v cirke, tigry napali na dressirovščika yesterday in circus tigerPL attacked on trainer
‘Yesterday, tigers attacked the trainer in circus.’

b. tigry- životnye svoenravnye/ naxodjatsja na grani tigerPL animals willful/ be on edge isčeznovenija disappearance
‘Tigers are very willful animals/in danger of becoming extinct.’

In what follows I argue against this hypothesis with four arguments showing that the complements of štuka, čelovek and golova are plural predicates and not kind terms.

Firstly, nominal complements in constructions with štuka, čelovek and golova can be modified by temporal and stage-level modifiers (39).

(39) a. pjat’ štuk včerašnix kotlet five itemGEN PL yesterday meatballsGEN PL
‘five yesterday’s meatballs’

b. našla pjat’ štuk noven’kix monet
found five item GEN PL new coin GEN PL
‘I found five new coins.’

[c. 30 štuk prosočennyx jaic
30 item GEN PL expired egg GEN PL
‘thirty expired eggs’

[https://regnum.ru/news/cultura/1498305.html]

d. 20 golov molodogo skota
20 head GEN PL young livestock GEN MASS
‘20 head of young livestock’

Secondly, it seems that these classifiers can have DP complements such as superlative and possessive nominal constructions (40)-(41).

(40) „šest’ štuk samyx žyrnyx karasej...” prikazal
six item GEN PL most fat crucian carp GEN PL ordered
kot
cat
‘Give me six of the fattest crucian carps...’- ordered the cat.’

[From The Adventures of Buratino by A.Tolstoj]

(41) 10 čelovek našix oficerov
10 person GEN PL our GEN PL officer GEN PL
‘10 persons of our officers’

[Yadroff 1999: 146]

Thirdly, bare singular nouns in Russian can have a kind interpretation, and classifiers which operate on kinds such as podvid ’subtype’ can take singular count complements (42). Ġtuka, čelovek and golova do not occur with singular count nouns (43), but if they denote functions from kinds to instantiations of the kind, they should.

(42) a. vsego vydelenn 9 podvidov tigra
in all distinguished 9 subtype GEN PL tiger GEN SG
‘In total 9 subtypes of tigers have been distinguished.’

b. do six por učenye vydelijali vosem

till this time scientists distinguished eight
podvidov tigrova
subtype GEN PL tiger GEN PL
‘Till now scientists have been distinguishing 8 subtypes of tigers.’

[https://otvet.mail.ru/question/15492926]

c. 5 čelovek stroitelj-kamenščikov
5 person GEN PL builder GEN PL brick layer GEN PL / builder
kamenščika
brick layer GEN SG
‘five builders-brick layers’

The fourth argument comes from so called singulative nominals. These are nouns which are derived from mass nouns using suffixes –inka/-ina as in ris ‘rice’ and risinka ‘a grain of rice’ (see Isačenko 1960; Corbett 2000; Trugman 2013). The contrast in (44) and (45), shows that while ris can be interpreted either as a predicate or as a kind denoting term, its singulative counterpart risinka/risinki has only a set interpretation.

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In the city one centimeter of air contains about 100 000 of dust grains.

Given the arguments above, we must conclude that štuka, čelovek and golova take predicates and not kind-denoting terms and can therefore not be analyzed analogously to Mandarin classifiers as functions at type \(<k, <e,t>>\).

5. ŠTUKA, ČELOVEK AND GOLOVA ARE MEASURE UNIT CLASSIFIERS

We have seen that štuka, čelovek and golova are neither relational nouns like counting classifiers such as piece or bottle, nor are they operators from kinds to countable predicates like Mandarin individual classifiers are. Now I will propose an alternative analysis. I will show that constructions with štuka, čelovek and golova have properties of measure predicates (e.g. five liters of water) and not of genuine count predicates (e.g. five eggs). Based on this I will argue that štuka, čelovek and golova are best analyzed as a closed set of measure words analogous to liter, which measure sums of entities in terms of natural units. I shall start with a general background on the semantics of counting and measuring.

5.1. The Semantics of Counting and Measuring

Intuitively, numeral NPs divide into two subtypes. Expressions such as five boys or five items of furniture in which individual entities are counted and expressions like five liters of milk or five meters of cloth in which quantities are measured in certain units.

Linguists often assumed that counting and measuring linguistic expressions have the same grammar. Either measuring was treated as a
form of counting (e.g. Lyons 1977; Gil 2013) or, conversely, counting was viewed as a form of measuring (Krifka 1989, 1995). Recent studies have shown that such analyses are not adequate, because counting and measuring expressions have different denotations and, hence, ought to have a different semantics. Such an approach has been introduced and developed in Landman (2004; this volume) and Rothstein (2009; 2010; 2011; in press; this volume). Below we briefly summarize the central points.

Measuring and counting expressions denote typically different predicates. Measuring NPs such as *five liters of milk*/*five kilos of potatoes* are mass predicates denoting sets of non-individuated quantities of entities/stuff whereas counting NPs, for example *five boys*/*five items of furniture* are plural count predicates denoting sets of sums of atomic entities (Landman 2004; this volume; Rothstein 2009; 2011; in press; this volume). This may be seen in the distribution of the two types of expressions with respect to operators that require individuated antecedents. As shown in (48) counting NPs can be antecedents of such operators whereas measuring NPs do not allow individuation (49) (Rothstein 2009, 2011, in press; Landman this volume).

\[ \text{five boys} \parallel \text{five} \parallel |\text{x}| = 5 \]
\[ \text{five items of furniture} \parallel \text{five} \parallel |\text{x}| = 5 \]

(48) a. Five boys sat next to each other.
   b. Five items of furniture were piled on top of each other.

(49) a. #The cook mixed five kilos of flour with each other in a big pot.
   b. #Five kilos of potatoes were piled on top of each other.

The two types of predicates ought to be derived by different operations. In the Landman-Rothstein framework the two operations are distinguished as follows. Counting is a cardinal operation which applies intersectively to sets of atomic pluralities and specifies how many atomic parts each plurality has, \( \lambda x. |x| = n \). (50)-(51) (Link 1983, 1984; Landman 1991, 2003, 2004).

\[ |\text{five boys}| = \lambda x. \text{PL(BOY)}(x) \parallel |\text{x}| = 5 \]
\[ |\text{five items of furniture}| = \lambda x. \text{PL(FURNITURE ITEM)}(x) \parallel |\text{x}| = 5 \]

\[ |\text{five liters of milk}| = \lambda x. \text{MEAS}^{\text{VOLUME}}(x) \parallel <\text{n}, \text{LITER UNIT}> \]
\[ |\text{five liters}| = \lambda x. \text{MEAS}^{\text{VOLUME}}(x) \parallel <\text{5}, \text{LITER UNIT}> \]
\[ |\text{five kilos of potatoes}| = \lambda x. \text{MILK}(x) \parallel |\text{x}| = 5 \]
\[ |\text{five liters of milk}| = \lambda x. \text{MILK}(x) \parallel \text{MEAS}^{\text{VOLUME}}(x) = <\text{5}, \text{LITER UNIT}> \]

(50) *Five boys*
\[ |\text{five}| = \lambda x. |\text{x}| = 5 \]
The set of all pluralities (sums of atoms) with 5 atomic parts
\[ |\text{boys}| = \lambda x. \text{PL(BOY)}(x) \]

(51) *five items of furniture*
\[ |\text{five}| = \lambda x. \text{PL(FURNITURE ITEM)}(x) \]
The set of pluralities of furniture items with 5 atomic parts

Rothstein (2011) argues that morphologically count plural complements in measure expressions (e.g. *five kilos of books/potatoes*) shift to a mass interpretation. She supports the claim using partitive constructions such as in (53). As seen *five kilos of potatoes* require *much* and not *many* as a determiner which shows that the whole construction is mass and this is possible only if the complement modified by *five kilos* is mass.

\[ \text{much}/\#\text{many of the five kilos of potatoes remained unused.} \]

The semantics for measuring proposed in (52), as desired, derives measuring and counting expressions as predicates of two different types. Count-
ing expressions denote sets of pluralities of atomic individuals, measuring expressions denote sets of pluralities in which atomic parts are not (fully) specified.

Crucially, the proposed grammatical contrast is attested in Russian. Counting and measuring expressions have different properties.

i. Agreement

In Russian, numeral subjects allow two patterns of agreement with verbs. Either plural or singular neuter is possible (54) (Franks 1995).

(54) desjat čelovek byli gospitalizirovany/ bylo ten personGEN PL werePL hospitalizedPL/ wasSG gospitalizirovano hospitalizedSG ‘Ten people were hospitalized.’

Counting numeral classifier constructions also allow for either pattern (55).

(55) a. na tarelke ležali dva bolšix kuska on plate layPL two bigGEN PL piecePAUC=GEN SG mjasa meatGEN MASS ‘Two big pieces of meat lay on the plate.’  

b. na bljude...ležalo dva bolšix kuska on plate laySG two bigGEN PL piecePAUC=GEN SG mjasa meatGEN MASS ‘Two big pieces of meat lay on the plate.’

Franks (1995) points out that plural agreement is associated with an individuated interpretation whereas singular agreement indicates a non-individuated or collective/group interpretation (see also Pereltsvaig 2006). Singular agreement is not possible in constructions modified by explicit distributive operators such as reciprocals (56) (cf. Franks 1995).

Crucially, Khrizman & Rothstein (2015); Matushansky & Ruys (2015a,b) note that in measuring contexts singular agreement is preferred (57)-(58).

(57) na étot pirog ušlo/ #ušli pjat’ jaic on this cake wentSG /wentPL five eggsGEN PL ‘Five eggs were used to make this cake.’

(58) a. pri sžiganii organismeskogo vešestva while burning organic material vydelilos’??vydelilis’ 22 grammа vody isolateSG /isolatePL 22 gramPAUC=GEN SG waterGEN MASS ‘As a result of burning organic material 22 grams of water was isolated.’

b. v kastrjule ležalo??ležali 250 gramm mjasa in pot laySG /layPL 250 grammGEN PL meatGEN MASS ‘There was 250 grams of meat in the pot.’

Thus speakers’ preferences with respect to agreement patterns suggest that counting expressions have individuated (count) denotations whereas measuring NPs have non-individuated (mass) denotations.

ii. Modification by individuating operators

Furthermore, as predicted, counting constructions can be modified by individuating operators (e.g. reciprocals) (59), whereas measuring expressions cannot (60). The examples in (60) imply that kilos should be interpreted as denoting discrete units which stay in the reciprocal relation. Since such an interpretation is not available (e.g. kilos in (60c) cannot be interlaced), the examples are infelicitous.

(59) a. pjat’ predmetov mebeli byli paspoloženy five objectGEN PL furnitureGEN MASS werePL situatedPL v centre komnaty na ravnom drug ot druga in center room on equal one from other

[Franks 1995]

[Khrizman & Rothstein 2015]
The conclusion is that counting and measuring constructions have different properties and, therefore, a different semantics. In the following section I will show that apparently counting constructions with štuka, čelovek and golova have properties of measuring constructions.

5.2. Construction with štuka, čelovek and Golova are Measure Predicates

I propose that constructions with štuka, čelovek and golova are measure predicates with the classifier introducing the unit of measure in the sense of Krifka (1989, 1995). More specifically, these classifiers are measure operators analogous to explicit measure words such as litr ‘liter’. While litr measures the pluralities in liter units (61), these classifiers measure pluralities in natural units (62).

(61) \[ \text{pjat' litrov N} \rightarrow \text{The set of pluralities of N which measure five liters} \]

(62) \[ \text{pjat' štuk/čelovek/golov N} \rightarrow \text{The set of pluralities of N which measure five natural units} \]

This analysis makes two predictions. One is that the classifiers will require predicates whose referents naturally come in distinguishable units. I.e. they should occur not only with plural count nouns but also with mass nouns denoting naturally atomic entities. Second is that constructions using these classifiers will have properties of measure predicates and not of count plural predicates. In the following two subsections we will see that both predications are borne out.

5.2.1. štuka, čelovek and Golova take mass nouns as complements

Contra Sussex (1976) who assumes that štuka and čelovek always take count complements I show that these classifiers do occur with mass nouns (63)-(65).

(63) \[ \text{5-6 *(štuk)item} \rightarrow \text{5-6 dried apricots} \]
(64) a. 5-6 *štukitem pečenja/kartofelja
   5-6 item biscuitGEN MASS / potatoGEN MASS
   ‘5-6 biscuits/ spuds’

b. za god v mire proizvoditija okolo trex milliardov
   in year in world produced about three billion
   štuk pečenja’s predskazanijami
   item’sGEN PL biscuitGEN MASS SG with predictions
   ‘About three billion fortune cookies are made every year.’

[http://www.orientalica.com/kitayskoe-pechene-s-predskaziyami-retsepty-i-istoriya]

(65) na peryx dvux po 10 čelovek narodu
   on first two DIS 10 personGEN PL crowd/peopleGEN SG MASS
   ‘on the first two (ships) there were ten people on each’

[‘Poezdki po Severu Rossii v 1885-1886 godax’, Sluchevskij, K.,
  Google books]

Golova classifier is also used with mass nouns (66).

(66) 20 golov krupnogo rogatogo skota
   20 headGEN PL big horned livestockGEN SG MASS
   ‘twenty head of cattle’

Crucially, as predicted štuka and čelovek occur only with naturally atomic
mass nouns as in the above examples and they are not compatible with
mass nouns denoting stuff such as water, see (67).

(67) *pjet’ štuk vody
    five itemGEN PL waterGEN SG MASS

The conclusion is then that štuka, čelovek and golova require comple-
ments which make reference to entities which are associated with clearly
distinguishable objects/units. This is exactly what we would expect if
štuka, čelovek and golova were referring to natural units of P.

5.2.2. Constructions with Štuka, Čelovek and Golova have Properties of
Measure Expressions

Now I will show that the properties of constructions with štuka, čelovek
and golova are characteristic of measuring expressions and not of count-
ing expressions.

i. Štuka, čelovek and golova are preferred in measure contexts and less
   natural in counting contexts

Numeral constructions with and without štuka, čelovek and golova
cannot always be used interchangeably with each other. These classifiers
occur naturally in measure contexts making reference to the quantity
properties of a collection of individuals, but are often degraded in count
contexts in which the identification or identity of the individual atomic
parts of the group must be salient.

For example, two cows may be referred to either as dve korovy ‘two
cows’ or as dve golovy skota ‘two head of livestock’. Dve korovy is felici-
tous in both, a count context in (68a) where we refer to two individual
cows lying by the river and a measure context in (68b) where we refer
to an overall quantity of livestock owned by a household. Dve golovy
skota on the other hand is felicitous only in the measure context (69).

(68) a. dve korovy ležali na beregu reki
   two cowP AUC=GEN SG lay on bank river
   ‘Two cows lay on the bank river.’

b. na každyj dvor prixdilos’ po dve korovy
   on each yard come DIS two cowP AUC=GEN SG
   ‘Each household owned two cows.’

(69) a. na každyj dvor prixdilos’ po dve golovy
   on each yard come DIS two headP AUC=GEN SG
   skota livestockGEN Mass
   ‘Each household owned two head of livestock.’

b. ???dve golovy skota ležali na
   two headP AUC=GEN SG livestockGEN MASS lay on
   beregu reki
   bank river

Conversely, pjet’ golov svinej ‘five head of pigs’ is very natural when
used to describe the capacity of the factory (70a) whereas the variant
without a classifier is infelicitous in the same context (70b).

www.thebalticyearbook.org
ii. Approximative inversion constructions

It has been argued independently that some apparently count constructions on approximative interpretation involve measuring and not counting (e.g. Li & Rothstein 2012 for Mandarin). Khrizman & Rothstein (2015) have shown that Russian inverted constructions with an approximative interpretation as in (71), including those which look like genuine count expressions (71b), denote measure predicates.

(71) a. litrov pjat’ moloka
liter five milk
‘about five liters of milk’

b. knig pjat’
book five
‘about five books’

Thus following Khrizman & Rothstein (2015), while pjat’ knig is a genuine count expression, its inverted variant knig pjat’ involves measuring and not counting. Crucially, while štuka, čelovek and golova are acceptable but often sound redundant in non-inverted numeral constructions, they are very natural and clearly not redundant in inverted constructions (cf. Sussex 1976; Khrizman & Rothstein 2015; Matushansky 2015). In particular, many speakers think that, out of context, constructions such as in (72) are unnatural. The inverted variants in (73), however, are perfectly fine.

(72) a. pjat’ štuk jablok
five item egg
‘five eggs’

(73) a. štuk pjat’ jaic
item five egg
‘about five eggs’

b. celovek pjat’ stroitelej
person five builders
‘about five builders’

c. golov pjat’ korov
head five cow
‘about five cows’

Furthermore, Matushansky (2015) observes that inverted constructions are in fact more natural with classifiers than without them (74).

(74) [When the kidnapper rushed into the study, to his utter surprise he discovered that...]

a. bankira okružal o five bodyguard
‘The banker was surrounded by five bodyguards.’

b. #bankira okružal o five bodyguard
‘The banker was surrounded by approximately five bodyguards.’

c. bankira okružal o čelovek pjat’ oxrannikov
banker surrounded people five bodyguard
‘The banker was surrounded by approximately five bodyguards.’

[Matushansky 2015:310]

Some additional examples with štuka and golova are in (75)-(76).

(75) a. ja kupila pjat’ jaic i desjat’ jablok
I bought five egg and ten apple

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‘I bought five eggs and ten eggs.’

b. #ja kupila jač pl jablok desjat
I bought eggGEN PL five and appleGEN PL ten
‘I bought about five eggs and about ten eggs.’

c. ja kupila štuk pl jač i štuk desjat
I bought itemGEN PL five eggGEN PL and itemGEN PL ten
jablok appleGEN PL
‘I bought about five eggs and about ten eggs.’

(76) a. fermer priobrel korov i desjat’ovc
farmer purchased five cowGEN PL and ten sheepGEN PL
‘A/The farmer purchased five cows and ten sheep.’

b. ??fermer priobrel korov pl jač i desjat’ovc
farmer purchased cowGEN PL five and sheepGEN PL ten
‘A/The farmer purchased about five cows and about ten sheep.’

c. fermer priobrel golov pl korov i
farmer purchased headGEN PL five cowGEN PL and
golov desjat’ovc headGEN PL ten sheepGEN PL
‘A/The farmer purchased about five cows and about ten sheep.’

So, štuka, čelovek and golova are natural and even obligatory in approximative inversion constructions. Given the independently made claim that all inverted expressions are measure predicates, this distributional pattern is further evidence that štuka, čelovek and golova are used as units of measure.

iii. Decrease in animacy

Russian distinguishes between inanimate and inanimate forms of plau-cal numerals in accusative NPs (77) (cf. Vinogradov 1960).

(77) a. ja vižu tri stola
I see threeACC INANIM tablePAUC
‘I see three tables.’

b. ja vižu trex mal’čikov
I see threeACC ANIM boyGEN PL
‘I see three boys.’

Measure contexts have been noticed to trigger decrease in animacy. This is witnessed by the observation that in measuring expressions numerals decline as inanimate even if used with animate nouns (78) (Mel’čuk 1980; Matushansky & Ruys 2015a,b).

(78) siloj rovno tri medvedja strength exactly threeNOM =ACC INANIM bearPAUC ‘as strong as exactly three bears’

Matushansky & Ruys (2015a) show that when čelovek is used as a classifier it behaves as a measure expression, i.e. shows lack of animacy (79).

(79) nanjali čtyrex čeloveka/ čtyrex čeloveka/ čeloveka/ čeloveka/ čeloveka/ čeloveka/ čeloveka/ čeloveka/
*hired fourNOM=ACC INANIM personPAUC / fourGEN=ACC ANIM personPAUC / personPL / scientistPL
‘They hired four scientists.’

iv. Numerals cannot be Dropped

In section 3 we saw that in construction with štuka, čelovek and golova numerals cannot be dropped (80), as opposed to count classifier constructions with nominal classifiers such as butylka ‘bottle’ or kusok ‘piece’ (81).

(80) a. *on kupil štuk/i jaič
he bought itemGEN PL/ACC PL eggGEN PL
‘He bought some eggs.’

b. *ja vstretila čelovek stroitelej
I met personGEN PL builderGEN PL
‘I met a few builders.’
c. "na pole paslis’ golovy ovec on field grazed headNOM PL sheepGEN PL
Sheep grazed in the field."

(81) a. na polkax ležalilay butylkibottleNOM PL wineGEN SG
‘There were some bottles of wine on the shelves.’

b. mama predložila kotu kusok ACC SG meatGEN SG but he
refused him to eat
‘My mother offered our cat a piece of meat, but he refused to eat it.’

If constructions with optional classifiers are measure expressions, this is not surprising because in numeral NPs with explicit measure words such as meter, it is also very difficult to drop a numeral (82) (Mel’čuk 1985).¹⁴

(82) ??on kupil metry sitca he bought meterGEN PL calicoGEN MASS
‘He bought a few meters of calico.’

Furthermore, the syntactic dependency on numerals has been shown to characterize measuring expressions in other languages as well. For example, Zhang (2011); Li & Rothstein (2012) show that in Chinese a numeral can be omitted on the individuating interpretation and cannot on the measure reading (83).

(83) a. wo mai le (yi) ben shu (individuating use)
I buy PRF one Clvolume book
‘I bought a book.’

b. wo mai le ‘yi) gongjin pingguo (measure use)
I buy PRF one Clkilo apple
‘I bought a kilo of apples.’

Thus the syntactic dependency on a numeral observed in constructions with optional classifiers also suggests that the latter are measure constructions.

v. Reduced individuation

Finally, constructions with štuka, čelovek and golova show decrease in individuation as compared to genuine count constructions. Firstly, singular agreement is often preferred in such constructions (84)- (85).

(84) a. v étom godu bylo proizvedeno/bylie prozvedeny in this year wasSG produced/werePL produced
pjat’ graždanskyx samoletov fiveGEN PL civil planeGEN PL
‘Five civil planes have been produced this year.’

b. v étom godu bylo proizvedeno/#byli prozvedeny in this year wasSG produced/werePL produced
pjat’štuk graždanskyx samoletov five itemGEN PL civil planeGEN PL
‘Five civil planes have been produced this year.’

(85) a. v ofise rabotali/rabalo /cetere sekretarja in office workedPRF/workedSG four secretaryPL=GEN SG
Four secretaries worked in the office.’

b. v ofise rabotalo/??rabotali /četere čeloveka in office workedSG/workedPL four personPL=GEN SG sekretarej secretaryGEN PL
‘Four secretaries worked in the office.’

c. v časti služilo/ služili 20 čelovek in part servedSG/servedPL 20 personGEN PL
‘20 people served in the military department’

d. v časti služilo/??služili 20 čelovek in part servedSG/servedPL 20 personGEN PL
narodu peopleGEN MASS
‘20 people served in the military department’

With golova the contrast is less salient. Nonetheless, some speakers tend to prefer singular agreement (86).

(86) a. pogiblo/? pogibli 20 golov skota
diedSG / diedPL 20 headGEN PL livestockGEN MASS
‘Four head of livestock died.’
b. na zavode bylo/??byli pererabotany 200 golov
  on factory was/ were processed 200 head
  skota/ korov
  livestock / cows
  ‘The factory processed 200 head of livestock/cows.’

Secondly, speakers report that štuka, čelovek and golova are degraded in distributive contexts such as reciprocal constructions (87)-(89).

(87) a. pjat’ (??štuk) graždanskyx samoletov leteli drug za
  five item civil plane flew on after
  other
  ‘Five civil planes were flying one after the other.’

b. #pjat’ štuk kuragi sliplis’ drug s
  five item dried apricot stuck one with
  other
  Intended: ‘Five dried apricots stuck one to the other.’

(88) pjat’ (#čelovek) studentov spisali drug u druga
  five person student copied one from other
  otvety
  answers
  ‘Five students copied the answers one from the other.’

(89) a. pjat’ (?? golov) korov ležali drug naprotiv druga
  five head cow lay one in front other
  ‘Five cows lay one in front of the other.’

b. pjat’ (?? golov) korov prižališ’ drug k drugu
  five head cow cuddled up one to other
  ‘Five cows cuddled up one to another.’

I admit that the decrease in individuation in such constructions is not as strong as in explicit measure constructions with abstract units of measure such as liter. Some of my informants accepted some occurrences of štuka, čelovek and golova with reciprocals, see for example (90).

(90) a. ?pjat’ štuk knig ležali drug na drug
  five item book lay one on other
  ‘Five books were piled on top of the other.’

b. ?pjat’ čelovek stroitelj pomogali drugu drugu
  five person builder help one other
  gruzit’ kirpič
  load brick
  ‘Five builders were helping each other to load bricks.’

This is not totally surprising. In such constructions mass predicates are measured in discrete units which correspond to individual entities and not in abstract units. Therefore such constructions could allow for an interpretation under which the units of measure become antecedents of individuators. In any case, speakers for whom such examples are acceptable still agree that such constructions are not natural. Furthermore, some of my informants stated explicitly that the use of a classifier implies the expression makes reference to a number of objects as a single quantity and that constructions in (90) become worse in distributive contexts like (91) where such an interpretation cannot be derived by any means. This after all supports the hypothesis that these are measure predicates.

(91) pjat’ štuk knig ležali ?? v raznyx
  five item book lay in different room
  komnata
  ‘Five books were placed in different rooms.’

vi. Mass complements are rare

As mentioned štuka, čelovek and golova optionally occur with count nouns but in some cases they are used with naturally atomic mass complements. Count nouns do not require a classifier to be counted. Naturally atomic mass nouns, even though they make reference to entities which come in individuated units grammatically, cannot be counted directly and do require a classifier. If štuka and čelovek were count/individuating classifiers we would predict them to be more frequent and more natural with naturally atomic mass nouns than with
count nouns. However, exactly the opposite is true. The use of štuka is possible but highly restricted with mass nouns. Not every naturally atomic mass noun is a felicitous complement (92).

(92) # pjat štuk risa
five itemGEN PL riceGEN SG MASS

Furthermore, štuka is not felicitous even with classical examples of naturally atomic mass nouns such as furniture and footwear. I encountered a few examples on the Internet (93), but none of my informants (including myself) could confirm that such constructions are felicitous. If štuka is an individuating unit classifier, this is very surprising.

(93) a. ??neskol’ko štuk brendovoj obuvi
several itemGEN PL brand footwearGEN SG MASS
‘a few items of designer footwear’
b. ??5 štuk mebeli
5 itemGEN PL furnitureGEN SG MASS
‘five items of furniture’

These observations also strongly suggest that these items are not counting classifiers used to create grammatically count predicates from naturally atomic mass predicates and that constructions using them do not involve grammatical counting.

vii. Štuka occurs with genuine individuating unit classifiers.

In Russian there is a class of (nominal) individuating unit classifiers which occur with naturally atomic nouns such as kartofel ‘potato’, malina ‘raspberry’ etc. (94) (Isačenko 1960).

(94) a. pjat’ *(klubnej) kartofelja
five tuberGEN PL potatoGEN MASS
‘five potato tubers’
b. pjat’ *(jagod) maliny
five berryGEN PL raspberryGEN MASS
‘five raspberries’

Crucially, we encountered some occurrences of štuka in such constructions (95).

(95) skol’ko štuk klubnej kartofelja nadopriobresti…?
how many itemGEN PL tuberGEN PL potatoGEN MASS
‘How many potato tubers are required…?’

If štuka were an individuating unit classifier whose function is to map mass predicates onto count it would be infelicitous in (95) where this function is fulfilled by an explicit individuator ‘tuber’.

To conclude, the arguments presented in the previous two subsections give a good reason to treat expressions with štuka, čelovek and golova as measure expressions in which the classifiers introduce a unit of measure. In the following section we offer the compositional interpretation.

5.3. Compositional Interpretation

I propose that štuka, čelovek and golova are measure words which measure sums of entities in terms of natural units. I model the interpretation of these classifiers on measure expressions such as litr ‘liter’ in Rothstein’s (2009; in press) and Partee and Borschev’s (2012) framework.

A. Syntax

I assume that constructions with štuka, čelovek and golova have the syntax of measure expressions such as pjat’ litrov moloka ‘five liters of milk’ (96). The classifier first combines with the numeral to form a morphological plural or mass noun.15
Štuka, čelovek and golov denote functions at type $<n,<e,t>>$ from numbers to predicates denoting the sets of sums of objects which measure $n$ number of natural units on the cardinality scale. The full compositional derivation of constructions with štuka, čelovek and golov are presented in (100)-(102). For example, $pjat' štuk jaic ‘five eggs’$ is interpreted as follows in (100). $Štuk$ combines with the numeral $pjat'$ to produce a measure predicate denoting the set of sums of objects which measure 5 natural units. $Štuk$ introduces a presupposition that the measured $N$ must be inanimate. When $pjat' štuk$ combines with a noun $jaic$ the presupposition is satisfied. The derived predicate then denotes the set of quantities of eggs which measure 5 natural units. Expressions with čelovek and golovu are interpreted analogously but involve different presuppositions (101)-(102).17

(100) $pjat' štuk jaic ‘five eggs’$

$$\parallel pjat' štuk jaic \parallel = \lambda x. \text{MEAS}(x) = <5, \text{NATURAL UNIT}>$$

Presupposition: $x \in \{x: x \text{ is inanimate}\}$

$$\parallel pjat' štuk \parallel = \lambda x. \text{MEAS}(x) = <5, \text{NATURAL UNIT}>$$

Presupposition: $x \in \{x: x \text{ is inanimate}\}$

$$\parallel jaic \parallel = \lambda x. \text{EGG}(x)$$

$$\parallel pjat' štuk jaic \parallel = \lambda x. \text{EGG}(x) \land \text{MEAS}(x) = <5, \text{NATURAL UNIT}>$$

Paraphrase: The set of pluralities of eggs whose measure value is 5 on the cardinality scale calibrated in natural units

(101) $pjat' čelovek stroitelej ‘five builders’$

$$\parallel five \parallel = 5$$

$$\parallel čelovek \parallel = \lambda x. \text{MEAS}(x) = <n, \text{NATURAL UNIT}>$$

Presupposition: $x \in \{x: x \text{ is human}\}$

$$\parallel pjat' čelovek \parallel = \lambda x. \text{MEAS}(x) = <5, \text{NATURAL UNIT}>$$

Presupposition: $x \in \{x: x \text{ is human}\}$

$$\parallel stroitelej \parallel = \lambda x. \text{BUILDER}(x)$$

$$\parallel pjat' čelovek stroitelej \parallel = \lambda x. \text{BUILDER}(x) \land \text{MEAS}(x) = <5, \text{NATURAL UNIT}>$$

Paraphrase: The set of pluralities of builders whose measure value is 5 on the cardinality scale calibrated in natural units

B. Semantics

Štuka, čelovek and golov, analogously to measure words such as litr, are functions at type $<n,<e,t>>$ from numbers to measure predicates denoting sets of sums of entities which measure $n$ number of units on a dimensional scale, $λnλx. \text{MEAS}_{\text{DIMENSION}}(x) = <n, \text{UNIT}>$ (Landman 2004; Rothstein 2009, 2011, in press; Partee & Borschev 2012). A scale is defined as a triple in (97).

(97) A scale is a triple $<D, U, N>$:

- $D$ is a dimension (volume, weight etc)
- $U$ is the unit in terms of which the scale is calibrated (liters, kilos etc.)
- $N$ is a set of numbers (the natural numbers, the real numbers etc)

Litri example is associated with a volume scale calibrated in liter units (98).

(98) Scale: $<\text{VOL,LITER, N}>$

$$\parallel \text{litri} \parallel = \lambda nλx. \text{MEAS}_{\text{VOLUME}}(x) = <n, \text{LITER UNIT}>$$

I follow Rothstein (in press) in assuming that measuring pluralities in terms of natural/object units involve cardinal scales with an arbitrary dimension (99).16

(99) $S= <⊥, \text{NU}, N> :$

- The dimension is arbitrary.
- Calibration is in terms of Natural Units (NU)
6. CONCLUSION

The paper explored a subclass of optional classifiers štuka, čelovek and golova. We saw that these classifiers are different from nominal classifiers such as kusok ‘piece’ or butylka ‘bottle’. They form a closed set of functional expressions and, prima facie, look very much like counting unit (sortal) classifiers in Mandarin. I showed that apparently count constructions using these classifiers in fact have properties of measure predicates. Given that, I argued that štuka, čelovek and golova are not individuating operators but are measure words which measure predicates in terms of natural units.

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Notes

1This paper is based on chapter 5 of my dissertation “Numerous Issues in the Semantics of Numeral Constructions in Russian” submitted to Bar Ilan University in October 2016.
2Although Rothstein (in press) suggests that in English head in five head of cattle is possibly a sortal classifier
3Rothstein (2010, in press) argues that atomicity is encoded in the grammatical structure of count nouns. On her account mass nouns are interpreted as type <e,t> and denote plural individuals with partially specified atoms whereas count nouns are interpreted at type <e,k,t> and denote sets of individuals which count as atoms in a given context.
4This view is adopted in Li’s (2013) and Li & Rothstein’s (2012) analyses of counting expressions in Mandarin. In this paper, however, I use simplified representations in which both mass and count predicates are interpreted at type <e,t>.

(i) Krifka (1995) assumes that complements in measure constructions denote kinds and analyzes measure classifiers at type <k,n,<e,t>>. We saw that štuka, čelovek and golova take predicates and not kind-denoting complements. I thus followed Landman (2004); Rothstein (2009) and Partee & Borschev (2012) in assuming that measure words denote functions from number to predicates, i.e. <n,<e,t>>. Such an analysis is also different from Krifka’s (1989) proposal in which measure words are inherently heads of modifiers at type <n,<<e,t>,<e,t>>.

(ii) Krifka (1989, 1995) does not distinguish counting and measuring. In his analysis measuring in terms of natural units is in fact counting. We saw that in Russian counting and measuring are different operations. I argued that measuring in terms of natural units/cardinalities indeed occurs in pjat’ golov korov but not in pjat’ korov which involves genuine counting of atoms. Crucially, measuring in terms of cardinalities is still different from counting. Counting involves accessing the internal structure of atomic pluralities and identifying how many atoms each sum has. This requires individuating the denotation in terms of atoms. Measuring in terms of cardinality involves assigning a value to an overall quantity of naturally atomic objects without necessarily individuating the atoms.

In the proposed analysis štuka, čelovek and golova instantiate an operation similar to that proposed in Krifka (1989, 1995). However, the presented account differs from Krifka’s proposal in two respects:

\[ \text{Paraphrase: The set of pluralities of cows whose measure value is 5 on the cardinality scale calibrated in natural units} \]

\[ \text{We saw that these classifiers are different from nominal classifiers such as kusok ‘piece’ or butylka ‘bottle’. They form a closed set of functional expressions and, prima facie, look very much like counting unit (sortal) classifiers in Mandarin. I showed that apparently count constructions using these classifiers in fact have properties of measure predicates. Given that, I argued that štuka, čelovek and golova are not individuating operators but are measure words which measure predicates in terms of natural units.} \]

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\[ ^4\text{This is a simplified representation. As mentioned, in Rothstein’s (2010; in press) framework mass and count predicates are interpreted at different types, <e,t> and <e,k,t>;} \]

\[ \text{Vol. 11: Number: Cognitive, Semantic and Crosslinguistic Approaches} \]
In colloquial speech štuka can be used with animate nouns (e.g. p'jt štuk gus'j 'five geese').

When a nominal čelovek is modified by a numeral or appears in the scope of neskol’ko 'several' it can have either form p'jt čelovek/fiudej, neskol’ko čelovek/neskol’ko fiudej 'five/ several people'. There may be a certain difference in meaning though.

Not all adjectives are equally acceptable as modifiers of classifiers.

Also, one of the reviewers suggested that the fact that piece in (36b) takes a diminutive suffix is potentially further evidence that this classifier is nominal. Prima facie this is correct, since we would not expect diminutives to apply to functional expressions. However I encountered some examples in which diminutives appear on štuka classifier (e.g. otdam za p'jt štuka DIM šokoladnyja jaic 'will exchange for five chocolate eggs' [https://m.ok.ru/group52102142165168/topic/65643119064496]). I will not elaborate on this issue here since the semantics of diminutives in Russian is a very complex topic going far beyond the scope of this paper (see Khrizman (work in progress)).

Yadroff offers a syntactic analysis in which he argues that štuki and čelovek express [+count] feature merged in the functional Meas P projection of nouns. In the absence of these classifiers the category stays phonologically empty.


³²Meaning the set of individuals such that they belong to the kind k.

³³An alternative proposal would be that these constructions involve measuring of count plural denotations (grammatically atomic pluralities). Working out the details of this proposal is beyond the scope of this paper.

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