Portions and countability: a crosslinguistic investigation

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We examine three constructions in various languages in which a mass noun is embedded in what appears to be a count environment (involving measures, classifier-like elements, and/or pluralisation), but the construction as a whole remains uncountable.

(1) *'Q-nouns' (Klockmann 2017)*
John spilled $\left\{\begin{array}{c} \text{*three} \\ \text{*several} \\ \text{*many} \end{array}\right\}$ $\left\{\begin{array}{c} \text{lots} \\ \text{loads} \\ \text{heaps} \end{array}\right\}$ of water.

(2) *Bare measures*
Jan heeft (*drie) liters water gemorst.
John has (*three) liters water spilled
'John has spilled liters of water'. (Dutch)

John spilled $\left\{\begin{array}{c} \text{*three} \\ \text{*several} \\ \text{*many} \end{array}\right\}$ liters and liters of water.

(3) *Pluralised mass nouns* (e.g. Tsoulas 2009, Alexiadou 2011, Kane et al 2015 for Greek; also in Yup'ik (Corbett & Mithun (1996), Ojibwe (Mathieu 2012), Innuttut (Gillon 2012), Old High German (Carr 1936), Blackfoot (Wiltschko 2012), Nez Perce (Deal 2013), Evenki (Nedjalkov 1997), Persian (Sharifian & Lotfi 2003), Indonesian (Dalrymple & Mofu 2012)
Trexoun nera apo to tavani
drip-3-PL water*s*-PL-NEUT-NOM from the ceiling-NEUT-SG
'Waters are dripping from the ceiling.' (i.e., 'a lot of water is dripping from the ceiling') (Greek)

In addition to their unexpected mass-ness, these constructions have several properties in common.
1. The expressions they involve generally function as genuine measure words or classifiers in different contexts. Measure words like *liter* typically appear in measure constructions like *three/several liters of water*, in which they serve to make the reference of a mass noun countable. Similarly, most Q-nouns are either synchronically or diachronically related to a countable noun expressing a certain unit or quantity. And in many languages that allow pluralisation of mass nouns, the construction has an (additional) countable interpretation meaning 'pieces or portions of X' (e.g. Innu-Aimun and Evenki (Nedjalkov 1997)).

(4) a. There's only two reams of printing paper left in the supply closet.
b. We need to analyse (*multiple) reams of data before we can draw any conclusions.

(5) pimî   pimî.a   (Innu-Aimun; from Gillon 2010)
'oil'   oil.INAN-PL 'amounts of oil' *or* 'lots of oil'

The difference between (1-3) and their countable counterparts cannot be explained in terms of vagueness or a figurative use of measure words (e.g. *heap* ∼ 'unspecified large amount'), as vague quantities are not uncountable (*Drink three unspecified large amounts of water a day* is fine, albeit not particularly instructive).
2. These constructions involve different syntactic configurations from their countable counterparts. First, as Klockmann (2017) notes, in many Q-noun constructions the number of the DP as a whole is not inherited from the Q-noun but from the embedded noun (*Lots of water was/*were dripping from the ceiling*); the opposite holds for classifier constructions (*Three lots of furniture *was/were ruined by water damage*). Second, the fact that bare measures are obligatorily marked plural in Dutch (2a) indicates that they do not occupy their usual position as head of a measure phrase, as this position is not number-marked in

Dutch (*drie liter(*s) water* 'three liter(*s) of water') (Doetjes 1997, Rothstein 2011, Khrizman et al. 2015). Third, the possibility of coordinating Q-nouns and bare measures (as in (2b)) suggests that they are not heads but phrases, i.e. specifiers or modifiers.
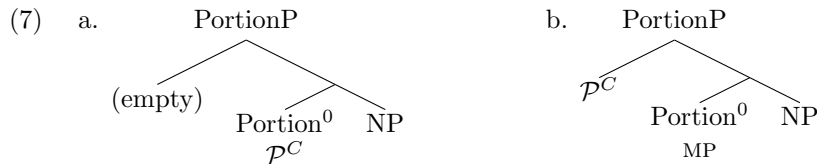
3. All three constructions are associated with an inference of abundance or large quantity. This inference arises only with the mass constructions (e.g. (1-3)), not with their countable counterparts. In addition, some contexts allow the abundance inference to be 'reversed' to indicate a strikingly *small* quantity: *The car came to a halt feet away from the cliff edge.* It follows that this inference cannot be reduced to either the lexical meaning of the expressions involved or a multiplicity inference carried by plural morphology.

Analysis: Working in a disjointness-based approach to the mass/count distinction (Rothstein 2011, Landman 2011, Khrizman et al. 2015, Landman 2016), we propose to analyse the constructions in (1-3), as well as their countable counterparts, in terms of portioning-out of mass denotations. All portioning-out constructions involve some portion operator that applies to a mass denotation (a set of sums which is closed under sum) and returns a subset of it (a set of non-overlapping sums). In the case of bare measures, this involves a shift of the measure word into a portion operator (as in Rothstein 2011 and Khrizman et al. 2015). In the case of pluralised mass nouns, the portion operator is covert.

(6) A portioning-out operator $\mathcal{P}^C$ is a function of type $\langle et, et \rangle$ such that:
$\mathcal{P}^C(X) := \{y \in X | y$ meets individuation criterion $C\}$

Here, the individuation criterion can be anything from shape to size to spatial separation from other sums or a combination of such factors, depending on the lexical content of the portion expression. We assume that the individuation criterion guarantees disjointness and hence countability. (So far, our analysis is similar to the one in Khrizman et al. 2015 except for the fact that, for various conceptual and empirical reasons, we do not assume that portioning-out is intersective.) Countable portioned-out NPs, then, are derived by directly applying the portion operator to a mass complement, as in (7a). Mass portioning-out (the cases in (1-3) involves an additional covert operator MP that mediates between the portion operator and the mass noun, as in (7b), in order to derive an NP whose denotation is overlapping and hence non-countable.

(7) a.   PortionP
            /   \
     (empty)   /   \
              Portion^0 NP
              $\mathcal{P}^C$

     b.   PortionP
            /   \
     $\mathcal{P}^C$ /   \
              Portion^0 NP
                  MP

(8) $\text{MP}(Q)(P) := \{x | x \in Q \wedge \exists y [y \in P(Q) \wedge x \sqsubseteq y]\}$ with Q a set of sums and P a portion operator.

In words, the result of applying MP to a mass predicate Q and a portioning-out operation P is the set of all sums that are both Q and a Boolean part of some member of the portioned-out predicate $P(Q)$. Suppose that $\textbf{water} = \{a \oplus b \oplus c, a \oplus b, a \oplus c, b \oplus c, a, b, c, ...\}$ and $\mathcal{P}^C(\textbf{water}) = \{a \oplus b, c\}$. Then, the denotation of $\text{MP}(\textbf{water})(\mathcal{P}^C)$ is the set $\{a \oplus b, a, b, c, ...\}$. In this set, the portioned-out structure is preserved in the form of partial disjointness: the set does not contain any sums $x \oplus y$ such that x is part of one portion, and y part of another. However, the set as a whole overlaps and is mass; its meaning can be paraphrased as 'water that is part of a C-individuated quantity'.

The abundance inference as an informativeness-based Quantity implicature: The above analysis does not derive the 'large quantity' interpretation shared by all forms of mass portioning-out. We will show evidence that mass portioned-out predicates involve a total order $\leq$ on portion size, similar to quality nouns like *courage* and *wisdom* (Tovena 2001, Francez & Koontz-Garboden 2017). For example, in both (9a) and (9c) the exclamative targets the quantity of the courage/heaps of gear, in contrast to (9b), in which a quantity-related interpretation is unavailable.

(9) a. What courage she has!   b. What water I drank!
     c. And, what heaps of gear you can pack in this roof top carrier!
        http://www.autoanything.com/roof-racks/77A1400A6489405.aspx

We take the behaviour of mass portioned-out predicates in exclamative constructions (as well as several other environments that test for the presence of a size ordering) to indicate that their denotation is size-ordered. We model this by building a degree relation into the semantics of the operator MP: $\text{MP}(Q)(P) := \{x|... \wedge \exists d[\textbf{size}(d)(x)]\}$. The size scale imposes a trivial condition on the members of the portioned-out predicate, namely, that they have some size. Following Rett's (2015) analysis of the positive form of gradable adjectives (*Mary is tall*), we assume that such triviality triggers pragmatic strengthening of the predicate: the hearer infers that the size of the quantity in question falls on the informative higher end of the scale.

Selected references. Francez, I. & Koontz-Garboden, A. (2017). *Semantics and morphosyntactic variation: Qualities and the meaning of property concepts.*. OUP. | Khrizman, K. et al (2015). Portion readings are count readings, not measure readings. *Proceedings of the 20th Amsterdam Colloquium.* | Klockmann, H. (2017). *The design of semi-lexicality.* Utrecht: LOT publications. | Landman, F. (2011). Count nouns - mass nouns - neat nouns - mess nouns. *Baltic international yearbook of cognition, logic and communication*, vol. 6. Manhattan (KS): New Prairie Press. | Rett, J. (2015). *The semantics of evaluativity.* OUP. | Rothstein, S. (2011). Counting, measuring and the semantics of classifiers. *Baltic Yearbook.* | Tsoulas, G. (2009). On the grammar of number and mass terms in Greek. *Proceedings of the 2007 workshop in Greek syntax and semantics at MIT.*