# Single: Exhaustivity, scalarity, and nonlocal adjectives

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## 1. Introduction

Superficially, English *single* seems close to being a numeral, essentially a variant of *one*. But its syntax and semantics turn out to be considerably more nuanced than that. In this paper we argue that in its primary sense, *single* contributes an exhaustivity presupposition that in some contexts yields an 'only one' interpretation and in others an 'even one' interpretation. Additionally, like (controversially) numerals and unlike *even* and *only*, it is an adjective—but an unusual one, a nonlocal adjective in the sense of Schwarz (2006, 2020) and Morzycki (2016b, 2020) that scopes outside the nominal that contains it.

As we'll see, *single* is interesting because it sits at a crossroads of many other areas of semantics—quantification, the grammar of adjectives, plurality, counting, degrees, scalar phenomena, distributivity (perhaps), particles such as *even* and *only*—and yet appears to have so far largely escaped scrutiny. Moreover, it has a rich array of lexical cousins in English (e.g. *sole*, *individual*, *lone*, *singular*, *double*, *multiple*, *threefold*) and across languages, which despite similarity in semantic domain, each appear to invoke their own constellation of peculiar semantic properties.

The first step in the project is to distinguish between two distinct uses of *single*, each with a different syntax and semantics. Our primary focus in this paper will be the first of these uses, which we'll call the BASIC READING:

(1) Here's a single cold cappuccino. *(basic reading)*
'Here's only one cold cappuccino.'

This reading is roughly paraphrasable as 'exactly one'. It is the only reading possible when *single* occurs high in the nominal (i.e., preceding other adjectives), as it does in (1). When it occurs lower—in (2), below *cold*—*single* gets another reading, which we'll call the 'NOT DOUBLE' READING:

(2) Here's a cold single cappuccino. *(not-double reading)*
'Here's a cold cappuccino with one shot of espresso in it.'

On this reading *single* gives rise to an entailment of having only one principal constitutive part. In the case of espresso drinks, this is one shot of espresso, but of course this varies according to the modified NP.[1]

One piece of evidence that these are, in fact, distinct readings available in distinct structural positions is the fact that they can co-occur:

(3) Here's a single single cappuccino.
'Here's only one cappuccino with one shot of espresso in it.'

There is no sense of redundancy about (3), and one has straightforward intuitions about which of these instances of *single* contributes which meaning.

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[1] There is also a reading of *single* that means roughly 'romantically unattached', which we will set aside here because it is relatively ordinary.

Neither reading of *single* is compatible with predicative uses:

(4) #That cappuccino is single.

This is somewhat surprising, inasmuch as the not-double reading can be expressed with a nominal in predicative position: *That cappuccino is a single*.

Our main concern here will be to characterize the basic reading. In section 2, we characterize more carefully the interpretation of basic *single*. In section 3, we take the first step toward an analysis by arguing that *single* is part of a family of nonlocal adjectives. In section 4, we argue that the basic reading involves an *even*-like presupposition. Section 5 offers some remarks on the not-double reading. Section 6 concludes.

## 2. Basic facts about basic single

### *2.1. 'Single' entails 'exactly one'*

Numerals are conventionally understood to contribute an at-least entailment (see Bylinina & Nouwen 2020 for overview), which at-most readings driven by scalar implicature—that is, *one book* entails that there is at least one individual that satisfies the descriptive content of the NP. Being an implicature, the at-most inference is cancelable:

(5) Q: Did John read one book this summer?
A: He read one book… In fact, he read two!
ENTAILS: There's at least one book that he read.
IMPLICATES: There's only one book he read.

When *single* is embedded in the same environments, however, the at-most component is no longer cancelable. Unlike numerals, *single* modified expressions appear to denote exactly one:

(6) Q: Did John read a single book this summer?
A: He read a single book… #In fact, he read two!
ENTAILS: There's only one book he read.

This exactly-one reading is the clearest and perhaps most consistent part of the denotation of *single*. In other contexts, however, the situation becomes more complicated.

### *2.2. 'Single' has a scalar reading in downward-entailing contexts*

In downward-entailing contexts, as in the question in (6), single has a scalar reading analogous to *even,* as in *even one book.* In (7) below, other scalar contexts show the same behavior: in (a) under negation, and in (b) in the scope of *rarely*. In these contexts, *single*—like scalar *even*—conveys approximately that not even the most likely alternative (or perhaps just truth-conditionally weakest one) is true:

(7) a. Howard didn't read a single book! … *Howard didn't read even one book.*
b. Howard rarely reads a single book. … *Howard rarely reads even one book.*

Under the scope of the quantifier *every*, *single* seems to have a similar intensifying effect to the readings given above, although perhaps it is not directly comparable to these examples–it's certainly harder to recover *even one book* from *every single book*, as in the example below. We will return to this particular example in section 4.

(8) Every single book in the shelf is Howard's.

### *2.3. Determiner selection and modification*

Another immediately apparent fact about the distribution of *single* is its pickiness about the determiners it combines with. While (8) showed that it is compatible with *every*, and the examples in (9) show

this extends to *no* and the indefinite singular *a*, most other quantifiers are either ungrammatical or at least odd (10).

(9) a. A single house was painted red …*all the others were green.*
b. No single house was painted red …*though parts of all of them were.*

(10) a. *All single houses were painted red.
b. ?Each single house was painted red.
c. *Most single houses were painted red.
d. *Many single houses were painted red.
e. *Some single houses were painted red.

The grammatical badness of these examples is distinct from the number of the noun in question. While *single* often combines with singular nouns, it is also compatible with plurals, given sufficient context (11). Instead, the incompatibility seems to be linked to some quality of the determiners themselves.

(11) Three single events were noted in my calendar.

*Single* also resists direct modification of the type numerals undergo, as well as coordination with adjectives which occur in similar high positions within a DP (12), however indefinite DPs containing *single* are *not* subject to this restriction (*Howard ate precisely a single egg.*)

(12) a. *Howard ate a(n) $\left\{\begin{matrix}\text{at least}\\ \text{at most}\\ \text{precisely}\end{matrix}\right\}$ single egg.
b. *Howard ate every single and $\left\{\begin{matrix}\text{occasional}\\ \text{average}\end{matrix}\right\}$ egg.

### *2.4. A last note: the 'single' family*

Before turning to the next section, it is worth noting again that English *single* is part of a family of expressions in the language which are used with meanings related to *one*, *exactly one*, or *at least one.* While no others display the same range of readings as *single* (most notably, the scalarity effects in downward-entailing contexts), they do constitute a semantic cluster of interest, which deserve future analysis.

(13) a. A single man stood on the beach.
b. A lone man stood on the beach.
c. An individual man stood on the beach

There are also interesting differences among *single*'s non-singleton counterparts, including *double*, *binary*, and *two-fold*.

## 3. Scope and nonlocality

### *3.1. Nonlocality and the 'at most' reading*

The 'at most' interpretation of *single* has an important consequence: to give *single* the compositional power needed to impose this reading, it needs to have access to information expressed outside the nominal in which it occurs. A concrete example will illustrate why this is so:

(14) Oscar read a single book.
$\exists x[\mathbf{read}(\mathbf{Oscar}, x) \wedge \mathbf{book}(x) \wedge |x| = 1]$ *(not actual denotation)*

A logical representation like the one in (14) could be constructed straightforwardly even if *single* were an ordinary, property-denoting adjective. Crucially, though, it expresses only an 'at least' reading, despite the requirement in the final conjunct that the cardinality of $x$ be exactly 1. That's because in a situation in

which Oscar in fact read two books, it will nevertheless be possible to find a book $x$ with a cardinality of exactly 1 that he read. (Indeed, it will be possible to find two such books.) To truly express the 'at most' reading, something more is required. One possibility would be to add wide-scope negation, denying that there is any book apart from $x$ that Oscar read. Another more standard move would be to introduce a maximality operator, so that the maximal number of books that Oscar read must be 1. On either approach, however, it would be necessary for *single* to be able to scope at the sentence level, because Oscar and reading must be included in the scope of negation or the maximality operator to reach the desired result.

### *3.2. Is 'single' like a modified numeral?*

Given that *single* means something close to *at most one*, a natural course might be to give it a similar analysis. There's a thriving cottage industry around modified numerals (Nouwen 2008, Schwarz et al. 2012, Nouwen 2010, Coppock & Brochhagen 2013, Buccola & Spector 2016, Kennedy 2015, Rett 2014 among others). We believe this isn't the right analytical road to go down for reasons articulated below, but it's worth sketching. On such an analysis, *exactly one* would denote a generalized quantifier over degrees, in line with a tradition in degree semantics of analyzing degree expressions this way (von Stechow 1984, Hackl 2000, Geurts & Nouwen 2007). To make use of this type, one might suppose that *exactly one* occurs underlyingly as the measure phrase associated with an implicit adjective MANY (Bresnan 1972, Hackl 2000; see Morzycki 2016a for extended discussion). In (15), for example, there are two instances of quantifier raising: the indefinite DP *exactly one sock* scopes out of its clause, and then the degree generalized quantifier scopes out from within the DP:

(15) Oscar ate exactly one sock.
[exactly one] $\lambda d$ [ [ $\exists$ [ $t_d$ MANY ] sock ] $\lambda x$ Oscar ate $t_x$ ]

a. $[\![ \text{MANY} ]\!] = \lambda d \lambda x \, . \, |x| \geq d$

b. $[\![ \exists \, [t_d \text{ MANY } ] \, sock ]\!] = \lambda P \, . \, \exists x[|x| \geq d \wedge \mathbf{sock}(x) \wedge P(x)]$

c. $[\![ \lambda x \, Oscar \, ate \, t_x ]\!] = \lambda x \, . \, \mathbf{ate}(\mathbf{Oscar}, x)$

d. $[\![ \exists \, [t_d \text{ MANY } ] \, sock \, \lambda x \, Oscar \, ate \, t_x ]\!] = \exists x[|x| \geq d \wedge \mathbf{sock}(x) \wedge \mathbf{ate}(\mathbf{Oscar}, x)]$

e. $[\![ exactly \, one ]\!] = \lambda D_{\langle d,t \rangle} \, . \, \mathbf{max}(D) = 1$

f. $[\![ [exactly \, one] \, \lambda d \, [ \, [ \, \exists \, [t_d \text{ MANY } ] \, sock \, ] \, \lambda x \, Oscar \, ate \, t_x \, ] ]\!]$
$= \mathbf{max}(\lambda d \, . \, \exists x[|x| \geq d \wedge \mathbf{sock}(x) \wedge \mathbf{ate}(\mathbf{Oscar}, x)]) = 1$

This sort of strategy builds the maximality operator directly into *exactly one*.

Might *single* just be another word for *exactly one*, then? Well, it's certainly true that this approach would provide a principled explanation of how *single* comes to have nonlocal scope: it would, on this analysis, simply denote a generalized quantifier. It would also knit *single* and modified numerals closely together, which has a certain elegance.

### *3.3. Nonlocal adjectives*

Such an approach would, however, fail to recognize another pattern. *Single* manifests the signature collection of properties that identify nonlocal adjectives—a class whose most salient property is that they are interpreted as though they were outside of the DP that contains them. The most well-known exponent of the class is *occasional*, which alongside its ordinary reading also has what's known as an 'adverbial' reading that can be paraphrased with 'occasionally' (Bolinger 1967, Stump 1981, Larson 1999, Zimmermann 2000, Schäfer 2007, Gehrke & McNally 2010, 2015):

(16) The occasional sailor strolled by.

a. ORDINARY READING: 'Someone who sails occasionally strolled by.'

b. ADVERBIAL READING: 'Occasionally, a sailor strolled by.'

It turns out, however, that the class of nonlocal adjectives extends far beyond just *occasional* to include a wide range of other adjectives, all of which have other properties in common apart from scope (Morzycki

2016b, 2020, Schwarz 2020). Among these are *wrong*, *average*, *whole*, *entire*, epistemic adjectives like *undisclosed* (Abusch & Rooth 1997), *same*, *different*, and perhaps *random*, *unlikely*, *unfortunate*. These share a number of apparently disparate characteristics (see Morzycki 2020 for full argumentation):

- They have two readings, an 'internal' in-situ one and an external wide-scope one.
- They are subject to idiosyncratic restrictions on their determiners on their external reading. *Occasional*, for example, only receives an external reading with *the*, *a*, and *your*.
- Often, determiners receive an interpretation that they ordinarily wouldn't. With *occasional*, *the* and *a* both receive an indefinite interpretation.
- On their external reading, they aren't possible in predicative position.
- They occupy a position high in the DP, adjacent to the determiner, on their external reading and a lower one on their internal reading.
- On their external reading, they are unable to coordinate with ordinary adjectives.
- They don't admit degree modification on their external reading.

*Single* has all of these properties. Its basic reading is the external one, but it also has the internal not-double reading. On the basic/external reading, it is incompatible with coordination, degree modification, and predicative position, and it occurs higher than it does on the internal/not-double reading. These are all precisely the properties we have already noted above. None of them follow—at least in any straightforward way—from a modified-numeral-style analysis.

### *3.4. Nonlocal adjectives via incorporation*

Perhaps the best established analysis *occasional* is to assume that the adjective incorporates into the determiner through a process called 'complex quantifier formation' (Larson 1999, Zimmermann 2000; see Gehrke & McNally 2015 and Morzycki 2020 for different alternatives):

(17) $[_{DP}\ [_{D}$ an occasional $]\ [_{AP}\ t_1\ ]$ sailor ] strolled by

For brevity and convenience, we will adopt this as a general approach to nonlocality. Only certain lexically specified determiners license this process, which explains the idiosyncratic restrictions on determiners. The complex determiner that results has its own lexically assigned interpretation, which explains the idiosyncratic interpretations of determiners with nonlocal adjectives. This analysis also provides an essentially syntactic explanation of the resistance to coordination, degree modification, and predicative positions, as well as of the requirement to be structurally close to the determiner: all of these fail to provide the structure required for incorporation.

The facts around basic *single* accord with this picture. The incorporation analysis explains the nonlocal scope because the complex determiner that results from incorporation of *single* can have a type $\langle et, ett\rangle$ denotation like ordinary quantificational determiners. The other crucial properties follow as well, for exactly the same reasons. Of course, this provides only the structural underpinnings for an analysis. The next step is articulating a denotation.

## 4. The exactly interpretation and the exhaustivity presupposition

### *4.1. Burmese*

What remains for our analysis is to account for the 'exactly one' reading in non-downward-entailing contexts, but scalar 'even one' readings in downward entailing contexts, as exemplified in the pair below:

(18) a. Howard read a single book — *Howard read exactly one book.*
b. Howard didn't read a single book — *Howard didn't read even one book.*

To capture this duality, we will borrow an analytical tool from an unlikely source: Burmese, in which New & Erlewine 2018 examine a focus particle, *hma*. The basic analogy we draw between *hma* and *single* is

on the basis of their behavior in non-DE contexts, on the one hand, and DE ones, on the other. Below, the two Burmese examples parallel those given above for *single*—in the first, *hma* is responsible for an exhaustive interpretation of *water*, in which Aung only drank water. In the second, *hma* is responsible for a scalar reading, in which Aung didn't even drink water.

(19) EXHAUSTIVE:
Aung-ga ye-ko-hma thauq-keh-deh.
Aung-NOM water-ACC-HMA drink-PAST-NONFUT
'It's *water* that Aung drank.'

(20) SCALAR:
Aung-ga ye-ko-hma ma-thauq-keh-dar.
Aung-NOM water-ACC-HMA NEG-drink-PAST-DAR
≈ 'Aung didn't even drink *water*.'

### *4.2. Exhaustive 'single'*

New & Erlewine (2018)'s analysis for the Burmese particle has two pieces: first, non-exhaustive, non-scalar asserted content (e.g. 'Aung drank water'), and second, an exhaustivity presupposition relying on a likelihood scale, which negates all less likely alternatives (i.e., a presupposition that it is not true that Aung drank any other drink). Such an analysis applies fairly straightforwardly to *single*, which is in some ways simpler than the Burmese *hma*. The asserted content states that there is at least one individual of the relevant sort, one that satisfies the descriptive content of the nominal and its prejacent. The presupposition, meanwhile, asserts that all less likely alternatives are false, meaning that only the asserted content and more likely possibilities are true.

(21) $[\![ a\ single ]\!] = \lambda P_{\langle e,t\rangle} \lambda Q_{\langle e,t\rangle} : \forall q \in C[\ q \prec_{\textbf{likely}} |\{x : P(x) \wedge Q(x)\}| \geq 1 \rightarrow \neg q\ ]\ .\ |\{x : P(x) \wedge Q(x)\}| \geq 1$

This will be clearer with a concrete example:

(22) a. Howard read a single book.
b. $[\![ a\ single\ book\ \lambda x\ Howard\ read\ t_x ]\!] = |\{x : \textbf{book}(x) \wedge \textbf{read}(\textbf{Howard}, x)\}| \geq 1$
PRESUPPOSITION: $\forall q \in C \left[\ q \prec_{\textbf{likely}} |\{x : \textbf{book}(x) \wedge \textbf{read}(\textbf{Howard}, x)\}| \geq 1 \rightarrow \neg q\ \right]$

For *single*, these alternative possibilities vary on the basis of cardinality.[2] If Howard read at least two books, then he necessarily also read at least one. In all contexts, alternatives with higher numbers of books read asymmetrically entail alternatives with lower numbers of books read. This in turn means that these higher-number alternatives are necessarily less likely (or in any case, at least as likely). Negating less likely alternatives, then, in this context amounts to negating all alternatives involving a higher number of books read:

(23) PRESUPPOSITION:
$$\begin{aligned}\forall q \in C \left[\ q \prec_{\textbf{likely}} |\{x : \textbf{book}(x) \wedge \textbf{read}(\textbf{Howard}, x)\}| \geq 1 \rightarrow \neg q\ \right] \\ = \neg \left|\left\{x : \textbf{book}(x) \wedge \textbf{read}(\textbf{Howard}, x)\right\}\right| \geq 2 \wedge \\ \neg \left|\left\{x : \textbf{book}(x) \wedge \textbf{read}(\textbf{Howard}, x)\right\}\right| \geq 3 \wedge \\ \vdots\end{aligned}$$

This yields a presupposition that Howard read at most one book. This, together with the asserted content, yields an exactly reading.

The concept of 'likeliness' (which is quite consequential in the Burmese analysis) is somewhat underutilized here. This is by virtue of the fact that the set of alternatives varies on the basis of cardinality: because higher cardinality alternatives entail the lower ones, those higher alternatives will always be less

[2] We leave unaddressed here the question of what ensures that the relevant alternatives are precisely these.

likely. That means that regardless of context, the ordering of alternatives given above will remain the same. In principle, a version of this analysis could have been framed in which the alternatives each involve an exact number of books, in which case the probabilities could cash out differently. There doesn't seem to be clear evidence that this is necessary, though.

### *4.3. Scalar 'single' under negation*

So far, this gives us the 'exactly one' reading that is observed in non-DE contexts. To exemplify DE contexts, we'll focus on how the exhaustivity presupposition is affected by negation. First, we'll consider cases where *single* scopes beneath negation.

(24) Howard didn't read a single book
*(It is not the case that there is even one book that Howard read.)*

The asserted content now includes negation scoping over the entire proposition:

(25) a. Howard didn't read a single book.
b. $[\![ \text{NEG } \textit{a single book } \lambda_1 \textit{ Howard read } t_1 ]\!] = \neg\,|\{x : \mathbf{book}(x) \wedge \mathbf{read}(\mathbf{Howard}, x)\}| \geq 1$

This alone already entails that Howard read no (complete) books. Because presupposition survives negation, the presupposition—and the set of alternatives—remains the same. This is due to the position of negation relative to *single*: because the alternatives are calculated on the basis of the proposition which *single* takes scope over, the higher-scoping negation is omitted. This has the desired effect: the asserted content (that Howard read at least one book) is negated by the high scoping negation introduced by *not*, and all other less likely alternatives (that Howard read at least two books, three books, and so on) are negated by the presupposition.

(26) PRESUPPOSITION:
$$\forall q \in C \left[ q \prec_{\mathbf{likely}} |\{x : \mathbf{book}(x) \wedge \mathbf{read}(\mathbf{Howard}, x)\}| \geq 1 \rightarrow \neg q \right]$$
$$= \neg \left|\left\{x : \mathbf{book}(x) \wedge \mathbf{read}(\mathbf{Howard}, x)\right\}\right| \geq 2 \wedge$$
$$\neg \left|\left\{x : \mathbf{book}(x) \wedge \mathbf{read}(\mathbf{Howard}, x)\right\}\right| \geq 3 \wedge$$
$$\vdots$$

Thus, we have a reading that Howard read less than one book, if any amount of book at all, and have pragmatically invoked a likelihood scale that frames this literary failure in terms of Howard having missed the most likely alternative. Via the presupposition, *single* becomes a way of highlighting that reading one book is the weakest or most likely of possibilities.

### *4.4. 'Single' over negation*

If the scope is flipped—so that *a single* scopes higher than negation—the picture reverts to something more like the non-downward-entailing contexts. Consider again the sentence below:

(27) Howard didn't read a single book *(There is a single book that Howard didn't read.)*

While not the primary reading for such a sentence, it is felicitous in a context where, for example, Howard has read every book on the summer reading list but one. In the denotation, the asserted content is negated as previously, now with the negation lower than *single*:

(28) $[\![ \textit{a single book } \lambda_1 \text{ NEG } \textit{Howard read } t_1 ]\!] = |\{x : \mathbf{book}(x) \wedge \neg\mathbf{read}(\mathbf{Howard}, x)\}| \geq 1$

The alternative set will reflect the negated proposition contained below the scope of *a single*. Since the presupposition negates all less likely alternatives (which are, as always, generated on the basis of cardinality, and therefore always less likely than the asserted content), this will derive an exhaustive reading analogous to the non-downward-entailing context. More concretely, it is presupposed that it is *not* the

case that Howard failed to read at least two books, three books, and so on. This means that the only possibility remaining is that, of the relevant set of books, Howard only failed to read exactly one book.

(29) PRESUPPOSITION:

$$\forall q \in C\Big[\, q \prec_{\textbf{likely}} |\{x : \textbf{book}(x) \wedge \neg\textbf{read}(\textbf{Howard}, x)\}| \geq 1 \rightarrow \neg q \,\Big]$$
$$= \neg|\{x : \textbf{book}(x) \wedge \neg\textbf{read}(\textbf{Howard}, x)\}| \geq 2 \wedge$$
$$\neg|\{x : \textbf{book}(x) \wedge \neg\textbf{read}(\textbf{Howard}, x)\}| \geq 3 \wedge$$
$$\vdots$$

### *4.5. A few words about other quantifiers*

Of course, other quantifiers apart from *a* are possible with *single*, most prominently *every*, *no*, and *any*. The same incorporation strategy could be pursued for these cases—indeed, it's especially plausible for *every single*, where the case seems especially strong that it isn't just the product of ordinary semantic composition of *every* and *single*. For that reason we'll focus on it here.

One strategy for *every single* would be to frame the effect of universal quantification numerically, as in (30), which has a certain intellectual continuity with the narrow-scope negation scenario in the previous section:

(30) a. $[\![\, \textit{every single} \,]\!] = \lambda P_{\langle e,t\rangle} \lambda Q_{\langle e,t\rangle} : \forall q \in C[\, q \prec_{\textbf{likely}} |\{x : P(x) \wedge \neg Q(x)\}| \leq 0 \rightarrow \neg q \,] \,.$
$|\{x : P(x) \wedge \neg Q(x)\}| \leq 0$

b. $[\![\, \textit{every single sock was eaten} \,]\!] = \forall q \in C[\, q \prec_{\textbf{likely}} |\{x : \textbf{socks}(x) \wedge \neg\textbf{eaten}(x)\}| \leq 0 \rightarrow \neg q \,] \,.$
$|\{x : \textbf{socks}(x) \wedge \neg\textbf{eaten}(x)\}| \leq 0$

The asserted content here is that the number of uneaten socks is zero (or, in a metaphysically unconventional turn of events, fewer). That, of course, is simply a way of rendering the usual content of universal quantification. The additional scalar flavor of this sentence arises as before, from the way the presupposition highlights expectations. But in this case, because the numerical component involves being at or *below* a certain cardinality, higher-numbered alternatives would actually be *more* likely. Any context in which there are no more than zero uneaten socks is also a context in which there are no more than one uneaten sock. This means that quantification over less likely numerical alternatives is vacuous: setting aside hypothetical negative cardinalities, there are no such alternatives. The presupposition is vacuous.

This is a slightly odd result, but *every single* is a slightly odd expression, so its oddness may be appropriate. The *every single* claim in (31a) entails its plain *every* counterpart in (31b), and vice versa:

(31) a. Every single sock was eaten.
b. Every sock was eaten.

Nor do these sentences differ in their directly discernible presuppositions. The synonymy goes further still. One occasionally hears sentences like (32):

(32) Every single solitary sock was eaten.

In all these cases, the addressee is left to wonder why the speaker is going to the trouble of using additional modifiers to achieve a sentence with the same truth conditions as one without them. A reasonable answer is that these are demonstrations of communicative effort, a way for the speaker to convey their commitment to the claim by emphasizing, gratuitously, that no socks have been spared. It's a conventionalized way of preemptively denying any objections of the form, "but surely there must have been at least *one* uneaten sock?!"

Of course, this kind of denotation is odd in that it makes no reference to 1, which would seem to be the etymological heart of what *single* means. But perhaps that's to be expected, too—in its current use, *every single* has drifted away from this connection.[3]

[3] Another strategy that would maintain this connection would be to suppose *every single* is about denying claims of the form *every other N*, *every third N*, etc.

## 5. The not-double reading

We will offer only a rough sketch of the not-double reading here. In a sense, though, the explanation of this reading consists in large measure of explaining why the basic reading is different—by comparison, the not-double reading is relatively well-behaved. Again, the essential intuition is that not-double *single* indicates that an individual has only one principal constitutive part. What precisely this amounts to, however, isn't always obvious, and in certain uses this approach may begin to fray. To return to our cappuccino example, a single cappuccino is one with a single shot of espresso in it. Two subtleties arise. First, it is not the case that a cappuccino is made up of only one thing—there is, of course, also milk. Rather, there seems to be a convention around coffee beverages that the principal parts of interest are shots of coffee, so a single cappuccino has only one *principal* part. Second, a shot of espresso of course itself has smaller parts that are also espresso, but these don't count against the requirement of only having one because they don't measure a full shot. In that sense, social conventions define not just which components count as principal parts, but also in some cases a conventional measure. That's even clearer in (33):

(33) a. The woman took a single dose of vitamin C.
b. The recipe called for single cream.

In (33a), *single* may be doing nothing apart from measuring a conventional amount of vitamin C. In (33b), it measures fat content, but not volume, again by the conventions associated with measuring cream. Interestingly, these observations seem to generalize to *double* and *triple*, but not to their cousins *twofold* and *threefold*: a double espresso is not twofold espresso. A rough denotation is in (34), which makes use of a 'principal material part' relation, $\sqsubseteq_m$:[4]

(34) $[\![ \textit{single}_{\textit{not-double}} ]\!] = \lambda x \,.\, \exists! y[|y| = 1 \wedge y \sqsubseteq_m x]$

This doesn't directly encode that a principal part must have a sufficient measure. Perhaps one can understand this as an aspect of what it means to be a principal part—that is, it's encoded in the definition of $\sqsubseteq_m$. More still may be lurking there: we've characterized this as a *material* part relation, but in some cases, such as (35), its not clear that it is material composition that's at issue:

(35) The temperature was in the single digits.

In still others—such as *single bed*—there is a flavor of measurement alone, without an obvious connection to part structure.

A number of interesting issues remain to be explored, but for our purposes here the most important point is that this reading behaves differently compositionally. It has a freer distribution than basic *single* because it doesn't incorporate into the determiner and because its semantic type isn't quantificational.

## 6. Conclusion

Empirically, our aim has been to highlight several notable features of *single*. It has two readings with two different syntactic positions, and is a member of the larger class of nonlocal adjectives. On its basic reading, it has an exactly interpretation achieved via an at-most presupposition that in some contexts gives rise to an 'even' flavor.

We've had to set aside a number of important questions, including how the analysis works in interrogative contexts and with a wider range of quantifiers. We've also only touched on the not-double reading. More broadly, it's worth understanding how *single* compares to similar expressions (including e.g. *sole, individual, lone, singular, double, multiple*) and its many counterparts across languages.

[4] The requirement that $y$ have a cardinality of 1 is necessary only because we have been assuming above that variables can range over both atoms and pluralities.

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