Scalar Modifiers of Quantifier Phrases

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Abstract: This paper analyzes the syntax and semantics of scalar modifiers of quantifier phrases in expressions like *almost every student*, *absolutely every student* and *nowhere near every student*. The semantics is based on scales (positive and negative) of generalized quantifiers.

Key Words: scalar modifiers, negative polarity items, endpoint quantifiers

1. Introduction

The universal quantifier phrase headed by *every* can be modified by various scalar modifiers:

(1) a. Almost everybody was there.
b. Absolutely everybody was there.
c. Nowhere near everybody was there.

Other expressions that fall in the same class as *almost* include: *just about*, *nearly practically*, *essentially*, *virtually*, *close to*, *damn near*, *pretty much*. Other negative modifiers include: *not nearly, far from, not quite,* and *nothing like.* I will not investigate these other expressions here.

Such expressions can be used with other kinds of quantifier phrases:

(2) a. Almost all the students were there.
b. Absolutely all the students were there.
c. Nowhere near all the students were there.

(3) a. Almost no students were there.
b. Absolutely no students were there.
c. ?Nowhere near no students were there.

In this paper, I will present the semantics for such scalar modifiers, on analogy with the cross-categorial semantics of negation presented in Collins and Postal 2014.

Section 2 presents the framework for the syntax and semantics of negation in Collins and Postal 2014 and the basic proposal for scalar modifiers. Section 3 shows how generalized quantifiers can be arranged on scales (positive and negative). Section 4 discusses scalar modification of negative quantifier phrases. Sections 5 and 6 discuss the modifiers *nowhere near* and *absolutely* respectively. Section 7 discusses the distribution of negative polarity items in modified quantifier phrases. Section 8 explains why scalar modifiers cannot modify existential quantifier phrases. Section 9 discusses an unresolved issue concerning the Klima tests. Section 10 is the conclusion.

2. Proposal

I follow Collins and Postal 2014 in assuming the following about the semantic value of negation:

(4) If X has a semantic type ending in <t>, then
NEG takes X with semantic value: $\lambda P_1 \ldots \lambda P_n$ […]
And returns Y with semantic value: $\lambda P_1 \ldots \lambda P_n \neg$ […]

For propositional variables p (no predicate abstraction), the negation is simply ¬p. On this view, negation can combine with constituents of various different types, parallel to the analysis of conjunction given in Partee and Rooth (1983). One way to think of it is that the function negation denotes depends on the type of its argument (where the different types partition the domain of the negation function).

Consider the following example:

(5) Not everybody was there.

Collins and Postal 2014 assume that in (5), *not everybody* is a constituent, and that negation modifies the DP e*verybody*, in other words, the structure is [NEG [$_{DP}$ everybody]] (see also Collins 2016). In the framework of (4), negation in (5) has the following semantic value in (5):

(6) $[\![\text{NEG}]\!] = \lambda Q.\lambda P.\neg[Q(P)]$

In other words, NEG takes a generalized quantifier argument of type <<e,t>,t> and produces a generalized quantifier of type <<e,t>,t>.

On analogy with the proposals about the syntax and semantics of negation in Collins and Postal 2014, I propose that *almost* modifies a quantifier phrase with the structure [almost DP], and has the following semantic value (when it modifies a quantifier phrase):

(7) $[\![\text{almost}]\!] = \lambda Q.\lambda P.\exists X[\text{near}(X,Q) \wedge X(P)]$

In both cases, *not everybody* and *almost everybody* involve modification of the DP *everybody*.

In the next section I will discuss scales of generalized quantifiers and the definition of *near* in (7).

3. Scales

Following (Horn 2001: 235), I assume that generalized quantifiers are organized into two related scales, one for increasing quantifiers (the positive scale) and one for decreasing quantifiers (the negative scale):

(8)	a.	some	<	half	<	every	(positive)
	b.	not every	<	less than half	<	no	(negative)

I assume that all generalized quantifiers on a scale have the same NP restriction. The positive scale is defined by the smallest number of elements (satisfying the restriction) in each set of a generalized quantifier. For example, for the DP [some boy], each member of the

generalized quantifier has one or more boys in it. The negative scale is defined by the greatest number of elements in each set of the generalized quantifier.

Consider a quantifier phrase like *every boy*. Assume that *every boy* denotes a set of sets (each containing every boy), and that the cardinality of the set of boys is n (an integer greater than or equal to zero). The generalized quantifier denoted by *every boy* is the right endpoint of the positive scale in (8a).

From the standpoint of the scales in (8), negation and scalar modifiers have complementary functions. The function of negation is to move from one scale to another (e.g., when *every boy* on the positive scale is negated it becomes *not every boy* on the negative scale), and the function of the scalar modifiers is to move along a single scale.

In (7), *near* is a relation in the meta-language that evaluates the nearness of one generalized quantifier to another along a scale of generalized quantifiers (on the use of scales in the semantics of *almost*, see Hitzeman 1992). What counts as *near* depends on contextual factors. For example, suppose we have a party, and invite 100 people. If 95 of the people show up, we might be happy saying (9):

(9) Almost everybody showed up.

(9) has the following truth conditions:

(10) $\exists X[\text{near}(X, [\![\text{everybody}]\!]) \wedge X([\![\text{showed up}]\!])]$

In this case, the generalized quantifier X can be taken as 95% of the people, so that (9) entails (11):

(11) 95% of the people showed up.

A property of the analysis in (9) is that it makes the relation between (12a) and (12b) an implicature, not an entailment:

(12) a. Almost everybody was there.
b. Not everybody was there.

I believe this is the right prediction. Consider (13a,b). If the child finishes eating all of the vegetables, they will not be stopped from watching TV. And in (13b), if everybody is present, the vote will not thereby become invalid (but see Horn 2011:14 for uses of *almost* where the negative implication is not cancellable, see also Hitzeman 1992: 233 for discussion):

(13) a. As long as you finish nearly all/almost of your vegetables, you can watch TV.
b. Just about/almost everybody should be present, before we can vote.

Adding a negative entailment to the semantics of *almost* would be easy to do: $\lambda Q.\lambda P.\exists X[\text{near}(X,Q) \wedge X(P) \wedge \neg Q(P)]$. But based on the examples in (13), I will assume no such addition is needed.

Penka (2011: 237) proposes a treatment where: "…*almost* applied to a proposition p is true iff p is false in the actual world but an alternative proposition q close to p on the

corresponding scale is true." However, she assumes that syntactically at LF *almost* occupies a clause initial position and "…there is thus a discrepancy between the surface position of *almost* and the position where it is interpreted." (pg. 243). My account has no such discrepancy. The scalar modifiers are sisters of DP and compose semantically with their sisters. This is achieved by giving *almost* a semantic value that maps generalized quantifiers to generalized quantifiers, in the same way that negation maps generalized quantifier to generalized quantifiers in the framework of Collins and Postal 2014.

4. The Negative Scale

Scale modifiers also modify negative quantifier phrases (see Zanuttini 1991: 116-117 for a similar fact about n-words in Italian):

(14) Almost nobody showed up.

(14) will have the following truth conditions:

(15) $\exists X[near(X, [\![nobody]\!]) \wedge X([\![showed\ up]\!])]$

Only quantifiers X near the right edge of the scale in (8b) will count as near to *nobody*. In the context of a party where 100 people were invited, depending on contextual factors, X might be defined as 5% of the people.

Now consider (16):

(16) Almost half of the people were there.

This means a little less than half of the people were there, not that a little more than half of the people were there. So the following condition on the meta-language relation *near* holds:

(17) near(X,Q) only if X is less than Q (on the contextual scale S)

Examples where *almost* modifies generalized quantifiers on the negative scale (other than *nobody*) also exist on the internet, although they seem marginal to me:

(18) This means there are almost fewer than 1 million veterans remaining of the 16 million who served our nation in World War II.
(http://www.southcoasttoday.com/article/20141209/OPINION/141209484)

(19) At this point, we have fewer than 40 days of walking and almost fewer than 600 miles to go,
(https://stormingjericho.com/saying-hi-ohio/)

In these examples the generalized quantifier X which is near Q is less than Q on the scale in (8b).

5. *nowhere near*

The semantic value in (7) involves existential quantification over generalized quantifiers. There are other scalar modifiers that are more transparently quantificational. Consider negative scalar modifiers, such as *nowhere near*, which seems to have a compositional interpretation (contra Morzycki 2001: 322). *near* is a relation between generalized quantifiers, and *nowhere* quantifies over points on the scale of generalized quantifiers. So the expression in (20) has the truth conditions in (21):

(20) Nowhere near everybody showed up.

(21) $\neg\exists X[\text{near}(X, [\![\text{everybody}]\!]) \wedge X([\![\text{showed up}]\!])]$

The question is what counts as near in (20). The use of the phrase *nowhere near* seems to push what counts as near to a lower threshold than the use of *almost*. If 80% or more counts as near, then 79% or lower counts as nowhere near.

I will now show how to derive (21) compositionally given the assumptions about scalar modifiers in this paper. Assume that *nowhere near everybody* has the following structure:

(22) $[_{DP}$ [NEG SOME] $[_{NP}$ where $[_{PP}$ near everybody]]]

In other words, *near everybody* is a PP modifier of a noun *where* denoting the set of points on the positive scale of generalized quantifiers (each of which has as its restriction the set of people). On analyzing *no* as negation modifying SOME, see Collins and Postal 2014.

And assume the following semantic values:

(23) a. $[\![\text{NEG}]\!] = \lambda X.\lambda Q.\lambda P.\neg X(Q)(P)$
b. $[\![\text{SOME}]\!] = \lambda Q.\lambda P.\exists X[Q(X) \wedge X(P)]$
c. $[\![\text{where}]\!] = \lambda Q.\text{positive-scale}(Q)$
d. $[\![\text{near}]\!] = \lambda Q.\lambda X.\text{near}(X,Q)$
e. $[\![\text{everybody}]\!] = \lambda P.\forall x[\text{person}(x) \rightarrow P(x)]$

NEG in (23a) is the semantic value of negation, which directly modifies SOME (as opposed to negation in (6) which modifies the entire universal quantifier phrase, the distinction is not relevant to this paper). The first argument of SOME is a predicate of generalized quantifiers and the second argument is a predicate of indviduals. *where* is a predicate of generalized quantifiers so its type is <<<e,t>,t>,t>. *near* is a relation between generalized quantifiers of type <<<e,t>,t>, <<<e,t>,t>,t>>.

The composition is shown below:

(24) a. $[\![\text{near}]\!]([\![\text{everybody}]\!]) = \lambda X.\text{near}(X, \lambda P.\forall x[\text{person}(x) \rightarrow P(x)])$
b. $[\![\text{where}]\!]([\![\text{near everybody}]\!] =$
$\lambda Q.[\text{positive-scale}(Q) \wedge \text{near}(Q, \lambda P.\forall x[\text{person}(x) \rightarrow P(x)])$
c. $[\![\text{NEG SOME}]\!] = \lambda Q.\lambda P.\neg\exists X[Q(X) \wedge X(P)]$
d. $[\![(22)]\!] =$
$\lambda P.\neg\exists X[\text{positive-scale}(X) \wedge \text{near}(X, \lambda P.\forall x[\text{person}(x) \rightarrow P(x)]) \wedge X(P)]$
e. $[\![(20)]\!] =$
$\neg\exists X[\text{positive-scale}(X) \wedge \text{near}(X, \lambda P.\forall x[\text{person}(x) \rightarrow P(x)]) \wedge X([\![\text{showed up}]\!])]$

Alongside of *nowhere near*, as in (25a), there are also expressions like (25b):

(25) a. I saw nowhere near every student.
b. I didn't see anywhere near every student.

Following Collins and Postal 2014, the structure of (25b) is:

(26) I NEG_1 see [[<NEG_1> SOME] [where near every student]]

Examples like (25b) arise when NEG_1 raises from the DP object, and SOME is spelled out as *any* (See Collins and Postal 2014 for details). (25a) and (25b) have the same interpretation since they both involve the same negative quantifier ([NEG SOME]) quantifying over the same set.

The following sentence involving a negative scalar modifier modifying a negative quantifier is predicted to be acceptable:

(27) ?Nowhere near nobody showed up.

The truth conditions would be:

(28) $\neg\exists X[near(X, [\![nobody]\!]) \wedge X([\![showed\ up]\!])]$

Suppose in this case that 20% or fewer counted as near. Then these truth conditions would be consistent with 21% or more of the people showing up. However, this example sounds degraded and does not show up on internet searches. I leave the issue to future research.

A similar analysis could be given of expressions like *somewhere around*, as in the following example:

(29) Somewhere around half of the people showed up.

Once again this could be compositionally interpreted to have the following truth conditions:

(30) $\exists X[around(X, [\![half\ of\ the\ people]\!]) \wedge X([\![showed\ up]\!])]$

The difference between the metalanguage *near* and *around* is that *around* does not obey the condition in (17), so that (29) is true if between 45% and 55% of the people showed up.

6. *absolutely*

Consider now *absolutely* as a scalar modifier:

(31) Absolutely everybody showed up.

I propose that *absolutely* denotes the identity function:

(32) $[\![absolutely]\!] = \lambda Q.Q$

However, this semantic value does not account for the following contrast:

(33) a. absolutely everybody was there.
b. absolutely nobody was there.
c. *absolutely half of the people were there.
d. *absolutely 75% of the people were there.

Such contrasts suggest that *absolutely* carries a presupposition that it only apply to endpoint quantifiers (see Horn 2001: 237), where the notion of endpoint quantifier is defined with respect to the scales of generalized quantifiers in (8a,b):

(34) An endpoint quantifier of S (a scale of generalized quantifiers) occupies the greatest position on the scale.

Given this definition, the semantic value of *absolutely* is (35a) (or more formally (35b)), were S is a contextually given scale of generalized quantifiers.

(35) a. ⟦absolutely⟧ = λQ:Q is the endpoint of S.Q
b. ⟦absolutely⟧ = $\lambda Q:\forall X[X \in S \rightarrow X \leq Q].Q$

Paul Postal points out that there is also an element of certainty of judgment in the semantics of *absolutely*, so that (31) implies that I am certain that everybody showed up. This implication is not captured in (35).

(35) predicts that combining *almost* and *absolutely* should be OK:

(36) Almost absolutely everybody showed up.

In (36), *absolutely everybody* denotes the same generalized quantifier than *everybody* does, and so *absolutely everybody* can be modified by *almost*.

While this sounds strained, there are actually a fair number of Google hits on the internet:

(37) Almost absolutely everyone has their own website, be it a corporate website or a private web page.
(https://universeinform.com/web-design-and-development-software/)

The reverse combination seems worse:

(38) ??Absolutely almost everybody showed up.

This would follow from the fact that *almost everybody*, as opposed to *everybody*, is not an endpoint quantifier.

The analysis in (35) also predicts that *absolutely everybody* can be modified by negation. Such examples are easy to find on the internet, and sound natural:

(39) Strange as it may seem, not absolutely everybody is hunting for rare Pokémon on their phones right now
(https://www.sciencealert.com/scientists-have-found-a-weird-glowing-purple-blob-on-the-ocean-floor)

(40) But not absolutely everybody who voted Labour in Canterbury has mental health problems.
(https://www.thesun.co.uk/news/3777032/if-the-tories-want-to-win-back-canterbury-they-should-wait-until-the-students-are-off-on-holiday/)

Once again, these sentences are OK because *absolutely everybody* has the same denotation as *everybody*, and *everybody* can be modified by negation (since it is of type <<e,t>,t>).

7. Negative Polarity Items

Universal quantifier phrases modified by *almost* license negative polarity items in their restriction:

(41) a. Everybody who has ever been to France smokes.
b. Almost everybody who has ever been to France smokes.

However, the restriction of the modified universal quantifier phrase does not license downward entailing inferences:

(42) a. Almost everybody who owns a car is happy.
b. Almost everybody who owns a Jaguar is happy.

If the number of Jaguar owners is small, it might be that there are hardly any happy Jaguar-owners, but still almost all the car owners are happy. The reason for this shift, on the theory presented in section 2, is that the scale of generalized quantifiers is calculated with respect to the restriction. The restriction in (42a) is the set of people who own a car, and the restriction in (42b) is the set of people who own a Jaguar (a much smaller set). Almost everybody who owns a car might be two billion people, but almost everybody who owns a Jaguar might be two thousand people. Even if every Jaguar owner was unhappy, it would not make much of dent in the number of happy car owners.

If the restriction of the modified quantifier phrase in (41) is not a downward entailing context, then why are NPIs licensed in (42b). I propose that the answer can be found in the structure of the modified quantifier phrases:

(43) [almost [everybody who has ever been to France]]

Consider (41) from the point of view of the following condition (from Ladusaw 2002: 467, see also CP2014: 72 who argue for a formulation in terms of non-increasing functions):

(44) A negative-polarity item is acceptable only if it is interpreted in the scope of a downward-entailing expression.

Crucially, nothing in this formulation makes reference to whether the overall sentential context of the NPI is DE or not. Therefore, since the restriction of a universal quantifier phrase is a downward entailing context, the negative polarity item is licensed.

8. Existential Quantifier Phrases

As opposed to universal and negative quantifier phrases, existential quantifier phrases do not admit scalar modifiers:

(45) a. *Almost somebody was there.
b. *Absolutely somebody was there.
c. *Nowhere near somebody was there.

(46) a. *Almost some boys were there.
b. *Absolutely some boys were there.
c. *Nowhere near some boys were there.

(47) a. *Almost a boy was there.
b. *Absolutely a boy was there.
c. *Nowhere near a boy was there.

(48) a. *Almost boys were there.
b. *Absolutely boys were there.
c. *Nowhere near boys were there.

One possibility is that these examples are all unacceptable because indefinites are not quantificational (rather, indefinite DPs would be of type <e,t> denoting predicates). As predicates, they could not be modified by a scalar modifier defined for generalized quantifiers. However, I propose a different account based on the assumption that indefinite DPs denote generalized quantifiers.

Since *absolutely* can only modify endpoint quantifiers, data in the (b) sentences follows from the fact that existential generalized quantifiers are not endpoint quantifiers.

As for the (a) sentences, consider the following contrast:

(49) a. *Almost one boy was there.
b. ?Almost two boys were there.
c. Almost ten boys were there.

(49c) is fine and would be true if eight or nine boys were there. (49b) seems acceptable, but odd because it implies that one boy was there (so one could have said one *boy*, instead of *almost two boys*). But (49a) would seem to be true only if no boys where there. But the generalized quantifier that *no boys* denotes is not in the positive scale, and so (17) is violated.

In other words, scalar modification cannot yield a value that jumps between the two scales in (8), but only moves around on a single scale (see Hitzeman (1992: 231) for a similar analysis of facts like (45-48)).

This condition allows the following examples:

(50) a. Almost half of the people were there.
b. Almost 75% of the people were there.
c. Nowhere near half of the people were there.
d. Nowhere near 75% of the people were there.

In none of these cases is the modified quantifier phrase equivalent to *no people*.
Consider now an element of the negative scale *not everybody*:

(51) a. *Almost not every student was there.
b. *Absolutely not every student was there.
c. *Nowhere near not every student was there.

Once again, the unacceptability of (51b) follows from the fact that *not everybody* is not an endpoint generalized quantifier, and so it cannot be modified by a*bsolutely*.

According to the constraint in (17), near(X,Q) entails that X is less than Q on the negative scale. But there is no X less than the denotation of *not everybody* on the negative scale.

Free choice *any* quite productively takes scalar modifiers:

(52) a. Almost anybody should be able to do that.
b. Absolutely anybody should be able to do that.

These example suggest that *anybody* is an endpoint generalized quantifier on the positive scale (equivalent to *everybody*), but I do not pursue the issue here.

9. Klima Tests

My analysis faces a problem in light of the Klima tests for sentential negation (see Klima 1964) (thanks to Stephanie Harves and Paul Postal for judgments):

(53) a. Almost everybody showed up. Didn't they?/*Did they?
b. Almost nobody showed up. *Didn't they?/Did they?
c. Nowhere near everybody showed up. *Didn't they?/Did they?
d. Somewhere around half of the people showed up. Didn't they?/*Did they?

These judgments show that (51b,c) (but not (51a,d)) are instances of sentential negation. Now consider the condition from Collins and Postal (2016):

(54) A sentence S is an instance of sentential negation only if some NEG or negative quantifier DP takes widest scope in the matrix clause of S.

But in (53b) *almost* is an existential quantifier over generalized quantifiers, and so it looks like (53b) violates (54). (53c) containing a negative scalar modifier counts as sentential negation, as predicted by (54).

One possible solution to this problem is to change the definition of *almost* to the following. Suppose that instead of the relation *near* in (7) we used meta-language function *distance* which takes two quantifiers X and Q and yields the distance between them as a

percentage. Then suppose that the maximum distance between two quantifiers consistent with *almost* was n (perhaps 5%). In other words, *almost everybody* would be 95% (of the cardinality of the restriction). Then the semantic value of *almost* could be stated as follows:

(55) $[\![\text{almost}]\!] = \lambda Q.\iota X[X < Q \wedge \text{distance}(X,Q) = n]$

According to this definition, *almost* takes a generalized quantifier Q and returns a generalized quantifier X that is less than Q and at a distance of n from Q on the contextual scale. This semantic value avoids the problem with the Klima tests (53b), since the new generalized quantifier X is on the negative scale and would be expected to behave like a negative quantifier according to (54).

A problem with (55) is that it is no longer parallel to the semantic value of *nowhere near*. For example, (55) involves no quantification, whereas (21) does. Also, (55) does not make use of the meta-language *near*, whereas (21) does. It may simply be that the condition in (54) is not quite right. I leave the issue to further research.

10. Conclusion

I have analyzed the syntax and semantics of scalar modifiers of quantifier phrases. The syntax is based on the structure [almost DP], analogous to the structure of negated quantifier phrases in the framework of Collins and Postal 2014. The semantics is stated in terms of scales of generalized quantifiers.

A future topic will be to extend this analysis to other elements. As noted by Morzycki (2001: 310): "*Almost* modifiers constitute a natural class distinguished by position and interpretation, whose members may occur in left peripheral positions across a range of syntactic categories." Some examples are the following:

(56)	a.	The cup is almost full.	(adjective)
	b.	Dinner is almost ready.	(adjective)
	c.	John has almost finished his homework.	(VP)
	d.	He almost died.	(VP)
	e.	Paris is near Versailles.	(Locative)
	f.	There is a bodega near my apartment.	(Locative)
	g.	He is almost always late.	(Adverb)
	h.	He is almost never late.	(Adverb)

Morzycki proposes that one can account for cross-categorical *almost* in terms of intensional similarity (similarity of worlds). But no notion of intensional similarity was needed for scalar modification of quantifier phrases on my analysis. Rather, only the extensional notion of nearness on a scale of generalized quantifiers was needed. I leave to future work whether nearness on a scale will also account for the other uses of *almost* in (56).

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