

Almost means ‘less than’: preschoolers’ comprehension of scalar adverbs

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1 Introduction

Children proudly produce sentences like ‘I’m almost 5’. This is an important concept to them, as it means that they are close to an age they perceive as a threshold, and children care about growing up. But the meaning of *almost* is quite complex: being ‘almost 5’ means *not* being five (yet) and being an age *close to* five (e.g. 4 and ten months). Does a 4 year-old understand the components of the meaning of *almost*? And does the child grasp the meaning of *almost* when it occurs with expressions other than number words? In fact, *almost* may modify expressions of different syntactic categories: verbs, adjectives, prepositions, other adverbs. Do children understand its meaning in all cases?

Previous studies claim that children aged 4 – 6 have difficulties with interpreting *almost*, and only reach adult-like interpretation of the adverb by age 7 or 8. According to these studies, children understand the ‘proximity’ component of the meaning of the adverb (being ‘close to’ five) but not its ‘scalar’ component (i.e. if you are ‘almost 5’ you are ‘less than’ 5).

In this paper I focus on children’s interpretation of *almost* as a modifier of number words (e.g. *almost five*), directional prepositional phrases (e.g. *almost to the lilypad*) and equative comparative phrases (e.g. *almost as far as*). I am interested in the following research questions:

- Do children interpret *almost* differently from adults across the board?
- How do children acquire the different components of the meaning of *almost*?
- How do children generalize from the cross-categorial instances of modification by *almost*?

My study explores the hypothesis that early difficulties with the interpretation of *almost* reported in the literature result from difficulties in identifying the scale that *almost* operates on, not from late acquisition of the scalar component of the adverb. I show that children grasp both components of the meaning of *almost* when the adverb modifies linguistic expressions that provide a scale that the child understands (e.g. number words).

This paper is organized as follows. In section 2 I describe the meaning of *almost*. In section 3, I summarize the findings of previous studies. Section 4 describes the aims and methods of my experimental study. Section 5 presents the results of the experiment and section 6 provides a discussion of the results.

2 Scalarity of *almost*

The meaning of *almost* can be analyzed as involving two implications or meaning components: a Polar component and a Proximal component ([1], [2]), exemplified below for (1).

- (1) John is almost five years old.

A sentence with *almost* entails the negation of the expression that is modified by the adverb (Polar component). For example, (1) means that John is NOT five years old.

- Polar component:
[...[almost x]...] entails [...[NOT x]...]

The meaning of *almost* requires that the modified expression, possibly with the support of the conversational context, provides a scale, i.e. a set of alternatives to the value of the modified expression with a linear order on it, and a value on that scale, which I will call ‘the endpoint’. A linearly ordered set is defined by a relation that is transitive, antisymmetric, reflexive, and connected, for which I use the notation $<$ ([3]). In (1), the scale needed to interpret *almost five* is the numeric order, the ‘endpoint’ is five (the expression modified by *almost*), and scalar alternatives to five are e.g. two, three, four, six, seven, etc.

A sentence containing *almost(S)* entails a related sentence S’, where S’ expresses a proposition in which existential quantification is made over scalar alternatives to the expression modified by *almost* that are ranked lower than the endpoint and are close to it on the scale. How close an alternative must be to the endpoint is context-dependent. This entailment relation can be schematized as follows:

- Proximal component:
[...[almost x]...] entails [for some $d < [[x]] \wedge \text{CLOSE}(d, [[x]]) (\dots d \dots)$]

To exemplify, (1) means that there is an age CLOSE TO FIVE and ranked lower than five on the numeric order, i.e. LESS THAN FIVE, and that John is this age (Proximal component).

The notion of a scale or ordered set has proven useful in different domains of semantics and pragmatics and their acquisition, e.g. in the study of the meaning of gradable predicates and in the study of conversational implicature ([4], [5], [6], [7]). For language acquisition, the meaning of *almost* provides an excellent test case for studying the relation between language and scalar knowledge: in order to understand the proximal component of the adverb, children must retrieve the scale relevant to the specific instance of modification by *almost*. Thus, children’s understanding of *almost* may be used to investigate what children know about scales.

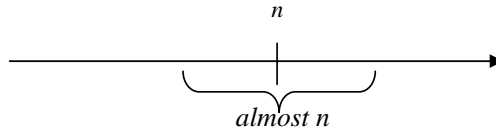


Figure 1: Interpretation of *almost* without the scalar implication.

3 Previous studies

To my knowledge, the only experimental studies on the acquisition of terms like *almost* have been done on French ([8], [9]). These studies have argued that children aged 4 to 7 interpret French *presque* ‘almost’ differently from adults across the board ([8]). A study with 4 to 11 year-olds shows that for young children, *presque n* seems to indicate a value which may be “less than *n*”, “more than *n*”, “equal to *n*” (i.e. same as the modified expression), or simultaneously “less than *n*” and “more than *n*”([8]). This has been taken as evidence that children first interpret *presque* as ‘close to’ and later acquire its scalar meaning ‘less than’. On the basis of these findings, the authors propose a developmental path in the comprehension of *presque*; from 4 to 7, children interpret *presque n* as denoting an area around the value *n*, this value included. This proposal suggests an initial interpretation of ‘almost’ as depicted in Figure 1, i.e. meaning ‘close to’, in contrast to the scalar interpretation I described in the previous section.

The findings of this study differ from [9]. In a study on the acquisition of different degree modifiers (e.g. *presque* ‘almost’, *à peine* ‘barely’), children did not interpret PRESQUE N as equivalent to *n* (i.e. as having the same meaning as the modified expression). In terms of the semantic analysis of *almost* given above, this suggests that children have acquired the Polar component of the meaning of the adverb:

The value *n* was almost never selected in the statements containing PRESQUE. This differentiates PRESQUE from all the other items studied and seems to uncover an essential peculiarity of the meaning of PRESQUE ... (p. 615).

This study reports the following response types for the group of 6 year-olds, the youngest age group in [9]: “slightly less than *n*” (60%), “less and more than *n*” (18%), “any value less than *n*” (10%).

The disparate findings of these two studies may stem from possible confounds in their methodologies. In both studies, children were tested on isolated sentences containing *almost*. The scale that was relevant to each specific utterance was not clear in the context of the task, so different children may have identified different scales and interpreted *almost* accordingly.

4 This study

The current experimental study aims to address the acquisition of the two implications of *almost* by providing children with rich contextual information about the scale that is relevant to each instance of modification.

Participants heard sentences with *almost* as a modifier of number words, directional prepositional phrases (PP’s), and equative comparative constructions. These expressions were chosen for two reasons. First, they were used in previous studies, so this allows for comparison with previous findings. Second, with these expressions one can test the comprehension of the scalar meaning of *almost*, since it is possible to provide discrete scalar alternatives to the value of n (the expression modified by *almost*) either ranked higher or lower than n on the scale, and the order of the alternatives can be contextually manipulated.

The predictions of this study are the following. If children acquire the scalar component of *almost* only by age 7 or 8 ([8]), and young children interpret *almost* as equivalent to “close to” (cf. Figure 1), then young children are expected to interpret *almost n* as “less than n ”, “more than n ”, or simultaneously “less than n ” and “more than n ”. The expected response pattern is that children are equally likely to choose either of these alternatives, and this should happen regardless of the expression that is modified by *almost*. On the other hand, if children have acquired the two components of the meaning of *almost*, and hence have grasped the scalar meaning of the adverb, they should tend to choose the “less than n ” alternative over the “more than n ” alternative.

4.1 Method

4.1.1 Participants

Two groups of children and one group of adults participated in this study: 4;0-4;11 year-olds ($N = 22$, mean age 4;7), 5;0-5;11 year-olds ($N = 23$, mean age 5;5) and 14 adults, undergraduate students at Stanford University.

4.1.2 Materials and Procedure

Children were pre-tested for their ability to count to 8; children who could not count did not participate in the experiment. Children sat next to the experimenter at a small table and saw slides on a computer screen. The slides depicted a situation with several characters (animals or people). In the number words condition, the experimenter presented slides with people or animals, as in (2):

- (2) The boys are playing with blocks. Let's see how many blocks each boy has. Can you count the blocks? (*Child counts the blocks for each boy*) Which boy has almost n blocks?

The child was asked to choose from the alternatives on the screen; the alternatives consisted of n , $n-1$ and $n+1$. For example, for the question *Which boy has almost 4 blocks?*, the alternatives were a boy with 4 blocks, a boy with 3 blocks, and a boy with 5 blocks. In the 4 experimental stimuli in the number words condition, the value of n ranged from 4 to 7.

In the directional PP's condition, the experimenter presented a sequence of slides telling a short story about a set of animals. This is exemplified in (3); the slides show a garden path with a vase on it.

- (3) There are three snails in the garden. The snails want to get to the vase. Let's see if they can do it. (*The snails move along the path, one by one*) There! Which snail got almost to the vase?

The sequence of the slides showed the motion of the snails along the path until they reached their final position with respect to the vase. The child was asked to choose from the snails on the last slide of the sequence. In the slide, there was a snail who *got to the vase* (i.e. the scalar value corresponding to the meaning of the expression modified by *almost*), a snail that was close to the vase but did not get to it, and a snail that was close to and beyond the vase.

In the sentences containing an equative comparative, children saw slides with 4 animals and a jumping board. The sequence of slides presented a jumping contest and the experimenter described the sequence as in (4):

- (4) This is a jumping contest. The zebra is going to jump first. (*Zebra jumps*) Now the zebra's friends are going to jump. (*The animals jump on the board, one by one*) There! Which animal jumped almost as far as the zebra?

The length of the jump of the first animal (here, the zebra) provides the standard of comparison. The child had to choose from the three animals that jumped after the zebra (described as "the zebra's friends" by the experimenter). For each animal, the length of his/her jump corresponded to one of the scalar alternatives: one of the animals jumped as far as the zebra (i.e. the scalar value corresponding to the meaning of the expression modified by *almost*), another animal jumped a bit less far than the zebra, and another animal jumped a bit farther than the zebra. The board was divided in stripes of equal width, so that the measure of closeness to the animal providing the standard of comparison (1 stripe in all the cases) remained the same and could be easily perceived.

In the situations depicted on the slides, for all the experimental conditions, there was one character per scalar alternative: one character corresponded to $n-1$, i.e. “less than n ”, another character corresponded to n (the value of the expression modified by *almost*), and another character corresponded to $n+1$, i.e. “more than n ”.

The dependent variable is the response type: LESS THAN n , MORE THAN n , SAME AS n and LESS AND MORE THAN n if the child chose both the characters corresponding to LESS THAN n and MORE THAN n . The independent variables are the expression modified by *almost* (within subjects) and age group (between subjects).

There were 4 experimental items per condition, with a total of 12 experimental stimuli, and 16 filler items. All the fillers were similar to the experimental items, with three alternative responses, and were designed to unbiased the response type in the critical items. Given that in the experimental items the adult-like response was LESS THAN n , in order to unbiased subjects towards this response, 8 fillers were biased towards the response SAME AS n and 8 fillers were biased towards the response MORE THAN n . The items were pseudorandomized (both for order of item and order of condition) for each child. Each session lasted approximately 15 minutes and was videotaped in order to record the responses, gestures and spontaneous comments provided by the children about their choices.

5 Results

Overall, the data show that there is continuity in the interpretation of *almost* by the three age groups, with greater variability in response from the younger group. The only exception to this pattern is the behavior of the youngest group (4;0-4;11) in the Equative comparatives condition: here, the more common response type is MORE THAN n , as shown in Fig. 2. There is almost no variability in the adult results: adults never chose two scalar alternatives (LESS THAN n and MORE THAN n) and had a clear preference for the LESS THAN n response.

A mixed-effects binary logistic regression model predicting the ‘other than LESS’ response (conflating responses into LESS THAN n vs ‘other than LESS’) revealed a main effect of condition: the interpretation of *almost* with number words and with directional PP’s differs significantly from the interpretation of *almost* with comparatives in disfavoring the ‘other than LESS’ response (Number words Condition: $B = -2.17$, $SE = 0.39$, odds = 0.11, $p < 0.001$; Directional PP’s Condition: $B = -1.59$, $SE = 0.38$, odds = 0.20, $p < 0.001$). The odds of a LESS THAN n response in the Number words condition, when compared to the Comparatives condition, is 9 to 1. The odds of a LESS THAN n response in the Directional PP’s condition, when compared to the Comparatives condition, is 5 to 1. The difference between the Number words and the Directional PP’s conditions was not statistically significant but I will return to this finding later.

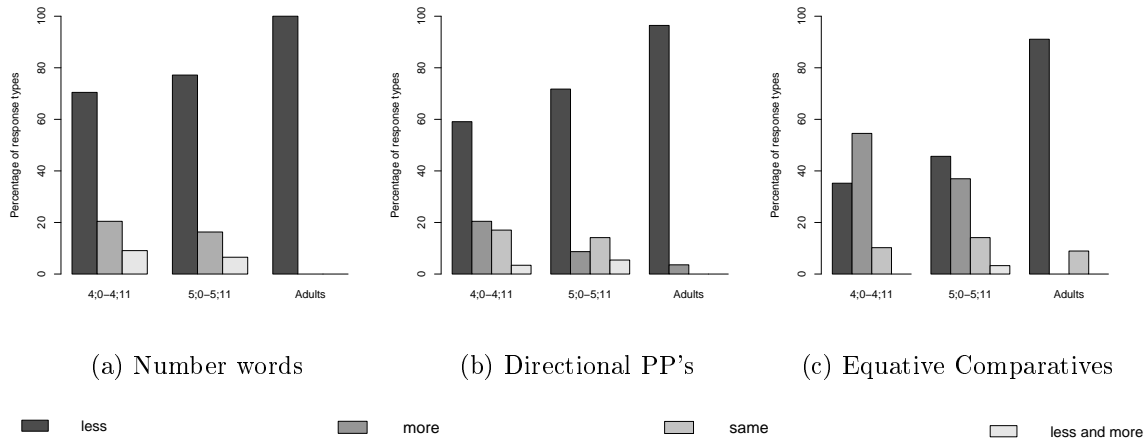


Figure 2: Percentages of response types per age group for each condition.

In the Number words condition, the choice of the LESS THAN n scalar alternative was accompanied by spontaneous comments by the children showing they have identified the relevant scale:

- (5) Experimenter: Which boy has almost 4 blocks?
 Child: I think it's this one [Points to 3], because it goes 1,2,3,4.

In other cases, children pointed to the value $n+1$ and said: “It's not this one, because this one has more/because this one has the most”.

Only two children chose both scalar alternatives LESS THAN n and MORE THAN n (a response type found in previous studies), but they did not do so consistently during the whole experiment. For one child, this response was given only in the Directional PP's condition. The child gave the following justification:

- (6) Experimenter: Which frog got almost to the lily pad?
 Child: I think these two did [Points to both MORE THAN n and LESS THAN n alternatives] 'cause they're close to it.

For the other child, this response (LESS THAN n and MORE THAN n) was given both in the Directional PP's and Comparatives conditions.

5.1 Patterns in the acquisition of *almost*

The children were sorted into groups according to their response patterns. The individual response patterns were coded as a triple of 0 and 1, with one digit per condition,

in the order N-P-C (Number words – Directional PP’s – Equative comparatives). The responses were coded in binary terms: 1 stands for ‘adult-like’ response, 0 for ‘non-adult-like’. If children had three or four (out of four) ‘adult-like’ responses in one condition, this was coded as a 1, otherwise as a 0, following the criteria adopted in [10].

Of all the possible combinations of response types (a total of 8), only the pattern 0–0–1 (i.e. ‘non-adult-like’ responses in Number words and Directional PP’s conditions, and ‘adult-like’ response in Comparatives condition) is not attested in the data. This means that children understand the sentences with *almost* as a modifier of equative comparatives after they have understood the sentences with *almost* modifying number words and directional PP’s. The patterns obtained were then grouped as reflecting no comprehension (i.e. ‘non-adult-like’ responses in all the conditions), partial comprehension (i.e. ‘adult-like’ responses in one or two conditions) and adult-like. The results of this coding scheme are shown in Table 1.

	Pattern (NPC)	Nr of children	Mean age (range)
No comprehension	0 0 0	6	4;8 (4;0–5;2)
Partial comprehension (one domain)	1 0 0	11	4;11 (4;0–5;11)
	0 1 0	7	4;11 (4;6–5;5)
Partial comprehension (2 domains)	1 1 0	5	5;5 (4;8–5;11)
	0 1 1	1	4;1
	1 0 1	1	5;0
Adult-like	1 1 1	14	5;1 (4;6–5;11)

Table 1: Individual response patterns for the total number of children (N=45).

The distribution of the four patterns (No comprehension, 1, Partial comprehension in one domain, 2, Partial comprehension in two domains, 3, Adult-like, 4) across ages is presented in Figure 3.

The plot shows that there is much variability in the distribution of the patterns across ages. Pattern 1 (No comprehension) and pattern 4 (Adult-like comprehension) present more limited age ranges, corresponding, as one would expect, to younger children and older children, respectively. Patterns 3 and 4 correspond to transitional stages, and are found across a wider range of ages. Overall, there is an upward trend in the data suggesting a developmental path from pattern 1 to pattern 4. However, the existence of such a path can only be confirmed by a longitudinal study. This remains for further research.

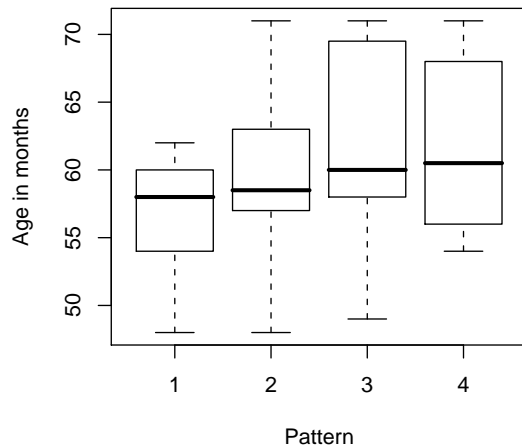


Figure 3: Distribution of patterns of interpretation of *almost* over age.

6 Discussion

The findings of this study demonstrate that children as young as 4;6 years-old can identify the two meaning components of *almost* and hence that they have acquired the scalar meaning of the adverb. In sentences with number words and directional prepositional phrases, children retrieve the scales that the adverb operates on. In the Number words condition, the scale is the numeric order, and in the Directional PP’s condition, the scale is the endpoint-oriented spatial path. In the sentences with comparatives, children had more difficulties. Here, the scale underlying the interpretation of *almost* and the relevant elements of the scale (the scalar alternatives and the endpoint) can only be retrieved from contextual information. This information is provided by the experimental setting of the study: the scalar alternatives are the positions of the animals on the jumping board and the endpoint of the scale is the position, on the jumping board, of the animal that provides the standard of comparison (e.g. the zebra in (4)).

The regression results show that the difference between the Number words condition and the Directional PP’s condition was not statistically significant. However, there is an indication that children made a distinction between the interpretation of *almost* with number words vs. PP’s. The regression coefficient for the Number words condition was almost twice the value of the coefficient for the Directional PP’s condition. One explanation for why the interpretation of the modified sentences with number words might have been easier is that, with small numbers, the measure of closeness to n is given in advance: the scalar alternatives to n would always be $n-1$ and $n+1$,

i.e., there is no variability in how close a value is to the reference point n . On the other hand, in the Directional PP's condition, the child had to assess the closeness to n on the basis of the visual setting.

The results reveal a difference in children's understanding of the scales underlying the Number words and Directional PP's conditions, on the one hand, and the Comparatives, on the other hand. Why do children have difficulty accessing the scale to interpret the sentence with the comparative? Given the semantics of *almost*, a scale must be somehow accessible here too since those sentences are perfectly acceptable for adults. Children understood the unmodified equative comparative, as shown by the accurate responses in the filler items containing such expressions (e.g. *Point to the elephant that is as big as the house*). Semantically, an equative comparative construction introduces a relation between sets of degrees. In the case of modification by *almost*, the child must identify an order between such relations, e.g. *2 cm less than, 1 cm less than, as much as, 1 cm more than*, etc.. It is possible that children have difficulty understanding 'almost as far as' because such scales are hard to access.

The results of this study suggest a developmental path: the meaning of *almost* is understood first in one domain, then generalizes to others, but further work is required to confirm this. My results are consistent with earlier findings that children's understanding of scales differs across domains ([5], [11]). One question for further research may be to compare the domain of scalar representations with numbers or spatial paths to the domain of scalar representations with relations between sets of degrees. Are there different types of scales? And why are some scales understood earlier than others by children?

Possible hypotheses to be pursued in further work include: differences in the frequency of the expressions (and respective scales) modified by *almost* in child directed speech, and the cognitive availability of certain scales (e.g. the representations of telic events and spatial paths oriented towards an endpoint). In sentences containing directional PP's, it is possible that goal-oriented motion may help children understand the meaning of *almost* and guide them in retrieving the relevant scale; for example, children understand early on the notion of a failed attempt and form representations of probable endings of motion events ([12]). The developmental pattern suggests that the type of scale encoded by the meaning of the expression modified by *almost* influences the way children generalize from cross-categorical instances of modification by *almost*.

Acknowledgements

Fundação para a Ciência e a Tecnologia (SFRH/BPD/38812/2007)
Spencer Foundation (Grant # 2080211)

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