

Distributivity and Logical Form in the Emergence of Universal Quantification

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Recent research on four-year-olds' and five-year-olds' knowledge of quantification has made two strongly attested and somewhat unexpected observations. First, it appears there is a stage in the emergence of universal quantification when the child fails to make consistent use of a syntactic mechanism---such as May's (1977, 1985) 'Quantifier Raising' (QR), or Heim's (1982) 'NP-prefixing'---to derive a restriction on the domain of quantification. This stage occurs well after the child has firmly grasped that universal quantifiers assert the completeness or exhaustive denumerability of some contextually relevant set. The second observation is that children at this stage have a strong, non-adult-like tendency to insist on distributive readings, not only with universal quantifiers (Drozd and Philip, 1992) but also with plural pronouns (Crain and Miyamoto, 1991; Miyamoto, 1992). Hearing the word every or how many can trigger such a 'fixation' on the distributive reading that the child consistently rejects collective and cumulative readings readily available to the adult. This latter observation is all the more surprising given the crosslinguistic evidence of the preference in adult grammars for cumulative readings (Gil, 1982).

In this paper I will argue that these two seemingly unrelated phenomena derive from the same underlying cause, namely (i) that the child prefers to quantify over events rather than objects (Philip and Aurelio, 1991; Philip and Takahashi, 1991; Takahashi, 1991), and (ii) that the child derives a restriction for the domain of quantification by means of a non-syntactic, pragmatic mechanism (cf. Philip, 1991a, 1991b, to appear) that may be loosely characterized as a form of 'accommodation' in the sense of Lewis (1979).

The first claim---which I will call the EVENT QUANTIFICATIONAL HYPOTHESIS---is based on the assumption that quantification over events or situations is a fundamental semantic capability (cf. Davidson, 1966; Higginbotham, 1983; Barwise and Perry, 1983; Kratzer, 1989; Parsons, 1990).¹ The supposition is that children (and adults under certain conditions) resort to quantifying over events in their interpretation of universal quantifiers because it achieves a net reduction of the total processing load. In other terms, it provides an alternative to type-shifting---a presumably costly operation (cf. Partee and Rooth, 1983).

¹ In this paper I will not distinguish between 'situations' in the sense of Barwise and Perry (1983) and 'events' in the sense of, say, Higginbotham (1983).

The second claim is that in the absence of QR (or like mechanism) the restriction to the domain of quantification is derived in a very non-adult-like but nonetheless rule-governed manner. The rule in question---which I will call the RESTRICTOR RULE---may be seen to instantiate the Subset Principle (e.g. Berwick, 1985). According to this general law of language acquisition, the child initially acquires a new rule of grammar in the most restrictive of its available forms, and thereby adopts an option that generates a subset of the adult grammar. In this manner (arguably only in this manner) subsequently assimilated positive evidence is able to modify the initial posit. Given quantification over events, then, the Restrictor Rule is seen to provide the most restrictive form of universal quantification because it supplies the largest possible linguistically² determined restriction of the domain of quantification, which increases the quantified sentence's falsifiability by positive evidence.

The paper is organized as follows. First I will present a phenomenon well-attested in children's use of universal quantifiers---which I call the SYMMETRICAL INTERPRETATION---that strongly argues against the view that QR is well-established in the grammars of young children, even as late as five years of age. Space limitation prevent a detailed discussion of why arguments in the literature to the contrary are not compelling; however, briefly put, the problem is that the evidence cited either fails to demonstrate that Move α is the operant principle behind the observed phenomenon (Lee, 1986; Chien and Wexler, 1989), or it is not very firmly established (Miyamoto, 1992). Having examined basic properties of the symmetrical interpretation that highlight its nonsyntactic nature, I will next present evidence that it is nonetheless a truly linguistic phenomenon, not an effect of some meta-linguistic, general cognitive mechanism. Then, I will give my account of it. Finally, I will show how my account predicts children's observed preference for a distributive reading with universal quantifiers.

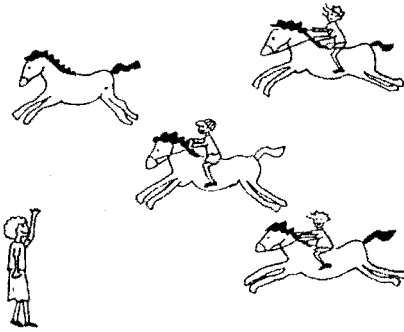
The symmetrical interpretation: nonsyntactic aspects

Evidence of the non-compositional way in which young children derive a restriction on the domain of quantification can easily be overlooked since the truth conditions of the symmetrical interpretation differ only minimally from those of an adult interpretation of universal quantification. The difference is revealed, however, by showing a child a picture such as in (1.a) and asking whether every boy is riding a pony. The typical response

² As opposed to non-linguistic restriction of this domain in terms of a relevant 'context set' (Stalnaker, 1978) or 'presupposition set' (Rooth, 1985). Children master this more basic sort of restriction of the domain of quantification long before they face the problem of interpreting universal quantifiers (see also footnote 8).

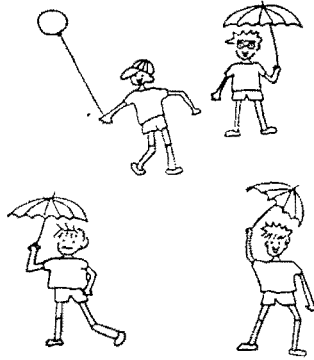
(approximately 75% of the time) is *no* for this experimental condition, with reference made to the riderless pony (not to the mom) as the reason for the negative response. The same child, however, will give adult-like responses to the questions in the control conditions exemplified in (1b)-(1.d).

(1) a. transitive



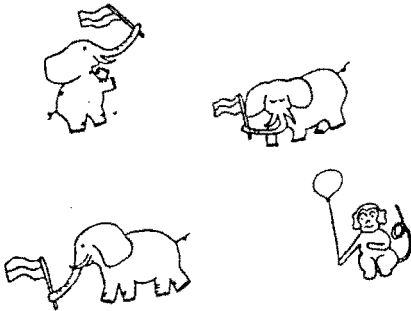
---Is every boy riding
a pony?
---No, not that one!

b. control 1



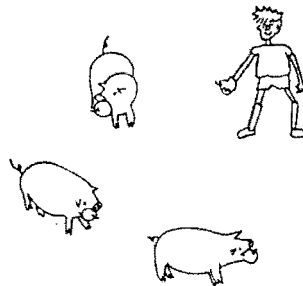
---Is every boy holding
an umbrella?
---No, one has a balloon

c. control 2



---Is every elephant
holding a flag?
---Yea

d. control 3



---Is every pig eating
an apple?
---Yea

Restricting our attention to the non-adult-like response in (1.a)---and abstracting away from interrogative mood---, the meaning the child gives to the adult's question may be provisionally described by the logical representation in (2), which happens also to fit as a description of an available adult meaning of *The boys are riding the ponies* (Langendoen, 1978). It may also be likened to the 'complete group' interpretation of Kempson and Cormack (1981), and the 'strong symmetric' interpretation of Gil (1982).

(2) $((\forall x \in \text{boy}')(\exists y \in \text{pony}')[\text{ride}'(x,y)] \ \& \ (\forall y \in \text{pony}')(\exists x \in \text{boy}')[\text{ride}'(x,y)])$

Aside from a formidable mapping problem, this 'Sum of Plurals' interpretation (cf. Chien and Wexler, 1989) fails to achieve descriptive adequacy in that it incorrectly predicts a negative response for control condition 3 in (1.d). Keeping this in mind, it is nonetheless useful as a first pass representation of the meaning the child is entertaining.

The symmetrical interpretation phenomenon is well known in the psychological literature (for overviews see Macnamara, 1982, 1986 and Braine and Rumian, 1983). Since its discovery by Inhelder and Piaget (1964), with French *tous*, evidence of it has been documented with English *all* and *each* (Donaldson and McGarrigle, 1973; Donaldson and Lloyd, 1974; Bucci, 1978) and with *every* (Philip and Aurelio, 1991; Philip and Takahashi, 1991; Takahashi, 1991; Philip, 1991a, 1991b, to appear), with Chinese *mei* (Chien and Wexler, 1989) and with Japanese *dono-mo* and *minna* (Takahashi, 1991; Kobuchi and Philip, 1990). In a recent set of comparable studies on *every*, involving a total of 129 four-year-olds, the symmetrical interpretation was detected on average 74% of the time for the experimental condition represented in (1a)---henceforth, the *transitive condition*---as shown in (3).

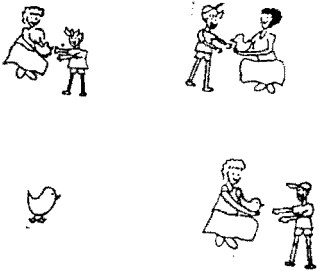
(3)

study	n	mean age	incidence of symmetrical interpretation
Philip and Aurelio 1991	20	4-3	84%
Philip and Takahashi 1991	9	4-6	80%
Philip (to appear)	41	4-9	70%
Philip 1991b	59	4-6	73%
	129	4-6	74%

The symmetrical interpretation proves to be fairly insensitive to syntactic structure. For an experimental condition formally comparable to the transitive condition in (1a) Donaldson and Lloyd (1974) found no significant effect on the phenomenon when they moved quantifiers *all* and *each* to floated positions. This finding was replicated in Drozd and Philip (1992), where in a study of 18 four-year-olds (mean age 4-9) the symmetrical interpretation was observed 64% of the time for the transitive condition with

sentences such as *The boys are all riding a pony* as against a virtually identical 67% of the time with *Every boy is riding a pony*.³ Further evidence of the insignificance of syntax comes from the observation that placing the quantifier in object position (e.g. *Is a boy is riding every horse?*) has no significant effect on the phenomenon (Philip and Aurelio, 1991: Philip and Takahashi, 1991).⁴ Nor does putting the indefinite NP in an embedded context (e.g. *Is every boy who's riding a pony waving?*) appear to have any effect (Philip and Aurelio, 1991). Finally, contra the earlier finding of Philip (1991a), we may observe that argument structure does not appear to interact with the phenomenon. Thus, for example, the pictures in (4.a) elicits the same degree of symmetrical interpretation with *Is every mom showing a boy a duck?* as does *Is every mom showing a duck to a boy?*, and likewise for the picture in (4.b) with respect to the sentences *Is every dad giving a girl a rabbit?* and *Is every dad giving a rabbit to a girl?* (Philip, 1991b).

(4) a. extra object



b. extra recipient



Linguistic aspects of the phenomenon

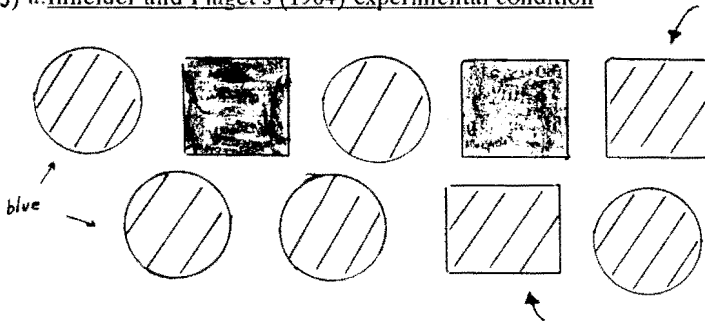
Given the seemingly non-syntactic nature of symmetrical interpretation it is not surprising that it has often been discounted as meta-linguistic phenomenon arising from an innate (Gestaltian) preference for symmetry (Inhelder and Piaget, 1964; Revlis and Leirer, 1980), or, in contemporary

³ The same study found no significant difference with respect to incidence of symmetrical interpretation between *all* and *every* across a variety of conditions.

⁴ The picture used for this condition showed five boys: three riding one pony each, two more just watching.

terms, 'cognitive isomorphism' (Roeper and de Villiers, 1991). The first theory of the phenomenon considered it symptomatic of the child being in an early stage in the development of logical competence. According to Inhelder and Piaget (1964), during the stage of the 'non-graphic collection' children cannot distinguish between the logical relations of class membership and sublogical, part-whole relations, and consequently 'all they can do to decide whether all the X's are y is to ascertain whether or not the collection of X's coincides with that of Y's...' (p.65). Formalizing this hypothesis in terms of set subtraction, we can see how it successfully accounts for cases of symmetrical interpretation with sentences like *Are all the circles blue?* when asked of the picture in (5.a). If the child is entertaining for this sentence a logical representation roughly of the form in (5.b), then he or she will answer *no* because of the presence of the blue squares; $\{y|y \in \text{blue}'\} - \{x|x \in \text{circle}'\}$ is not null. This accords with Inhelder and Piaget's (1964) observations. Their account, however, cannot be extended to the cases of symmetrical interpretation found with the transitive condition of (1.a). Under Inhelder & Piaget's (1964) account, the child's logical representation of *Is every boy riding a pony?* would be as roughly portrayed in (5.c). But this falsely predicts a *yes* response since it is the case that $\{y|y \in \text{ride} \wedge \text{pony}'\} - \{x|x \in \text{boy}'\} = \Lambda$.

(5) a. Inhelder and Piaget's (1964) experimental condition



---Are all the circles blue?

---No, there are squares and circles (i.e. some squares are blue too)

$$b. (\{x|x \in \text{circle}'\} - \{y|y \in \text{blue}'\} = \Lambda) \ \& \ (\{y|y \in \text{blue}'\} - \{x|x \in \text{circle}'\} = \Lambda)$$

$$c. (\{x|x \in \text{boy}'\} - \{y|y \in \text{ride} \wedge \text{pony}'\} = \Lambda) \\ \ \& \ (\{y|y \in \text{ride} \wedge \text{pony}'\} - \{x|x \in \text{boy}'\} = \Lambda)$$

A second major psychological account of symmetrical interpretation comes from the literature on the adult processing of syllogisms. Under certain (fatigue-inducing) conditions adults can be found to produce an

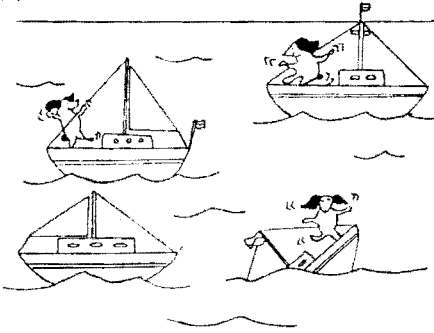
interpretation of universal quantifiers strikingly similar to that of the four-year-olds. To account for this Revlis (1975) and Revlin and Leirer (1978, 1980) have proposed the 'conversion model', according to which an original input linguistic representation of the form [all A are B] is transformed into a 'converted' output representation of the form [all B are A], where A is the subject NP and B is a predicate nominal. Both the original and the converted representation are stored in memory but since the memory stack operates on a first-in-last-out basis the converted representation always has priority. This proposal successfully accounts for the symmetrical interpretation observed under Inhelder and Piaget's (1964) experimental condition exemplified in (5.a), since it would not be the case that all the blue ones (B) are circles (A). However, again, the logical extension of this proposal⁵ to account for instances of symmetrical interpretation under the transitive condition exemplified in (1.a) falsely predicts a *yes* response: it is true of the picture in (1.a) that all the pony-riders are boys.

Despite the difficulties of these particular psychological theories one might still maintain, vaguely, that the phenomenon is due to a general, non-linguistic preference for symmetry. There are basic empirical problems with this general hypothesis, however. First, studies of children's perception of symmetry show that it is not until five or six years of age that (vertical) symmetry has a significant facilitating effect on pattern recall (Boswell, 1976). This is well after the onset of the symmetrical interpretation phenomenon, which may occur as early as 3 years of age---simultaneous, it appears, with acquisition of the basic meanings of *every* and *each*. Secondly, under the assumption that the phenomenon is purely cognitive in nature we would expect perceptual encoding alone to elicit it just as readily as linguistic input containing a universal quantifier. But this is a false prediction. When the linguistic input is a transitive predicate and a universally quantified subject the picture in (6) elicits the characteristic symmetrical interpretation response (e.g. *No, it takes a dog to dance and that boat doesn't have any*). This is the typical response for the transitive condition. For the same picture, however, there is a dramatic inhibition of the phenomenon with alternative linguistic input, as shown in the tables in (7). The contrast in the incidence of non-adult-like responses between the transitive condition on the one hand and the INTRANSITIVE and INCORPORATED conditions on the other is highly significant.⁶

⁵ Since under standard assumptions NP and VP are of the same logical type, namely <e,t>.

⁶ The fact that there is any symmetrical interpretation at all with the intransitive, bare plural and incorporated conditions is due partially to a perceptual set effect (cf. Mehler and Carey, 1976), partially to the fact that for younger children the phenomenon is not inhibited under these conditions.

(6)

transitive

---Is every dog riding a boat?

---No

intransitive

---Is every dog dancing?

---Yea

bare plural

---Are dogs riding boats?

---Yea

incorporated

---Is every dog a boat-rider?

---Yea

(7) a. Philip (1991b): n = 59; mean age 4-6

transitive	intransitive	bare plural
73%	31%	34%

(s.e. 5%)

(transitive vs intransitive/bare plural: p = 0.000)

b. Drozd and Philip (1992): n = 18; mean age 4-9

transitive	incorporated
67%	44%

(p = 0.0093)

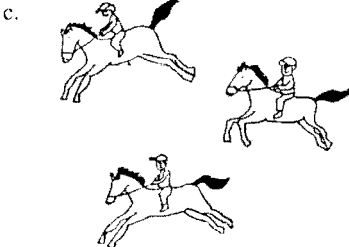
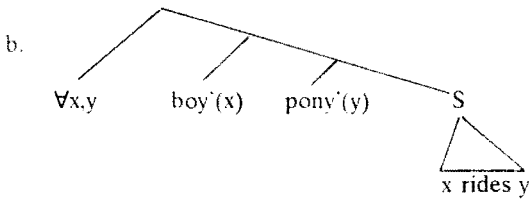
The facts in (7) show that symmetrical interpretation is not independent of linguistic content or form. The input sentence must contain a universal quantifier (cf. bare plural condition) and it must also contain one or more unincorporated indefinite NPs. This suggests that the mechanism producing the symmetrical interpretation is not meta-linguistic. Assuming Fodor's (1983) 'Modularity Thesis', the mechanism in question would seem to belong to a semantic/pragmatic subcomponent of the language faculty where syntactic structure is only minimally represented.

The proposal

As an introduction to the event quantificational account of the symmetrical interpretation that I will argue for, it is worthwhile considering first the intractability of the phenomenon within the framework of

quantification over objects. Consider first a simple Montogovian hypothesis that what the children (and tired adults) are doing is substituting a biconditional for a conditional in their interpretation of the universal quantifier, as shown in (8.a), abstracting away from intensionality. This overcomes the mapping problem of the representation in (2) but, again, like the psychological accounts discussed above, it fails to explain the basic phenomenon as observed under the transitive condition. It is the case that every pony-rider is a boy.

(8) a. $\lambda P \lambda Q \forall x [P(x) \leftrightarrow Q(x)]$

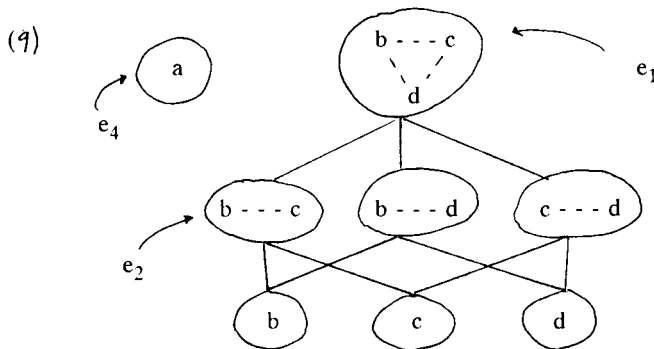


A second conceivable approach is to try to adopt a form of unselective binding (Lewis, 1975; Heim, 1982) to account for the phenomenon, as shown in (8.b). This works for the transitive condition; however, it makes the (absurdly) false⁷ prediction that children will reject the picture in (8.c) for the sentence *Every boy is riding a pony*. Nor can things be patched up very easily by quantifying over n-tuples of entities instead of individual entities, as, for instance, in May's (1989) analysis of 'resumptive quantification'. This would simply return us to the problem of falsely predicting a *yes* response

⁷ Attested by virtually every study in the literature on childrens' use of universal quantifiers.

under the transitive condition. The lone pony running loose in (1.a) does not obviously constitute, without some additional (crucial) stipulation, one of a set of related entities.

Bearing these problems in mind, let us now consider the account of symmetrical interpretation I am proposing. It consists of three parts. First is the Event Quantificational Hypothesis, which claims that young children prefer to interpret universal quantification as quantification over events, at least in the case of concrete events. Here it is assumed that truth is evaluated with respect to a mental model derived by perceptual mechanisms (cf. Johnson-Laird, 1983) which may represent not only objects but also events, i.e. sets of related objects. That is, thanks to a very basic, cognitive principle, a set of objects perceived as related in some manner, whether in terms of physical proximity, cause and effect, or some other basic relation, may also be apprehended as a whole, as constituting a particular event or situation. In addition, a single object standing alone may be perceived as constituting an event ('event' subsumes both action and state). I will assume further that any given event may receive an algebraic analysis in terms of the objects that participate in it. Thus, for example, if an event e_1 of type α consists of three objects a, b and c, then it will also have six associated subevents, each one also of type α , as shown in (9). Solid lines in (9) indicate part-whole relations; circles define sets of objects that constitute events.

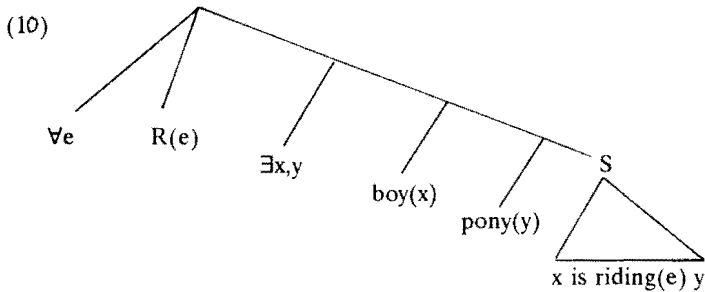


Note that the event associated with the object token a, i.e. e_4 , cannot be summed with, say, event e_2 to yield an event consisting of the participants a, b, and c. This is because there is no perceived relation between object a and objects b or d.

Assuming this psychological model, then, the Event Quantificational Hypothesis is the claim that children make use of the innate ability to perceive events to simplify an exhaustive denumeration procedure that is

activated by universal quantification. The simplification may consist in part in having less entities to individuate perceptually for the purposes of this denumeration procedure. As already noted, the strategy/option of shifting to event quantification with universal quantifiers is not unique to children; adults too exhibit the symmetrical interpretation. Furthermore, the unmarked interpretation of adult adverbs of quantification seem to call for event quantification (Berman, 1987; de Swart, 1990).

The second part of the proposal is the syntactic claim that children at this age impose a tripartite structure (cf. Heim, 1982; Partee, 1990, 1991) as the logical form they ascribe to a sentence containing a universal quantifier. Ignoring S-structure position, as if matching a template of canonical form, the child obligatorily interprets the quantifier as if it occupied a sentence-initial, adverb-like position (cf. Roeper and de Villiers, 1991), as exemplified in (10) with respect to the sentence *Every boy is riding a pony*.



Whether the child actually derives an LF fitting this description by means of an application of Move α is not clear. Such an analysis is no doubt compatible with my proposal. The point, though, is that even if there actually is quantifier fronting by a computational mechanism of the syntactic component, it would not be an instance of QR since, crucially, the NP in construction with the quantifier at S-structure is 'left behind'. Consequently, the restrictor, R, in (10), is not defined in the syntactic component.

In so far as there is a kind of primordial, 'anti-compositional' QR at work in the derivation of the logical form in (10) it would seem to be driven not by syntactic principle but rather by an interpretive need. In order for a quantifier to be interpreted it must be 'removed' from its sentential context. Having done this, though, a new interpretive problem arises: how to determine the restriction on the domain of quantification. The third part of my proposal, then, is that the content of R in (10) is supplied by a pragmatic Restrictor Rule that generates as the domain of quantification the set of all maximal events, or maximal subevents of potential events, of the type denoted by the nuclear scope S, as shown in (11).

$$(11) \quad \llbracket R \rrbracket = \{e \mid \exists e' [\text{RELEVANT}(e') \ \& \ \llbracket S \rrbracket(e') \ \& \ (e \leq e')] \ \& \ \text{MAX}(e)\}$$

where:

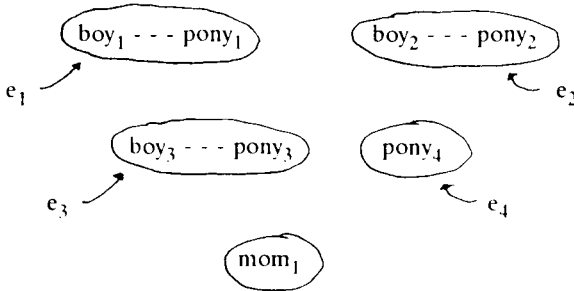
RELEVANT = contextually relevant, i.e. in the field of attention
(defined by a picture), whether actually or potentially visible

MAX = maximal event that is actually visible (in a picture),
i.e. $\{e \mid \exists e' [\text{actually} \wedge \text{visible}'(e') \ \& \ (e \leq e') \ \dashv\vdash \ (e = e')]\}$

$\llbracket S \rrbracket = \{e \mid \exists x,y [\text{boy}'(x) \ \& \ \text{pony}'(y) \ \& \ \text{ride}'(x,y,e)]\}$

As a result of restricting the domain of quantification in this manner, the child is compelled to judge the sentence *Every boy is riding a pony* false with respect to the picture in (1.a) because there will be included in the domain of quantification one sub-event of a boy-riding-pony event in which it is not the case that a boy is riding a pony, as shown in the mental model in (12), where $\llbracket R \rrbracket = \{e_1, e_2, e_3, e_4\}$.

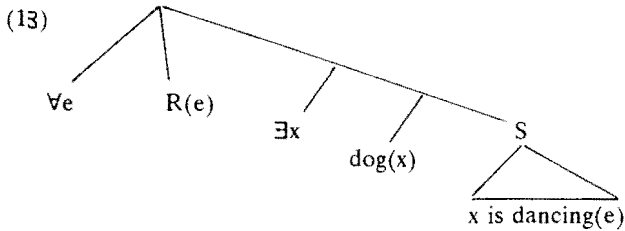
(12)



The falsifying case is event e_4 , which has ended up in the restricted domain of the quantifier because it is a maximal subevent of a potential instance of the type of event described by the nuclear scope, but which is falsifying because it does not in fact satisfy the truth conditions stipulated by the nuclear scope.

Having examined the basic manifestation of the phenomenon, i.e. the non-adult-like negative response of the transitive condition, we must next see how the analysis also explains its apparent disappearance under the intransitive and the incorporated conditions discussed in (6) and (7). In the case of the intransitive condition, the inhibition effect is only apparent. The

child may still be quantifying over events, but in this case the logical representation he or she entertains happens to be functionally equivalent to that of an adult quantifying over objects, as shown in (13). Hence the appearance of an inhibition of non-adult-like responses. The functional equivalence with adult readings occurs because the Restrictor Rule puts no falsifying case into the restricted domain of quantification when *S* denotes a set of single-participant events. Such events have no discrete subevents; they are atomic.



$$\llbracket R \rrbracket = \{e \mid \exists e' [\text{RELEVANT}(e') \ \& \ \text{dog} \wedge \text{dancing}'(e') \ \& \ (e \leq e')]\ \& \ \text{MAX}(e)\}$$

As for the inhibition effect observed with the incorporation condition, this may be explained in terms of an abandonment of quantification over events in the face of a need for a more generic, individual-level reading of the predicate. Following Kratzer (1989), for instance, we may suppose that by their very nature individual-level predicates lack implicit event variables. In this case, insofar as the child is sensitive to the generic quality of the predicate under the incorporated condition, she or he will be unable to quantify over events. The Restrictor Rule will simply never get a chance to apply because event quantification is abandoned all together in favor of adult-like quantification over objects.

This explanation of the phenomenon observed under incorporated condition also sheds some light on how the child is able to outgrow the symmetrical interpretation and eventually attain the adult grammar in which quantification over objects is obligatory for determiner quantifiers like *every*. There is no need to 'un-learn' anything. The child simply shifts from quantification over events to quantification over objects. In this case the Restrictor Rule stands idle. Without quantification over events there is no way for the rule to apply so as to produce the symmetrical interpretation.

It should also be noted that there is an earlier stage, just after the basic quantificational force of every has been acquired, during which the child quantifies over events but does not appear to have the Restrictor Rule. Instead, the domain of the quantifier is restricted purely in terms of what is taken to be the contextually relevant set, i.e. the set of all objects shown in

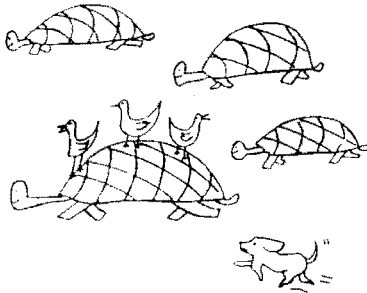
the picture. A key indication of this earlier stage is rejection of the picture under the transitive condition with reference to the extra, unmentioned agent as justification for this response (e.g. because of the mom in (1.a)).⁸

Predictions

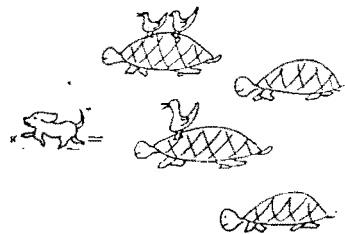
Having accounted for the basic facts of symmetrical interpretation, we may now see how the analysis also offers an explanation of why children at this age have such a strong, non-adult-like insistence on the distributive/wide scope reading of universal quantifiers, especially in the case of *every* and *each*. In addition, we finally find an explanation of a small but recalcitrant fact, first observed by Takahashi (1991), namely the fact that the phenomenon appears to be turned off under control condition 3, as exemplified in (2.d).

Evidence of children's strong preference for a distributive reading of universal quantification is found in their rejection of (14.a) and (14.b) as pictures satisfying the truth conditions of sentences *The birds are all riding a turtle* and *Every bird is riding a turtle* (Drozd and Philip, 1992). For pictures such as (14.a) negative responses were elicited 69% of the time for a group of 36 children. For (14.b) it was 80% of the time with 10 children. In all cases children gave the characteristic symmetrical interpretation response (e.g. *No, because there's no bird on that turtle, that turtle or that turtle*). This is just as predicted.

(14) a. collective



b. cumulative



Turning to the case of control condition 3, the adult-like response in this case was unexpected and somewhat problematic, not only for the Sum of

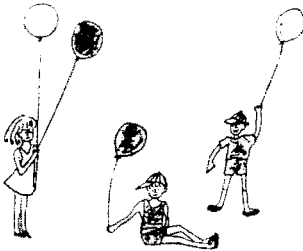
⁸ In addition, the younger child fails control 2 exemplified in (1.b), referring to the monkey holding the balloon as the reason for saying *no*. This earlier restriction of the domain of quantification purely in terms of contextual relevance seems non-linguistic.

Plurals account but also for earlier versions of the Restrictor Rule (cf. Philip, 1991a and b). But now this response is predicted since the event of the boy holding an apple in (1.a) will not be put into the restricted domain of quantification by the new Restrictor Rule. It is not a subevent of a real or potential event of the type denoted by the nuclear scope; an event of a boy eating an apple is not be a subevent of a pig eating an apple. Therefore, there is no falsifying case and just as with the intransitive condition the child's logical representation turns out to be functionally equivalent to that of the adult, event though the child is quantifying over events.

Conclusion

We have seen that a series of recalcitrant facts about children's use of universal quantifiers can receive a unified and principled explanation under the proposed analysis. The principal claims are: (i) that children overgeneralize quantification over events or situations, applying it even to determiner quantifiers; (ii) that they lack a compositional means (e.g. QR) of deriving a restriction for the domain of the universal quantifier, and instead make use of a pragmatic mechanism; and (iii) that as a consequence of their non-adult-like treatment of universal quantifiers, children manifest a preference for distributive readings. As regards the notion of a primitive, 'anti-compositional' form of QR, there may be some independent evidence for this hypothesis in the way children at this age handle the quantifier *only* (Crain, Philip, Drozd, Roeper and Matsuoka (in progress)). It seems that children give a single interpretation to a sentence containing *only* regardless of its syntactic position. For example, with respect (15), all three of the sentences on the right are found false of the picture for the same reason, i.e. because a boy has a balloon too. It is as if the children were always fronting *only* to a sentence-adverbial position prior to interpreting it.⁹

(15)



Only the girl has a red balloon
The girl only has a red balloon
The girl has only a red balloon

⁹ And interpreted it as 'living on' the subject NP

Whether or not the children's linguistic behavior is evidence that in the absence of QR they are nonetheless fronting quantifiers to A-bar positions, by means of a kind of incipient QR, it seems clear that their derivation of logical form is semantically driven. Extracting a quantifier from a sentence satisfies an interpretive need; it serves a semantic function. It is not the side effect of some gradually maturing innate compulsion to restructure linguistic representations.¹⁰ Similarly, the need to find a restriction for the domain of quantification is also an interpretive need. In the absence of QR some other mechanism is seen to arise in order to satisfy this need. In this sense the Restrictor Rule looks like a form of accommodation. The child knows that universal quantifier calls for some sort of restriction to the domain of quantification; the problem is how to 'accommodate' this need.¹¹ Alternatively, viewed from phylogenetic perspective, we might wonder if QR itself were not the grammaticization of a rule of accommodation. In any case, it is interesting to note that the Restrictor Rule conforms to Subset Principle, albeit in a purely semantic domain.

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¹⁰ In light of the arguments of Pinker and Bloom (1990), it seems extremely unlikely that any major mechanisms of the language faculty are functionless.

¹¹ '[The child] derives from the language a general notion of the theme---of the elements involved and the *kinds* of relation that are referred to ...but linguistic considerations alone leave open to [the child] certain options' (Donaldson and Lloyd, 1974: 82)

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