Animacy, Expletives, and the Learning of the Raising–Control Distinction

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1. Introduction

In the past few years, renewed attention has been paid to the raising–control distinction both in adult grammar and in language acquisition research. This paper contributes to the discussion by addressing the following specific questions: Which cues available in language do young children make use of in discriminating these two verb classes? At what age do children come to have an adult-like distinction between the two classes?

I will begin with a brief background on the nature of the learning problem at hand. Then I will present my previous experimental findings and how I had accounted for that data. New data from two further experiments will be presented. The first experiment follows up on an alternative explanation for the original data, by examining children's pairing of subjects and predicates on the basis of animacy in simple, monoclausal sentences. The second experiment examines children's willingness to permit control verbs in a further sentential environment which, in the adult grammar, permits only raising verbs; namely, with expletive subjects. I will argue that results from both of these experiments support the original account.

Let us start with why there is a learning problem at all. Both raising verbs and control verbs can occur in the following sentence string:

(1) John ———— to be clever.
    a. John seems to be clever.
    b. John claims to be clever.

Upon hearing a novel verb in this context only, as in (2),

(2) John gorps to be clever.

a learner does not have an immediate means of determining whether the novel verb is in the raising or the control class. In other words, the string in (1)/(2) is ambiguous. Fortunately, learners will encounter other sorts of evidence that helps them. For instance, they might then encounter the same verb (*gorp*) with an expletive subject, as in (3) or (4).

(3) It gorps to be raining.
(4) There gorp to be a lot of people registered for the conference.

Such evidence would let learners know that *gorp* is a raising verb, not a control verb. A problem remains, however; namely, there are verbs that are ambiguous between being raising and control verbs. These are verbs like *begin, start, continue* and *have*. These verbs can occur with expletive subjects and thus can be raising verbs, as in (5).

(5) a. It began to rain.
    b. It started to snow.
    c. There continued to be a lot of disagreement.

    d. There has to be a solution.

However, these verbs can also function as control verbs, shown in (6).

(6)   a. John began to eat a sandwich.

        b. Mary started to write a novel.

        c. Bill continued to pick on Sarah.

        d. Joanne has to leave by 5p.m.

According to Perlmutter (1970), it is the animacy of the subject that determines whether these verbs are raising or control when they occur in the ambiguous string. It should not be surprising, then, that subject animacy is a significant factor in leading adults to assume that the string in (1) (i.e., with a blank where the verb should be) is a raising or a control sentence (Becker, 2005): when the subject of the sentence is animate, adults strongly tend to choose control verbs to go in the blank. When the subject is inanimate, adults strongly tend to choose raising verbs for the blank. In both cases, however, people also choose ambiguous verbs a significant portion of the time. Therefore, I have argued in previous work that learners must rely on different cues across multiple types of sentence frames in order to distinguish raising, control and ambiguous verbs.

2.   Previous Findings

In other experimental work (Becker, 2006a,b) I investigated whether children make use of the cue of subject animacy in distinguishing raising from control verbs. In the experiment (which I will refer to as Experiment A), children were asked to judge whether a puppet's comment about a cartoon picture was "okay" or "silly". All test sentences contained an inanimate subject, either a raising or a control main verb, and an embedded predicate which itself was either compatible or incompatible with the matrix subject.

Table 1: Test Items in Experiment A

Item	Type
The door is trying to be purple	control/compatible
The door is trying to be friendly	control/incompatible
The hay seems to be on the ground	raising/compatible
The hay seems to be excited	raising/incompatible

For example, in the sentence *The door is trying to be purple*, the predicate *be purple* is compatible with the subject *door*, since doors can be purple. But in *the door is trying to be friendly*, the predicate *be friendly* is incompatible with *door* since doors can't be friendly.

Participants in this experiment were 43 children ages 3 to 5 years. The results are given in Tables 2 and 3.

In these data, we can see that the primary difference between the younger children and the older children is in their responses to sentences like *the door is trying to be purple*. The younger children tended to accept this sentence as OK while the older children tended to reject it as silly. (Please see Becker (2006b) for details about the statistics of these results.)

The account given in Becker (2006b) is that given an inanimate subject, 3-year-old (and some 4-year-old) children analyze the main verb as a raising verb, even if the verb is in fact a control verb in adult grammar. That is, the sentence *the door is trying to be purple* would be OK if the main verb had been *seem* (thus: *the door seems to be purple*); *the door is trying to be friendly* would still be silly (cf. *the door seems to be friendly*).

Table 2: Results of Experiment A: Relative Proportion of OK/Silly Responses

Type	Item	3-year-olds		4-year-olds		5-year-olds	
		OK	silly	OK	silly	OK	silly
control/compat.	The door is trying to be purple	▭		▭		▭	**
control/incompat.	The door is trying to be friendly	▭	*	▭	**	▭	**
raising/compat.	The hay seems to be on the ground	▭	*	▭	**	▭	*
raising/incompat.	The hay seems to be excited	▭	*	▭	**	▭	**

$*p \leq 0.05$, $**p \leq 0.01$

Table 3: Results of Experiment A: Percent OK/Silly Responses (%)

Type	Item	3-year-olds		4-year-olds		5-year-olds	
		OK	silly	OK	silly	OK	silly
control/compat.	The door is trying to be purple	67	33	47	53	17	83
control/incompat.	The door is trying to be friendly	30	70	16	84	0	100
raising/compat.	The hay seems to be on the ground	77	23	91	9	79	21
raising/incompat.	The hay seems to be excited	27	73	12	88	0	100

Another possible explanation for the results is that the youngest children simply ignored the main verb in these sentences. This possibility was tested in a follow-up experiment.

In this experiment (Experiment B), 52 children ages 3 and 4 participated in a truth-value judgment task. They listened to stories told by the experimenter. At the end of each story a puppet made a comment about what happened in the story, and children had to say whether the puppet was right or wrong. The stories and test sentences were constructed in such a way that in order to respond to the test sentences correctly, children had to parse/interpret the main verb. Here is an example.

> This is a story about a sheep who liked to play tricks on the farmer. Sometimes the sheep would hide so the farmer couldn't find him. Or he would wait behind a tree till the farmer was coming and then he'd jump out and surprise the farmer! One day the sheep wanted to hide from the farmer. The sheep found a big piece of shiny red plastic and went under it. The sheep thought the red plastic was magic and would make him disappear, but really the plastic just made the sheep look red. When the farmer came by, he saw the sheep under the red plastic and said, "Hey, wait a minute! My sheep is red! How did that happen?"

Half of the children heard the true statement "The sheep seemed to be red" and half heard the false statement "The sheep seemed to have disappeared."

The results are given in Table 4.

Table 4: Results of Experiment B: Percent Correct

age	raising	control
3	64.0*	65.9*
4	78.3**	88.4**

$*p < 0.05$, $**p < 0.01$, one-tailed

For both age groups, the means are significantly above chance for both raising and control verbs. This result tells us two things: firstly, children do not ignore the main verb of the sentence. Secondly, since all test sentences had an animate subject, we can see that given an animate subject children correctly interpret control verbs: they do not incorrectly interpret them as raising verbs when the subject is animate.

However, there is still another possible alternative account of the results of Experiment A: perhaps the youngest children in the first experiment have a nonadult-like concept of animacy, such that they think that inanimate things are alive and thus could "want" or "try" to do something. In fact, a few of the children in Experiment A said that, for example, a flower could want to be a certain color. This hypothesis was tested in Experiment 1.

3. Experiment 1: Animacy

The purpose of Experiment 1 was to find out whether 3- and 4-year-olds have adult-like concepts of animacy or whether they think (incorrectly) that inanimate things can have properties of living things. A large body of research suggests that children in fact distinguish living from nonliving things from a very young age.

Work by Carey (1985), Gelman (1990), and Woodward et al. (1993), among others, shows that infants as young as 7 months of age have correct expectations about the physical properties of living and nonliving things. For example, they show surprise (indicated by longer looking times) when an inanimate thing moves spontaneously (that is, without being pushed by another object). But infants do not hold this expectation of humans: they show no surprise when a human moves spontaneously.

Massey and Gelman (1988) showed that preschoolers make a mostly adultlike distinction between animate and inanimate things. Massey and Gelman asked 3- and 4-year-olds to judge whether a number of depicted objects (including mammals, non-mammals, statues of animals, wheeled vehicles and rigid objects) could move up or down a hill by themselves. Both 3- and 4-year-olds said that mammals and non-mammals could move up or down a hill by themselves, that statues of animals and rigid objects could do neither, and that wheeled vehicles could not go uphill by themselves. Interestingly, the large majority of the children's nonadult-like answers involved judging that animals could *not* go up the hill (as opposed to judging that nonliving things *could* go up the hill by themselves). In some cases it was because the child judged the animal to be too small to go up a big hill; in other cases it was because the child could not identify the animal's feet in the picture.

In my own work, many of the children's justifications of their responses in Experiment A also betrayed an adult-like understanding of animacy. For example, children would say things like "Flowers don't talk" (when justifying why *The flower wants to be pink* is silly; age 4;0) or "It doesn't have a mouth" (when justifying the silliness of *The basket appears to be hungry*; age 3;10). Other examples of children's appropriate justifications are given in (7).

(7) a. *The paint is trying to eat the grass* → "Paint wouldn't do that" (3;5)

  b. *The bucket wants to play in the sandbox* → "Buckets don't have feet" (3;10)

  c. *The door is trying to be purple* → "Doors don't change colors" (4;3)

  d. *The paint is trying to drip on the ground* → "OK, because paint is messy" (Experimenter: Could the paint try to drip on the ground?) "Yes . . . actually no, paint doesn't try, it just drips" (4;3)

3.1. Procedure

In Experiment 1, 48 children ages 3 and 4 years participated in a sentence judgment task (24 3-year-olds and 24 4-year-olds). An additional 6 children were run but were excluded due to a failure to complete the task. The task was introduced as a picture game in which we would look at a series of cartoon pictures together with a puppet, and the puppet (Marvin the Monkey) would comment on each picture. The children were told that sometimes Marvin says the right thing about the picture, but sometimes he says the wrong thing or a silly thing. Examples were given of what would count as "right" or as "wrong/silly". Children were encouraged to feed Marvin a banana if he was right, or an apple if he was wrong.

Test sentences paired both animate and inanimate subjects with either animate or inanimate predicates. Each child heard one exemplar of each type of sentence, illustrated in Table 5, plus filler sentences interspersed.

Table 5: Test Sentences in Experiment 1

Example Sentence	Subject	Predicate	Target Response
Bert is friendly	animate	animate	OK
Bert is purple	animate	inanimate	silly
The door is friendly	inanimate	animate	silly
The door is purple	inanimate	inanimate	OK

Thus, there were 4 different lists and each child saw only one list of sentences. The pictures were the same for all children.

3.2. Results and Discussion

Table 6 shows the mean percentage of correct responses collapsing across predicate type.

Table 6: Mean Percent Correct (collapsing across predicate type)

Subject	3-year-olds	4-year-olds
Animate	85.1%*	93.5%*
Inanimate	87.5%*	87.5%*
	$*p < 0.001$	

Correct versus incorrect responses were compared using a logistic regression adjusted for multiple observations within participants. All means are significantly above chance: for age 3 with animate subjects, $\chi^2 = 19.52, p < .0001$; for age 3 with inanimate subjects, $\chi^2 = 19.16, p < .0001$; for age 4 with animate subjects, $\chi^2 = 29.88, p < .0001$; for age 4 with inanimate subjects, $\chi^2 = 23.57, p < .0001$ (all are Wald's chi square and all have 1 degree of freedom). There was no main effect for animacy (Wald's $\chi^2 = .38, p = .54, df = 1$), nor was there a main effect of age (Wald's $\chi^2 = 1.35, p = .25, df = 1$), both on the margin. There was also no age×animacy interaction, either for subject animacy or predicate animacy.

Table 7 shows the results taking into account the predicate type as well. (Since the means in Table (7) are very close to those in Table (6) I did not make an independent comparison of these means to chance.)

Table 7: Mean Percent Correct (with predicate type)

Subject–Predicate	3-year-olds	4-year-olds
Animate–Animate	83.3%	100%
Animate–Inanimate	87.0%	87.0%
Inanimate–Animate	87.5%	91.7%
Inanimate–Inanimate	87.5%	83.3%

The results show that children in both age groups are highly significantly above chance in responding in an adult-like way to these sentences. There were no significant differences between age groups, or between sentences with animate vs. inanimate subjects or animate vs. inanimate predicates. Thus, consistent with previous research on children's concepts of animacy, preschoolers distinguish reliably between living and nonliving things, and they do not deviate widely from adults in their notion of which properties are appropriate for living vs. nonliving things. This result runs counter to the alternative explanation and therefore supports the original account for Experiment A.

4. Experiment 2: Expletives

Experiment A showed that in one particular sentential environment young children analyzed control verbs as if they were raising verbs; namely, when the subject of the sentence was inanimate. If this is in fact the correct analysis of the result, then children of the same age should also permit control verbs to occur with expletive subjects, since this is an environment that tolerates only raising (or raising and ambiguous) verbs. This is what was tested in Experiment 2.

4.1. Procedure

This experiment was also a sentence judgment task, and 48 children ages 3-4 years participated (24 3-year-olds and 24 4-year-olds). Many of the same children who participated in Experiment 1 also participated in Experiment 2. An additional 9 children were run but were excluded due to a failure to complete the task. Children were shown a series of cartoon pictures of weather events and were asked to judge Marvin the Monkey's comment about each picture as being either OK or silly. Examples of OK and silly puppet comments were given in the pretraining phase.

The test sentences are given in Table 8.

Table 8: Test Sentences in Experiment 2

Sentence	Main verb	Target Response
It wants to be raining	control	silly
It seems to be snowing	raising	OK
It's trying to be sunny	control	silly
It appears to be cloudy	raising	OK

4.2. Results and Discussion

Table 9 shows children's mean percentage of "OK" responses; that is, the proportion of the time they accepted these sentences.

Table 9: Responses in Experiment 2: Percent Judged OK

Verb type	3-year-olds	4-year-olds
raising	82.98%**	91.67%**
control	66.67%*	68.09% (ns)
$*p < 0.05, **p < 0.01$		

For both age groups, mean "OK" responses to items with raising verbs are significantly above chance, as expected. For the items with control verbs, the 3-year-olds are marginally significantly above chance in their OK responses ($p = 0.03$), and 4-year-olds are almost, but not quite, significantly above chance ($p = 0.06$). (The reason that the higher mean for the 4-year-olds is not quite significant, while the lower mean for the 3-year-olds is significant, is that there were slightly fewer observations for the 4-year-olds (47 vs. 48) because one child failed to respond to one of the items.)

A comparison between raising and control verbs within age groups revealed a significant difference for the 4-year-olds but not the 3-year-olds (3-year-olds: Wald's $\chi^2 = 3.04, p = 0.08, df = 1$; 4-year-olds: Wald's $\chi^2 = 5.41, p = 0.02, df = 1$). There was no significant difference between age groups for

either verb (3 vs. 4 for raising: $\chi^2 = 1.45, p = 0.23, df = 1$; control: $\chi^2 = 0.02, p = 0.90, df = 1$). The overall test of equality of the means was significant (Wald's $\chi^2 = 10, p = 0.02$).

Thus, both age groups were quite good at accepting raising verbs with expletives. They were slightly less inclined to accept control verbs with expletives but still accepted them more than half the time. It is interesting to note that the the difference between raising and control responses was not quite significant for 3-year-olds, and both 3- and 4-year-olds gave "OK" responses to control verbs a fairly high proportion of the time.

When children rejected raising verbs with expletives the reason was either unclear, or the rejection seemed to stem from an objection to the particular picture or picture-sentence pair for reasons that seemed unrelated to the main verb. For example, one of the sentences on one list was "It seems to be windy" and had a picture of a person holding an umbrella that had been blown inside out. At least one child pointed to the umbrella and said it was raining, even though there was no rain in the picture. Also, one child rejected the sentence "it appears to be cloudy" saying that "it *is* cloudy." This kind of justification could suggest either difficulty with the construction (the same child also rejected the other raising sentence and when asked for a justification said he didn't know), or unfamiliarity with the lexical meaning of *appear*. I should point out that this child was the only one who was incorrect on both raising sentences; it was very common, however, for children to be incorrect on both control items (27 children out of 48 were incorrect on both control items). I will come back to the issue of children's rejections of raising items in the final discussion.

Children did not often provide justifications for their rejections of control verb items (even when asked), but when they did, two kinds of justifications emerged. One kind was rejection based on grammaticality (i.e., it can't try to be sunny, etc.). The other kind of justification indicated that children did not find the sentences ungrammatical but rather inappropriate for the picture. For example, in the picture accompanying "It wants to be raining" there was a picture of a cloud and a few drops of rain coming out of it. Some of the children said that sentence was wrong "because it *is* raining". The picture accompanying the sentence "It's trying to be sunny" showed a drawing of a sun on a clear-blue sky. Some children objected that it *was* sunny. Asked whether it could try to be sunny three of the children said yes. A telling exchange with a 4-year-old illustrates. The exchange in (8) is a conversation with child SM (4;11) on a rainy day:

(8)   EX: does it want to be raining today?
      SM: no
      EX: why?
      SM: because it IS raining
      EX: what if it was sunny, could it want to be raining?
      SM: no
      EX: why?
      SM: because it's sunny
      EX: what if it was cloudy? If it was cloudy could it want to be raining?
      SM: yes. If it was a dark cloud.

5.   Summary and Implications

Let us now summarize and look at the implications of these results. The children interviewed in Experiment 1 showed that they have virtually adult-like judgments about the pairing of animate subjects with animate predicates and inanimate subjects with inanimate predicates. That is, they rejected mismatches of either sort. The children interviewed in Experiment 2 disallowed control verbs with expletive subjects more than they did raising verbs in this context, but they did accept control verbs with expletive subjects more than half the time (for 3-year-olds, significantly more than half the time).

The purpose of running Experiment 2 had been to see whether young children allow control verbs to occur with expletive subjects (an environment that permits only raising or ambiguous verbs in adult grammar) the same proportion of the time as they did with inanimate subjects in Experiment A. For 3-year-olds the answer is clearly yes: they accepted control verbs with an inanimate subject 67% of the time in Experiment A (provided the lower predicate was compatible with the subject), and they accepted

these verbs with an expletive subject 67% of the time in Experiment 2. It came out a little differently with 4-year-olds, who had accepted control verbs with an inanimate subject only 47% of the time in Experiment A, but accepted them with an expletive subject 68% of the time in Experiment 2. This result may reflect the fact that expletives serve as a stronger or more coercive cue that the main verb is a raising verb than inanimate subjects.

Thus, these results provide support for the original account of the data from Experiment A, namely that young children (3- and some 4-year-olds) interpret verbs occuring with an inanimate subject as a raising verb even if the verb is in fact a control verb in adult grammar. That is, they use an inanimate subject as a cue that the main verb is a raising verb, just as the adults in my fill-in-the-blank study had (Becker, 2005). Experiment 1 supports that account because it rules out the possibility that children were responding they way they did in Experiment A because they had nonadult-like concepts of animacy, and Experiment 2 supports it because it shows that children behave the same way in another sentential environment that should be a cue for raising verbs.

A question remains, however, as to why children do not accept 100% of either raising or control verbs in the weather context in experiment 2. Twenty of the 27 children in Experiment 2 who got both control items wrong were completely consistent, accepting both of the raising items and both of the control items (filler items ensured this did not result from a yes-bias). But there were several children who either got only one of the control items wrong or got one of the raising items wrong. A closer look at these responses reveals the following distribution:

Table 10: Number of Correct and Incorrect Responses to Raising Items in Experiment 2

	age 3	age 4
both correct	18/24	19/24
one correct	5/24	5/24
both incorrect	1/24	0/24

Table 11: Number of Correct and Incorrect Responses to Control Items in Experiment 2

	age 3	age 4
both correct	3/24	5/24
one correct	9/24	3/24
both incorrect	12/24	15/24*

*One response was missing

A test of no association between the correctness of the first and second responses was significant for the 4-year-olds for control verb items (Fisher's exact $p = .01$), meaning that if a child was correct on the first item, she was likely to be correct on the second item as well. For the 3-year-olds for control verbs this test was not significant (Fisher's exact $p = .62$).[1] Therefore, while the 3-year-olds may have been guessing in their responses to control items, it is unlikely that the 4-year-olds were guessing. While it is not possible to determine statistically whether responses for raising items were associated, the high degree of consistency of responses to these items suggests that children responded (at least mostly) on a principled basis.

The following is my analysis of children's pattern of responses: these children are at a stage of lexical development in which they are finding out about the lexical boundaries of words: how many different meanings does a given word allow? how many different kinds of environments can a single word occur in? They accept the use of control verbs with expletive subjects some of the time because they are still finding out the boundaries of these verbs' lexical properties. I don't think that children are

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[1] A test of no association was also run for both age groups on the raising items; it was not significant for either age group because there was an insufficient number of incorrect responses to determine whether there was an association or not.

confused about what *want* or *try* typically means: as we saw in Experiment B children interpret them correctly when used with an animate subject, and children use it correctly in spontaneous speech at this age. But young kids may have a somewhat more flexible entry for these verbs than adults do, permitting them in a wider range of contexts and with a slightly wider range of meanings than adults do.

As for why children sometimes rejected the raising sentences in Experiment 2, I think there are a few different possibilities, some of which I mentioned previously. Some of the rejections seemed to hinge on my choice of pictures; some rejections may have resulted from difficulty with the construction (although there was only 1 child out of 48 who was incorrect on both raising items, so I think this is not a strong possibility for most of the kids); and some rejections may have resulted from unfamiliarity with the verbs *seem* or *appear*. Neither verb is as frequent in use to children as *want*; within the Brown corpus on CHILDES *appear* is virtually never used in speech to children and *seem* occurs fewer than 20 times.[2]

To come back to the questions we started out with: inanimate subjects and expletive subjects serve as a cue for children (as they do for adults) that the main verb is a raising verb. The difference between young children on the one hand and older children and adults on the other is that young children are largely "frame compliant" (to borrow a term from Lidz et al. (2004)), while older children and adults are "verb compliant." An adult will reject "It's trying to be sunny" because they know that *try* is not the sort of verb that can go in this sentence frame. Young children accept the sentence because they know that the frame "It ——— to be sunny" requires a certain kind of verb, so whatever verb is in the blank must be of the right sort.

It remains to be determined exactly how children proceed through the process of drawing inferences about verbs' semantic and syntactic properties. One way to investigate this process is by using nonce verbs. I have recently begun piloting a new study to investigate whether children can use the experience of hearing a novel verb used in different frames, such as with an inanimate subject, to make an inference about that novel verb's ability to occur with an expletive subject. Hopefully this line of work will pinpoint more precisely children's lexical entries for these verbs and how children draw inferences about verbs' lexical properties across multiple occurrences.

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[2]I am aware that Christopher Hirsch has looked at a wider range of samples and finds more frequent usage of *seem* to some children (C. Hirsch, p.c., Hirsch and Wexler to appear), but the ratio I found between *want*+infinitive and *seem*+infinitive in the Brown corpus on CHILDES is 413:18.

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