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Pragmatic leads and null Subjects: When Children Consult Leads and When They Do Not

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1. Introduction

On asking adults to assign an interpretation to a null subject (from here on *ec*) in control constructions, for the most part they vary their responses according to the sub-type with which they are presented. Canonical object control, for example, as in (1), results uniformly in object responses. That is, the purported letter-writer must be *Peter*.

(1)   John persuaded/told/ordered $Peter_1$ [ec_1 to write the letter].

If the sentence is preceded by a weak or strong pragmatic lead, as in (2) and (3) respectively, their responses remain unchanged. *John* is never equated with the *ec* (Janke and Bailey to appear).

(2)   Let me tell you something about John. John persuaded $Peter_1$ [ec_1 to write the letter].

(3)   John is starting his job application. John takes out his laptop. John persuaded $Peter_1$ [ec_1 to write the letter].

This result is unsurprising as object control is classified as a so-called 'obligatory control' construction in which the *ec*'s reference is restricted to a single, local, structurally higher antecedent (Williams 1980). Since it is grammatically regulated, pragmatics should not be able to affect its interpretation. If we take another sub-type of control, however, such as a controlled verbal gerund subject, adults' responses are not so restricted. In (4), there is a strong bias to link the reference of the *ec* to the only sentence-internal referent mentioned, namely *Peter*, but the link is not mandatory, and it is possible for us think of an alternative, if less preferred, interpretation, such as *Peter* listening to someone else read.

(4)   [*ec* Reading the book slowly] made Peter tired.

The variable nature of the *ec*'s reference in controlled verbal gerund subjects becomes more apparent if we apply the same type of pragmatic leads that we used for the example in (1) to the example in (4).

(5)   Let me tell you something about John. [*ec* Reading the book slowly] made Peter tired.

(6)   John is reciting a poem. John stresses each word carefully.

[*ec* Reading the book slowly] made Peter tired.

The strong bias to pick *Peter* in (4) is substantially reduced in (5), and nearly removed entirely in (6). If, however, we prime the internal referent instead, as in (7), our interpretative choices shift back once again to *Peter*. So the cue's influence on our interpretative choice is pretty decisive.

(7)   Peter is reciting a poem. Peter stresses each word carefully.
        [*ec* Reading the book slowly] made Peter sleepy.

Once again, this pattern of responses is expected since controlled verbal gerund subjects belong in the 'non-obligatory control' category, so called because the *ec*'s reference can either be interpreted generically or linked to a context-derived referent, as in the examples above.

    But there is one sub-type of control which seems to behave differently from either of the two examples we have just seen. This is sentence-final temporal adjunct control, as illustrated in (8).

(8)   John tapped Peter [while *ec* feeding the dog].

Final temporal adjunct control has long been described as strictly subject-oriented (see Landau 2013). As such, on most accounts it is classified as obligatory control, which requires the *ec*'s reference to be linked to a unique, sentence-internal, structurally dominant antecedent. A slightly surprising finding in Janke and Bailey (accepted) was that in fact, adults do not opt absolutely for a subject-oriented reading in examples such as (8). In addition, when presented with pragmatic leads that prime the object, their interpretative choices shift marginally towards it in the face of a weak lead, as in (9), and substantially so under the pressure of a strong one, as in (10). This is in stark contrast to their responses to object control, for which they completely ignored either strength of cue.

(9)   Let me tell you something about Peter. John tapped Peter [while *ec* feeding the dog].

(10)   Peter is in charge of the animals. Peter takes out their food. John tapped Peter [while *ec* feeding the dog].

This is interesting because it implies that this sub-type of adjunct control doesn't fit neatly under standard definitions of obligatory or non-obligatory control. Like obligatory control, it is restricted to a sentence-internal referent (see Landau 2013), but unlike obligatory control, its referent can be shifted towards the object under the pressure of a strong pragmatic lead. However, this *ec* is not as permissive as the *ec* in non-obligatory control, suggesting that it does not sit naturally in this category. Final temporal adjunct control, for example, always takes specific interpretations, never generic ones and the influence of pragmatic leads is rather different. Specifically, the effect of the weak lead is marginal and the strong lead, although significant, causes nothing like the shift in interpretations that it does in the verbal gerund subject illustrated in (7), where the lead decides the referent. The implications this pattern has for the classification of temporal adjunct control is discussed further in Janke and Bailey (to appear), the focus of this study, however, is on children's interpretations of the *ec*s in the three construction types that have just been set out and how pragmatic leads affect their reference assignment choices.

    The prior use of pragmatic leads on uncontroversial instances of obligatory control (i.e. object control) and uncontroversial examples of non-obligatory control (i.e. verbal gerund subjects) demonstrates that this

paradigm is effective in providing empirical support for the OC/NOC split. Adults ignore the cues in OC yet attend to them in NOC so they are discerning between constructions that are regulated syntactically and pragmatically respectively. An immediate question that arises is how children perform on these constructions under similar circumstances. Work by Lust, Solan, Flynn, Cross and Schuetz (1986) and Cohen Sherman and Lust (1993) has shown that from the age of six to seven, children are largely resilient to pragmatic leads for constructions whose interpretations are set (e.g. obligatory control) yet that they attend to them for constructions that admit more than one possible interpretation (e.g. overt pronouns). Their conclusions on obligatory control were recently corroborated in Janke and Perovic (to appear) in which a group of typical children aged 5;7 to 13;8 (acting as controls to children with ASD, matched on non-verbal MA and verbal MA) were found to ignore pragmatic leads in object control yet to consult them in non-obligatory control. This was true for both weak pragmatic leads, as in (2) and strong ones, as in (3). In contrast, younger children up to the age of five have been found to allow inappropriate pragmatic cues to inform their referent choices in obligatory control (Eisenberg and Cairns 1994), suggesting that this paradigm might not be used reliably with young children.

Work on controlled verbal gerund subjects in children is much rarer (see Tavakolian 1977; Goodluck 1987; Adler 2006; Janke and Perovic to appear). What has been reported is that young children exhibit a so-called external-referent bias, which means that they show a strong propensity to by-pass the sentence-internal argument for a sentence-external antecedent. Goodluck (1987), for example, reported on an act-out task used with two sets of twelve children, aged 5;11 and 6 – 6;11. Faced with sentences such as (11), children preferred to interpret the agent of the verbal gerund as someone sentence-external rather than the internal referent (i.e. the pirate). Five year-olds chose the internal referent only 36% of the time and for six-year olds, this choice decreased to 17%.

(11)   *ec* Jumping quickly over the fence scares the pirate.

More recently, Adler (2006) tested thirty children divided into three age groups (3;7, 4;5, 5;5), using a truth-value-judgement task on absolutive adjuncts[1] and controlled verbal gerund subjects as in (12).

(12)   *ec* Racing the unicorn made Shrek nervous.

She found that from the four trials administered for verbal gerunds, 24 children produced external referent responses on either 4/4 or 3/4 occasions, whereas the remaining six opted for the external referent on either 2/4 or 1/4 trials. Interestingly, no child chose the internal referent uniformly and she found no evidence of age effects (see Adler 2006, p199). To my knowledge, there are no studies on this construction on children above the age of six (aside from a preliminary one on a smaller group in Janke and Perovic 2016) so it is not known when children start to choose the sentence-internal referent preferred by adults or how they respond when presented with pragmatic leads of different strengths.

With respect to temporal adjunct control, there is much literature on young children (see Goodluck 1981; Goodluck 1986; Hsu et al 1989; McDaniels et al 1990/1; Broihier and Wexler 1995; Adler 2006) that has examined children's interpretations of temporal adjunct control in the absence of any pragmatic leads. Without any cue, children show a strong bias for a subject-oriented interpretation from about six onwards but whether children who have grasped the obligatory nature of object control (as

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[1] For example, '*ec* Lifting the table, Care Bear found Kitty' (Adler 2006).

evidenced by their ignoring inappropriate cues) also ignore object-oriented cues in temporal adjunct control is a question that has not yet been addressed. The answer is interesting because if children beyond the age at which obligatory control is acquired pattern with the aforementioned adults in being guided by the lead when make their referent choice in temporal adjunct control but not in object control, this provides further corroboration that a strictly subject-oriented analysis of temporal adjunct control is off the mark.

The current study sought an answer to this question. It focused on typical children between the ages of six and eleven to find out how they attended to pragmatic cues when making referent-assignment choices for the *ec*s in the three sub-types of control discussed above: object control, controlled verbal gerund subjects and temporal adjunct control. The central questions asked were (a) whether children ignored the subject pragmatic leads in object control, (b) how they attended to pragmatic leads priming the internal and external referents in controlled verbal gerund subjects, and (c), whether they consulted pragmatic leads priming the object in temporal adjunct control. The expectation for object control was that children of this age group, being beyond the age at which object control is still being acquired, should largely ignore pragmatic leads cueing the subject, thereby predicting a near ceiling performance. The question for verbal gerund subjects was more exploratory given the paucity of studies on this construction in this particular age bracket. It was asked whether children would exhibit the previously reported external-referent bias and whether the strengths of pragmatic lead would differ in terms of their influence on the children's referent choices. Lastly, with respect to adjunct control, on the basis of the adult pattern described above, the expectation was that children's referent choices would also be affected by the pragmatic lead, which would manifest as a shift towards the object. However, given the strong base-line bias for a subject interpretation in both children and adults, coupled with the different pattern exhibited by adults on adjunct control and controlled verbal gerund subjects in Janke and Bailey (to appear), it was anticipated that the children might be more resistant to pragmatic interference in adjunct control than in controlled verbal gerund subjects. More specifically, it would be the strong pragmatic lead rather than the weak one that would be influential, and even the strong lead would not determine referent choice definitively. Such a pattern would further support temporal adjunct control and controlled verbal gerund subjects being categorised differently. The latter are well known for the greater number of referential possibilities they permit, as well as the ease with which their interpretations are shifted, as made possible by the discourse that governs them.

2. Method
2.1. Participants

76 children (34 girls) aged between 6;9 and 11;8 years (spread evenly according to age groups from years 2 to 6) in the South East of England took part.[2] They had no hearing impairments, neurological or genetic deficits, were monolingual native English speakers, and reported as typically developing by their head teachers. Standardised tests of non-verbal reasoning (Matrices subtest of the Kaufman Brief Intelligence Test (KBIT)), verbal reasoning (Test of Reception of Grammar 2 (TROG)) and vocabulary

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[2] The task was piloted on younger children (aged 5 to 6) to see how children still at the age where adjunct control can be free (for a sub-set) performed. But the tasks proved too difficult. They scored badly on the strongly primed fillers, indicating they could not yet ignore inappropriate context for an SVO sentence, as well as on object control. They also fared badly on the vocabulary test referred to in footnote 5.

(British Picture Vocabulary Scales 2 (BPVS-2) were also conducted, the results of which are in the appendix.

2.2. Materials

A two-choice picture-selection task was used. Four examples of control were included in the test battery but here we focus only on object control, controlled verbal gerund subjects and temporal adjunct control.[3] On being presented with two pictures, children needed to select the one that best matched the accompanying sentence, which was displayed at the bottom of the screen whilst they listened to a recording of it through headphones. Item presentation was randomized automatically for each participant, and location of the correct picture was balanced throughout (left or right). Characters were restricted to four (Harry, Ron, Hermione and Luna). The object control sentences occurred in a 'no prime' condition, in which they were presented in isolation, in a 'weak prime' condition, in which they were preceded by a weak pragmatic lead priming the subject, and in a 'strong prime' condition, in which a strong pragmatic lead primed the subject.[4] The temporal adjunct control sentences occurred in the same conditions as for object control but the pragmatic leads primed the object. The controlled verbal gerund subjects were also subject to the same levels of priming but there were more conditions for this construction as both the internal referent and the external referent were primed. Six control conditions were also included. The first was a simple SVO condition and the second was an SVO embedded sentence. The third condition checked their understanding of outcome in sentences such as 'The water made Harry wet', which acted as a control for the verbal gerund subject condition. The fourth tested knowledge of 'while'. The fifth weakly primed an incorrect interpretation of an SVO sentence and the sixth strongly primed an incorrect interpretation of an SVO sentence. There were six trials in each condition.

2.3. Test Sentences

The object control conditions used the matrix verbs, *persuade*, *order* and *tell*.[5] Each instantiation was used twice. The picture corresponding to the correct interpretation depicted the character represented by the object engaged in an action, while the character represented by the subject stood by. The foil showed the subject engaging in the action. For the examples below, the corresponding picture showed *Ron* kicking the ball, with *Hermione* standing next to him, and the foil showed *Hermione* kicking the ball, with *Ron* standing next to her.

(13)   Object Control Conditions ((a) no prime, (b) weak prime, (c) strong prime).

a.   Hermione persuaded Ron *ec* to kick the ball.
b.   Let me tell you something about Hermione. Hermione persuaded Ron *ec* to kick the ball.
c.   Hermione is learning a new game. Hermione aims at the goal post. Hermione persuaded Ron *ec* to kick the ball.

For temporal adjunct control, the matrix verbs were *tap, kiss* and *lift* and the verbs in the adjunct clause were *feed*, *fly* and *wave*. The picture

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[3] A second type of non-obligatory control (long-distance control) was tested in the same battery but for reasons of space is not reported on here.

[4] In Janke and Bailey (to appear), these are described as weakly and strongly established topics. The reader is referred to this text for the criteria used.

[5] A vocabulary test based on that used in Janke and Perovic (2015) was also administered to check understanding of 'persuade' and 'order'.

corresponding to a subject interpretation of the *ec* depicted the character represented by the subject engaged in an action, with the character represented by the object standing by. In the alternative picture, the object engaged in the action. For the sentences below, the picture aligned with a subject interpretation depicted *Harry* tapping *Luna* with *Harry* feeding the owl, and the picture aligned with an object reading showed *Harry* tapping *Luna* with *Luna* feeding the owl.

(14)   Temporal Adjunct Control Conditions ((a) no prime, (b) weak prime, (c) strong prime).

a.   Harry tapped Luna while *ec* feeding the owl.
b.   Let me tell you something about Luna. Harry tapped Luna while *ec* feeding the owl.
c.   Luna is looking after the birds. Luna takes out the food. Harry tapped Luna while *ec* feeding the owl.

For controlled verbal gerund subjects, the verbs in the gerunds were *pour*, *read* and *row*. The picture corresponding to an internal-referent interpretation showed *Harry* pouring the water, with the water splashing on him whilst *Luna* stands by, whereas the picture equating to the external referent interpretation showed *Luna* pouring the water with the water splashing on *Harry*. For each level of pragmatic lead (i.e. weak and strong), there were six trials priming the internal referent and six trials priming the external referent.

(15)   Controlled Verbal Gerund Subject Conditions ((a) no prime, (b) weak prime of an internal or external referent, (c) strong prime of an internal or external referent).

a.   *ec* Pouring the water quickly made Harry wet.
b.   Let me tell you something about Luna/Harry. *ec* Pouring the water quickly made Harry wet.
c.   Luna/Harry is making a potion. Luna/Harry lifts the jug awkwardly. *ec* Pouring the water quickly made Harry wet.

For reasons of space, the six control conditions are not illustrated here but an example of each is given in the appendix.

2.4. Procedure

Testing of the three tasks and the standardised assessments (BPVS II; KBIT; TROG) occurred over three sessions, with a gap of seven to ten days between each one. The stimuli were presented on a laptop and randomized by computer software. Prior to the trial, children took part in an introductory session familiarising them with the characters and the task. They were then told that they would be shown two pictures and see and hear a sentence describing the pictures. After the sentence had finished playing, they needed to choose the picture they thought went best with the sentence. Choices were made by clicking on one of two tabs by each picture. These appeared once the sentence had played, which prevented the children from making a premature choice.

3. Results

The control conditions were analysed first (SVO; SVO-embedded; made; while; weak prime SVO; strong prime SVO). The overall mean scores (SD) for each of the constructions in the order just given were 5.94 (0.28), 5.92 (0.27), 5.93 (0.34), 5.94 (0.31), 5.97 (0.16), 5.88 (0.32), and from a total of 2736 data points (76 participants on six conditions with six

trials), 2704 (98.8%) were correct responses. Figure 1 illustrates the near-ceiling results with the children's scores separated according to year group ((Years 2 (age 6;9 – 7;8), Year 3 (age 8;0 – 8;6), Year 4 (age 8;10 – 9;9), Year 5 (age 9;10 to 10;9) and Year 6 (age 10;9 – 11;8)).
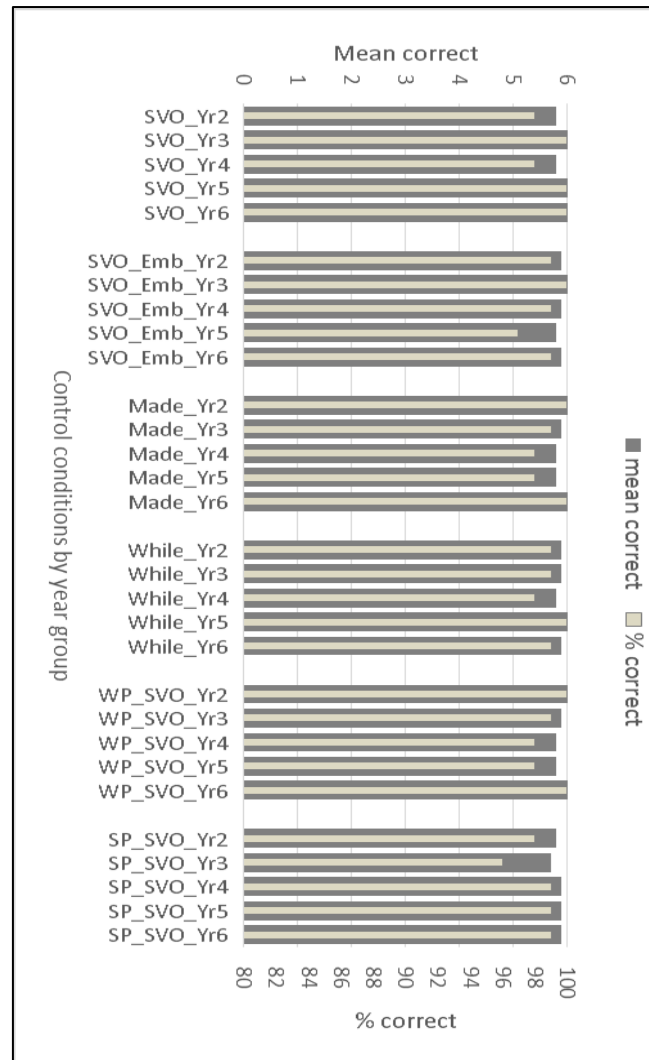

Figure 1. Mean and % of correct responses in control conditions by year group (Year 2 n=14; Year 3 n=15; Year 4 n=14; Year 5 n=16; Year 6 n=17).

Responses to object and temporal adjunct control were analysed using a generalized linear mixed model in the GLIMMIX procedure of SAS with a logit link function (SAS for Windows 9.3, 2011). Fixed factors were construction (AC and OC), condition (Condition 1: No Prime, Condition 2: Weak Prime, Condition 3: Strong Prime) and year group ((Years 2 (age 6;9 – 7;8), Year 3 (age 8;0 – 8;6), Year 4 (age 8;10 – 9;9), Year 5 (age 9;10 to 10;9) and Year 6 (age 10;9 – 11;8)). Random factors were participant and verb. The overall mean object scores (SD) on object control across conditions 1, 2 and 3 were 5.76 (0.46), 5.82 (0.38) and 5.79 (0.54) respectively. From a total of 1368 data points, 97% were correct, object responses. The mean object scores (SD) on temporal adjunct control for the three conditions in the same consecutive order were 0.59 (1.03), 0.58 (1.08), 2.43 (1.98). From an overall total of 1368 data points, 21% were object responses. There was a main effect for construction (F=239.65, df 1, 2260, p<0.001) and condition (F= 13.29, df 2, 2260, p<0.001) but not age (F=0.41,

df 4, 2260, p=0.81). Figure 2 illustrates the estimated mean probability of choosing the object in both constructions. For object control, we can see very small and overlapping confidence intervals, which indicate that the children's responses did not differ across conditions. In contrast, the confidence intervals for temporal adjunct control demonstrate a clear shift towards the object in condition 3 relative to 1 and 2.
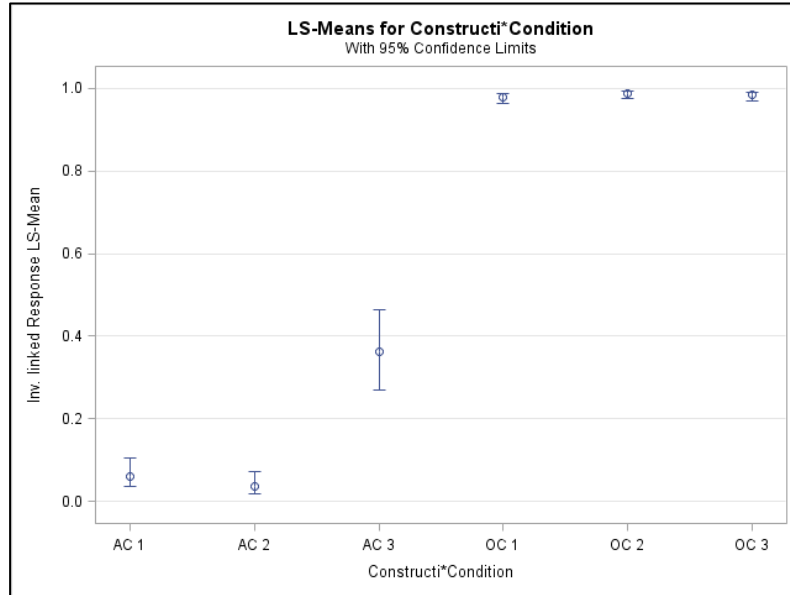

Figure 2. Estimated mean probability of children's object responses in temporal adjunct control (AC) and object control (OC).

There was a two-way construction*condition interaction (F=12.47, df 2, 2260, p<0.001), as well as an age*construction interaction (F=3.81, df4, 2260, p<0.001) but no condition*age interaction (F=1.58, df 8, 2260, p=0.13). There was also a three-way construction*condition*age interaction (F=3.41, df 8, 2260, p<0.001). Children demonstrated a strong preference for the subject in conditions 1 and 2 in temporal adjunct control. Only 13% (Mean=0.59; SD=1.03) of their data points were object-oriented in condition 1 and 10% (Mean=0.57; SD=1.08) were in condition 2. However, in condition 3, the number of object-oriented responses rose to 41% (Mean=2.43; SD=1.97). There was a significant difference (Sidak adjusted for multiple comparisons) between conditions 1 and 3 in temporal adjunct control (Wald t = 6.84, df 2260, p<0.001) as well as between conditions 2 and 3 (Wald t = 7.34, df 2260, p<0.001). Figure 3 shows responses by age group. It shows that for each year, there were no differences between conditions on object control, whereas for temporal adjunct control there is an evident shift towards the object interpretation in condition 3 relative to conditions 1 and 2 in all but the youngest year group. The variability of responses in temporal adjunct control in condition 3 can also be seen.
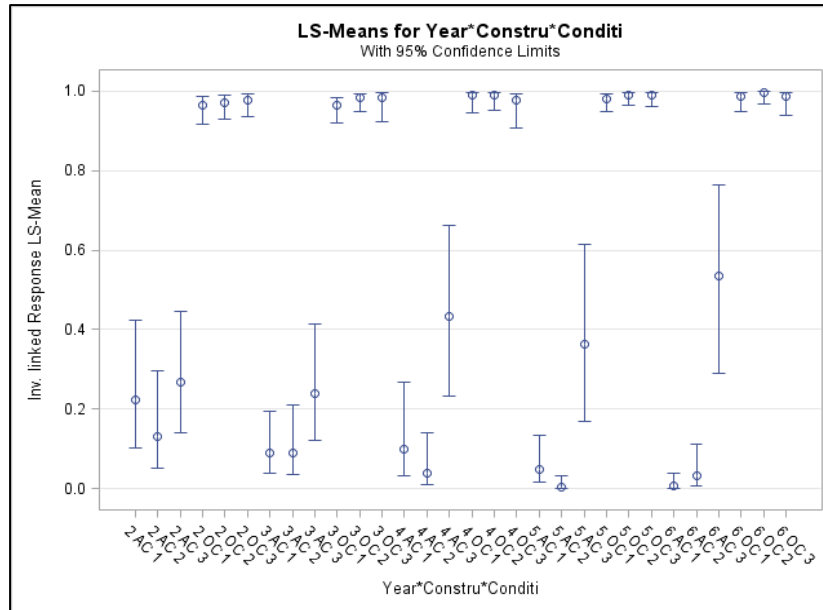
Figure 3. Estimated mean probability of object responses across year groups in temporal adjunct control (AC) and object control (OC).

The controlled verbal gerund subject responses were also analysed using GLMM in the GLIMMIX procedure of SAS. Fixed factors were construction (VGS), condition (Condition 1: No Prime, Condition2: Weak Prime of External Referent and Weak Prime of Internal Referent, Condition 3: Strong Prime of External Referent and Strong Prime of Internal Referent) and year group ((Year 2 (age 6;9 – 7;8), Year 3 (age 8;0 – 8;6), Year 4 (age 8;10 – 9;9), Year 5 (age 9;10 to 10;9) and Year 6 (age 10;9 – 11;8)). Random factors were participant and verb. The overall mean internal referent score (SD) in condition 1 was 4.12 (1.80). The mean scores for internal referent choices in condition 2 were 1.11 (1.54) and 4.61 (1.41), where the former score reflects choices made under the weak priming of an external referent and the latter under weak priming of the internal referent. Lastly, in condition 3, the mean internal referent scores were 5.30 (1.06) and 0.79 (1.20), where again, the former reflects choices made under the strong priming of an external referent and the latter to the strong priming of the internal referent. There was a main effect for condition (F =149.25, df 2, 2182, p<0.001) but not year group (F = 1.17, df 2, 2182, p=0.32). Figure 4 illustrates the estimated mean probability of choosing the internal referent. The confidence intervals demonstrate a large shift from the internal referent in condition 1 (Task1_NP) to the external referent in condition 2, when the external referent is primed (Task2_WPE) (t = 14.84; df 2182, p<0.001)[6]. In contrast, there is a degree of overlap between the number of internal referent responses in condition 1 (Task1_NP) and condition 2 when the internal referent is primed (Task2_WPI), but the difference still reaches significance (t = 2.95, df 2182, p=0.03). Under the pressure of the strong priming of the external referent, responses shift again slightly further towards the external referent (Task3_SPE) relative to the weak priming of the external referent (Task2_WPE), although there is quite some overlap between the confidence intervals, and the difference between these two strengths of cue just misses significance (t = 2.74, df 2182, p=0.06). In contrast, the confidence interval for the measure of internal referent responses when this referent is strongly primed (Task3_SPI) is clearly separated from the interval illustrating the weak priming of the internal referent (Task2_WPI), reflecting a significant

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[6] All p values are sidak adjusted for multiple comparisons.

shift further towards the internal referent in the strongly primed condition (t = 4.98, df 2182, p<0.001).
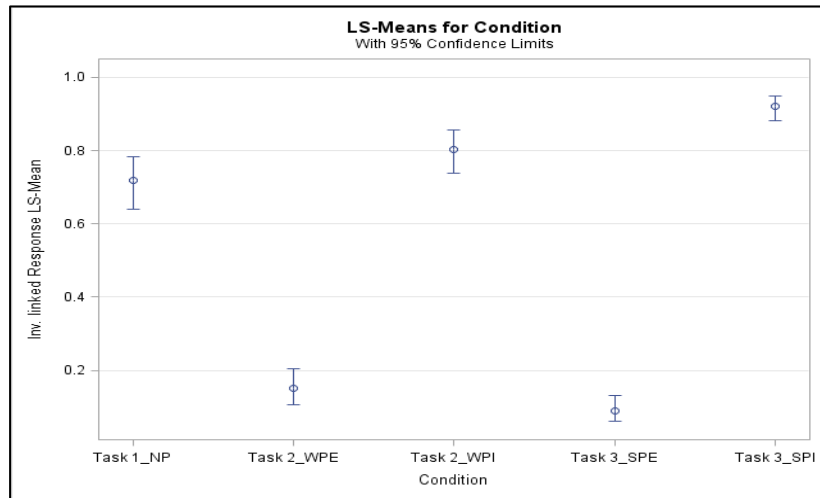
Figure 4. Children's overall referent choices for verbal gerund subjects in condition 1 (no prime (NP)), condition 2 (weak prime of external referent (WPE)) and weak prime of internal referent (WPI)), and condition 3 (strong prime of external referent (SPE) and strong prime of internal referent (SPI)).

There was a two-way condition*year interaction (F=2.92, df 16, 2182, p<0.001). The confidence intervals for each of the year groups in Figure 5 suggest that the differences between condition 1 (NP), condition 2 where the internal referent was weakly primed (WPI) and condition 3 where the internal referent was strongly primed (SPI) appear to get larger with age. However, all year groups show the same overall pattern.

Figure 5. Children's referent choices across year groups (2, 3, 4, 5, 6) for controlled verbal gerund subjects in all conditions (Task 1_NP, Task 2_WPE, Task 2_WPI, Task 3_SPE, Task 3_SPI).

4. Discussion
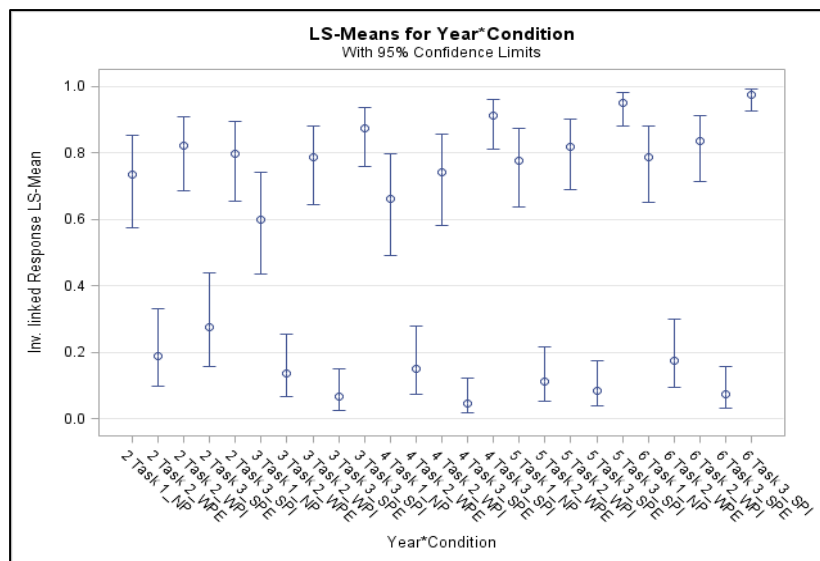
This study was a preliminary investigation into the kinds of interpretations children between the ages of six and eleven do and do not permit when presented with empty categories in different sub-types of control. It chose two examples of control whose categorisations are uncontroversial, namely canonical object control and controlled verbal gerund subjects, and one example of control whose categorisation is less clear, namely final temporal adjunct control. The first general observations are that (a) children's reference assignments in object control were unaffected by either of the pragmatic leads, (b) that their reference assignment choices in verbal gerund subjects were guided by both leads, and (c) that their responses to temporal adjunct control were affected by the strong lead. Further observations are that children across all age brackets did not exhibit a bias for an external referent with verbal gerund subjects and that they were all much less persuaded by the pragmatic leads preceding temporal adjunct control constructions than they were with those preceding verbal gerund subjects. Some initial thoughts on these patterns are now discussed.

The responses recorded for object control further corroborate its status as a syntactically regulated construction that resists pragmatic interference. This result is not new but the fact that the same children who ignored the context for object control consulted it selectively for the latter two constructions further corroborates that this paradigm is a valid means of distinguishing between constructions that do and do not permit pragmatics to permeate them. Their accurate responses to object control, together with their near ceiling performance on the SVO sentences priming an inappropriate referent, allow us to progress to the remaining constructions confident that the results are not simply performance errors.

The pattern exhibited by children on temporal adjunct control is important because it suggests that this construction is not strictly subject oriented in the way that object control is strictly object oriented. 96% of the children's responses to object control in the non-primed condition were object oriented, contrasting with 87% being subject-oriented responses in temporal adjunct control. Although this shows a strong bias for the subject in temporal adjunct control, it is not indicative of a mandatory relation. Importantly, across conditions, the percentage of object responses in object control remained constant, sitting at 98% in the weakly primed condition and 96% in the strongly primed one. This was not the case for temporal adjunct control, where although the percentage of subject oriented responses remained unaffected in the weakly primed condition, sitting at 90%, they decreased sharply to 59% in the strongly primed one. Interestingly, children did not become less influenced by the prime with age. This was made apparent in Figure 3, which showed how the confidence intervals for children's responses under the pressure of a strong prime from Year 4 onwards shared very little overlap with those illustrating responses under the weakly primed condition. It seems possible then, that there might be an age trend, a possibility that a longitudinal study could investigate. Importantly, the same susceptibility to pragmatic interference shown here in temporal adjunct control has been found in adults, as reported in the introduction above. On this basis, it would appear that a correct characterisation of temporal adjunct control needs to include reference to its relative flexibility, without losing the generalisation that most participants prefer a subject-oriented reading initially and that not all of them are equally persuaded by the pragmatic leads. Janke and Bailey (to appear) have proposed a structural account of this construction, which permits the evident interpretation shift, whilst still maintaining its obligatory-control status. Temporal adjunct control is not like non-obligatory control. This becomes obvious when we turn to verbal gerund subjects, which are far more permissive.

Firstly, children on this construction seemed not to exhibit the previously reported bias for an external referent found in younger children

(Goodluck 1987; Adler 2006). In the non-primed condition, 69% of the current children's trials resulted in internal referent choices. Their percentages of internal referent responses when divided according to their school year indicate a strong preference for the internal referent across all age groups (Yr2=70%; Yr3=59%; Yr4=63%; Yr5=75% and Yr6=75%). The task used in the present study was different to that of the previous ones, which relied on act-out and truth-value judgements. It could be that the nature of these previous tasks is such that they make the sentence-external referent more salient to the children. Certainly in a truth-value judgement task, the alternative referent is explicitly mentioned to the child, whereas in the non-primed picture-selection task, the external referent is only visually depicted. Alternatively, six to seven years of age might mark the point at which children generally move to a preference for a sentence-internal referent. The oldest child tested in Adler (2006) was aged 5;5, and the oldest one in Goodluck (1987) was 6;11. In contrast, the age of the youngest year group included in the present study, ranged from 6;9 to 7;9. A future study could include younger children to verify whether this is so. The current study's interest was in children's selective use of cues across several sub-types of control, so it was important to use children who could ignore the infelicitous leads in object control as a point of comparison with the other sub-types. This precluded our including a still younger age group who still consulted these leads in inappropriate circumstances (see footnote 2).

The second point of interest is that children across all age groups were enormously influenced by the weak pragmatic lead with controlled verbal gerund subjects. This is most evident if we look at each year group's shift from an internal referent in the non-primed condition to an external referent when that referent is weakly primed. In Figure 5, we saw the complete separation of these respective confidence intervals for all year groups, illustrating the decisive influence of this pragmatic cue. 82% of all the children's trials in the condition weakly priming the external referent resulted in external referent responses, compared with 31% in the non-primed condition. Note again how different this pattern is from object control, where only 2% of trials were affected by the weak pragmatic lead, but also from temporal adjunct control, where just 10% of trials were. This shows that these three sub-types of control are behaving differently from one another. Overall responses also shifted slightly further towards the internal referent when this was primed (77%), but the shift is less visible because of the children's already over-arching preference for an internal referent in the non-primed condition (69%).

Finally, we can consider the children's performance on this construction under the pressure of a strong pragmatic lead. In the condition strongly priming the external referent, the overall percentage of external referent responses rose to 87%, which is a slight increase from the weakly primed condition (82%) but not a significant one. In contrast, in the condition strongly priming the internal referent, the overall percentage of internal referent responses rose to 88%, a rise from 77% in the weakly primed condition, and this was significant. Although visible, the effect of this stronger pragmatic lead is clouded by the already substantial effect of the weak lead. If we highlight the percentages of the individual year groups, some age differences in terms of the children's attentiveness to the strong lead are suggested. The percentage of external referent responses in the condition reinforcing this referent were 69%, 92%, 93%, 90% and 99%, according to year groups 2, 3, 4, 5 and 6 respectively. The percentage of internal referent responses in the condition strongly priming this referent increased with age: Yr2=76%, Yr3=86%, Yr4=88%, Y5=94% and Y6=96%. The youngest year group, aged between 6;9 and 7;9, were the least responsive to the strong pragmatic lead in both instances. Once again, a subsequent study following the development of younger children's attention to discourse cues could help substantiate any age trends. As a reminder of how this construction is behaving differently from either object or temporal

adjunct control, we can return to the percentage of children's responses that were affected in these constructions under the pressure of a stronger pragmatic lead: 4% of trials strayed towards the subject in object control, whereas 41% of trials were object-oriented in temporal adjunct control.

In conclusion, children in this study demonstrated an ability to use pragmatic leads selectively, by generally ignoring them in infelicitous circumstances, as evidenced by the object control and filler sentences, yet attending to them for verbal gerund subjects, whose interpretations are known to be pragmatically led in adults. In between these two constructions fell temporal adjunct control, where responses were clearly more affected by cues than they were for object control but far less so than for verbal gerund subjects. Janke and Bailey (to appear) put forward a proposal that permits two structures for temporal adjunct control. This recognises that under severe discourse pressure, pragmatics can influence the way in which the tree is parsed, yet maintains a syntactic analysis so that other properties of this construction are not ignored; in particular, the fact that its *ec* does not permit generic or sentence-external interpretations. As one of the first studies tracking older children's attention to pragmatic leads in verbal gerund subjects, this study could serve as a base for further ones examining the behaviour of *ec*s in other sub-types of non-obligatory control. This in turn could lead to a comparison between non-obligatory controlled *ec*s and other discourse-mediated terms, such as pronouns and logophors, consequently moving forward an ongoing debate over which overt element the *ec* in non-obligatory control shares more properties with (see Landau 2013 for an overview).

Appendices.

Appendix A. Ages and Mean Standard and Raw Scores on Tests of Language and Cognition for all Age Groups.

Group	Year 2	Year 3	Year 4	Year 5	Year 6
Age in months	86.2	100	112	125	135
Range	81-93	96 - 103	106-115	118-129	129-140
KBIT SS	110.9	106.2	115.3	117.6	114.6
Range	98 - 152	91 - 126	97 - 143	88-138	89-130
KBIT Raw Scores	23.9	25.1	30.1	33	33.4
Range	18 - 38	19 - 32	24 - 38	23-38	24-40
BPVS-II SS	98.2	101.1	106.4	108.5	110.6
Range	87 - 113	84- 119	91 -123	99-121	88-129
BPVS-II Raw Scores	70.4	85.9	100.1	108.4	116
Range	58 - 88	65-103	81 - 120	95-124	91-134
TROG-2 SS	99.9	88.9	95.8	98.9	98
Range	83 - 111	62-104	81 - 109	83-111	69-106
TROG-2 Raw Scores	12.9	12.8	14.2	16.1	16.2
Range	10 - 16	7 - 16	11 - 17	13-19	10-19

Appendix B. Example of one sentence from each of the control conditions.

SVO	Ron is rowing the boat.
SVO embedded	Hermione said that Ron is feeding the owl.
Made	The potion made Harry wet.
While	Hermione is feeding the owl while Harry is waving the wand.

Weakly primed SVO_emb	Let me tell you something about Harry. Harry said that Luna is pouring the water.
Strongly primed SVO	Harry is making a magic potion for the class. Harry lifts up the yellow jug. Luna is pouring the water.

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