Discourse effects on older children's interpretations of complement control and temporal adjunct control.

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Abstract

The reference of understood subjects (*ec*s) in complement control (John persuaded Peter$_i$ *ec*$_i$ to read the book) and temporal adjunct control (John$_i$ tapped Peter while *ec*$_i$ reading the book) has long been described as restricted to the object and subject of the main clause respectively. These restrictions have shaped the grammatical targets proposed for children, most of whom are reported as having acquired both sub-types by seven. Using three picture-selection tasks, 76 children's (34 girls; aged 6;9-11;8) interpretations of the *ec*s were tested. Task 1 established their base-line preferences. Task 2 weakly cued the *ec*s towards an alternative referent and Task 3 strongly towards an alternative referent. Complement control responses were consistent across all tasks but in adjunct control they shifted significantly towards the object in Task 3 – a pattern mirrored by 15 adults. Responses in adjunct control also exhibited a degree of fluctuation in the baseline condition that complement control did not. A follow-up study on adjunct control showed that neither children nor adults permitted an external-referent reading, even when strongly cued in that direction. Two alternative proposals are discussed: one in which the results are viewed solely as the product of a parser's sensitivity to activation and another that proposes two possible structures for adjunct control; this permits the evident interpretation shift yet gives precedence to the highly preferred subject-oriented reading.

Keywords

Complement control, temporal adjunct control, contextual cues, typical development

1. Introduction

1.1 Complement control and temporal adjunct control

This study concentrates on older children's reference assignment in complement control and temporal adjunct control and the degree to which their interpretations of the sentences are shifted when contextual cues of different strengths precede them. The point of interest is that both these constructions are long reported as being restricted to a single interpretation yet it will be demonstrated that this is only so for one of these, namely complement control. Temporal adjunct control proves open to pragmatic influence in children up to the age of eleven, which is long after the age at which these constructions are reported to develop (see Guasti 2004). A number of explanations for these novel findings are considered - in particular, they raise the question of whether the data pattern necessitates a revision of how the child's target grammar should be formulated with respect to this particular construction.

All control constructions have an embedded non-finite clause with a phonetically silent subject, which depends upon another argument for its reference. The conventional term for this subject is 'empty category' (from here on *ec*). The sentence in (1) is an example of complement control, where the infinitival clause is a complement of the matrix verb, *persuade*. The sentence in (2) illustrates temporal adjunct control, where the non-finite clause is an adjunct that is adjoined optionally.

(1) Ron persuaded Hermione$_i$ [*ec*$_i$ to kick the ball]. Who kicked the ball?

(2) Harry$_i$ tapped Luna [while [*ec*$_i$ feeding the owl]]. Who fed the owl?

The *ec*s in these sub-types of control are widely reported as being restricted to a designated sentence-internal referent (see Landau 2013). In (1) this is the matrix object so in this example only *Hermione*

can be the potential agent of the verb, *kick*, as shown by the co-indexation. The relation between the matrix object and the *ec* in the infinitival clause is called a control relation, where the object is the controller and the *ec* the term whose reference is controlled. Aside from a very few exceptions (e.g. promise-type constructions, on which see Chomsky 1969; Cohen Sherman & Lust 1986; 1993), this type of control is object-oriented.[1] The *ec*'s interpretation is syntactically regulated, and as such, its antecedent must be sentence-internal and local to it as well as occurring in a structurally higher position (see Manzini, 1983; Cohen Sherman & Lust, 1993; Goodluck, Terzi & Diaz, 2001). This is illustrated by the co-indexation in (3a), which shows that a sentence-external reading of the *ec* is not permitted but neither is a subject reading, since the subject, though sentence-internal, is not the most local choice. (3b) demonstrates that only *Hermione's cousin* (and not *Hermione*) can be the *ec*'s antecedent, since only the whole possessive DP c-commands into the infinitival clause.

(3) a. Ron_1 persuaded Hermione_j [$ec_{*1/2/*3}$ to kick the ball].

b. Ron persuaded Hermione's cousin_1 [ec_1 to kick the ball].

Temporal adjunct control is reported as similarly restricted in its interpretation, however, in this instance the referential dependency is between the matrix subject and the *ec*. Like complement control, it does not generally permit external referents, and the antecedent must c-command the *ec*, as illustrated in (4a) and (4b) respectively. (4a) also illustrates the conventional opinion that the object cannot be linked to the *ec.* On most accounts, the adjunct, not being selected by the matrix verb, is free to attach high, where only the subject c-commands it (see Landau 2013) and this high attachment is why an object reading is ruled out.

(4) a. Harry_1 tapped Luna_2 [while [$ec_{1/*2/*3}$ reading the book]].

b. Harry's cousin_1 tapped Luna [while [ec_1 reading the book]].

Because they are both reported as being restricted to a unique, sentence-internal interpretation, these two sub-types of control are often subsumed under the broader heading of obligatory control. They contrast sharply with other sub-types that admit more flexibility in their interpretations and on this basis are classified as non-obligatory control (see Williams 1980). An example of non-obligatory

[1] Landau (2000) draws a distinction between exhaustive and partial control within the OC classification. These sub-types are not discussed here. Examples combining a partial control verb in the matrix clause with a collective predicate in the infinitival, which invites a partial control reading for some, have been avoided.

control can be seen in (5), where *Harry*, *Luna* or even a sentence-external referent could be the agent of *pour*, even if one interpretation is preferred over the others in the absence of any context. In this instance, the infinitival housing the *ec* is not a complement of the main clause but is itself a subject of a tensed clause; this property distinguishes non-obligatory from obligatory control, allowing its interpretation to be determined pragmatically.

(5) Harry$_1$ said to Luna$_2$ [that [*ec*$_{1/2/3}$ pouring the water quickly] was a big mistake].

Obligatory control, however, is a syntactically regulated relation that requires integration of a number of linguistic components for its successful acquisition (Tavakolian 1978; Chomsky 1969; McDaniel, Cairns & Hsu 1990/1; Cohen Sherman & Lust 1993; Goodluck, Terzi & Diaz 2001; Adler 2006; Kirby, Davies & Dubinsky 2010). One important aspect of this acquisition is for children to restrict their interpretations of the *ec* to the correct sentence-internal one. They must not only learn that outside referents are not permitted but that when there are two potential sentence-internal referents, the choice between these is dictated by the particular sub-type of control. The range of interpretations that young children permit has been tested using a number of methods (for act-out and elicited imitation tasks, see Hsu, Cairns, Eisenberg & Schlisselberg 1989; for truth-value judgement tasks, see Broihier & Wexler 1995 and Adler 2006; for grammaticality judgement tasks, see McDaniel et al 1990/1991 and Cairns, McDaniel, Hsu & Rapp 1994). Collectively, these studies have enabled us to witness children's interpretations of the *ec*s becoming less permissive with age, gradually rejecting illicit interpretations, before converging on adult-like readings.

One way in which children's interpretations have been monitored is by introducing topics of discourse prior to the critical sentences to see if these so-called pragmatic leads affect referent choice. Cohen Sherman & Lust (1987), for example, tested whether introducing the subject as the forthcoming topic before complement control would steer young children towards an illicit subject-oriented reading of the *ec*. They reported that children were not persuaded by the lead with these null elements (unlike overt pronouns, on which more below).

(6) This is a story about the skunk. The skunk tells the monkey *ec* to bump the block.

(Cohen Sherman & Lust's 4a)

The strength of pragmatic leads on complement control has also been staggered (Janke & Perovic 2016), by measuring interpretation of obligatorily controlled *ec*s in isolation, as in (7), when cued by a weakly established topic, as in (8), and when cued by a strongly established topic, as in (9). In (8), *Ron* is introduced as new information, making it the focus (Erteschik-Shir 1993; Neeleman, Van de Koot, Titov & Vermeulen 2009) yet the sentence promises to make *Ron* the topic of the subsequent discourse, and in this sense *Ron* is weakly established as the forthcoming topic. In (9), *Ron* is strongly established as a topic. The first sentence is about *Harry*, which establishes it as the topic (Strawson 1964, Reinhart 1981, Givón 1983, Vallduví 1992, Neeleman et al 2009), and the second sentence elaborates its narrative about *Ron*, making it a familiar topic, and in this sense, a strongly established one. These different levels of pragmatic leads, which in these examples, cue the incorrect subject referent, measure the extent of children's resilience to leads for sentences whose referents are argued to be set.

(7) Ron persuaded Hermione [*ec* to kick the ball].

(8) Let me tell you something about Ron. Ron persuaded Hermione [*ec* to kick the ball].

(9) Ron is practising a new game. Ron aims at the goal post. Ron persuaded Hermione [*ec* to kick the ball].

Children who have acquired complement control are impervious to pragmatic leads on these sentence types (Sherman 1983; Cohen Sherman and Lust 1987; Cohen Sherman & Lust 1993; Janke & Perovic 2016). Importantly, they do attend to these leads in non-obligatory control constructions such as (5) above and (10) below, whose interpretations are guided by topics of discourse (see Kawasaki 1993; Samek-Lodovici 1996; Ariel 2001; Adler 2006). For these constructions, the shifts in interpretation

increase with the strength of lead, which demonstrates that children do consult topics in appropriate environments.

(10) [*ec* Pouring the water quickly] made Luna wet. *Who poured the water?*

(11) Let me tell you something about Harry.
[*ec* Pouring the water quickly made Luna wet]. *Who poured the water?*

(12) Harry is making a potion. Harry holds the jug clumsily.
[*ec* Pouring the water quickly made Luna wet]. *Who poured the water?*

In (10), the preferred referent for the *ec* in the controlled verbal gerund subject is the topic of the sentence, which in this instance is also the sentence-internal argument, namely *Luna*. But children's choice of referent shifts substantially towards a sentence-external one when this alternative is provided by a preceding narrative. Interpretations of the discourse-anaphoric *ec* are determined by both strengths of lead in both typical populations (Janke 2016) and high-functioning children with autism (see Janke & Perovic 2016).

The current paper adopts this method to test the effect of two strengths of pragmatic lead on interpretations of the examples of control we began with, namely complement control and temporal adjunct control. It focuses on older children aged 6;9 to 11;8 because as we will see in section 1.2, both constructions are reported as having been acquired by most children by about the age of seven, so if complement control is resolutely object-oriented and temporal adjunct control subject-oriented, even the youngest age group should show a strong tendency to resist influence from the leads. The next sub-section reviews the acquisition literature which has informed the present study. Its predictions are made possible by these works, which have identified children's developmental paths and the ages at which interpretations settle. Readers familiar with the literature might skip this section. With the developmental trajectories clear, we can return to the current task's hypotheses.

1.2 Children's referent choices in complement control and temporal adjunct control

Examples of complement control are produced by children as young as three (Eisenberg & Cairns 1994). However, comprehension studies have shown that at five, not all children may have grasped the obligatory nature of the anaphoric relation between the matrix argument and the *ec* in the complement. Although Goodluck & Behne (1992), for example, reported that children between the ages of four and six mostly selected the object as the *ec*'s antecedent, Eisenberg & Cairns (1994) found that some five-year-olds still accepted an external-referent reading if it had been made prominent in the preceding discourse. But this propensity was far more pronounced in examples of single-complement control (i.e. try) than in double-complement control (i.e. tell). Other studies have shown that children discern between terms whose references can be determined by previously mentioned discourse and those that cannot quite early on. The aforementioned Cohen Sherman & Lust (1986) study employed a weakly established topic paradigm with children aged three to seven, comparing interpretations of *ecs* in complement control, repeated in (13), with those of pronouns in tensed complements, as in (14).

(13) This is a story about the skunk. The skunk tells the monkey *ec* to bump the block.

(14) a. This is a story about Big Bird. Big Bird tells Ernie that he will bump the block.

b. This is a story about Ernie. Big Bird tells Ernie that he will bump the block.

(Cohen Sherman & Lust's 4 a and b)

Whereas pragmatic leads did not affect interpretations in complement control, they did for pronouns in tensed complements. Children gave more subject responses for the pronoun's referent when the weakly established topic introduced the subject of the critical sentence, as in (14a), and more object responses when the weakly established topic introduced the object, as in (14b). The distinction found between sentences for which children consulted the context and those for which they did not was replicated in Cohen Sherman & Lust (1993), where preceding discourse did not affect choices made for complement control in children aged three to eight. More recently, Janke & Perovic (2016) used the three levels of pragmatic lead explained in (7) to (9) in a picture-selection task. Children (age range

5 – 13)[2] scored at ceiling on complement control, no matter how strong the lead. This resilience to a pragmatic lead was juxtaposed with their interpretation choices in non-obligatory control, where the lead determined referent choice. Thus in a number of different tasks, we see children's selective and appropriate use of pragmatic leads in reference assignment, ignoring them for constructions in which the interpretation is set yet attending to them for those which admit variable reference. Table 1 provides a summary of studies undertaken on complement control, the tasks that have been administered, the age and number of children, and the authors' main findings. It shows that whereas some studies have found variability in referent choice with children under five, by this age, the majority are opting for the correct, object interpretations consistently.

Table 1. A summary of experimental results on children's antecedent choices in object-oriented complement control in English.[3]

Study	Task	Age	No of children	Results without pragmatic lead	Results with pragmatic lead
Cohen Sherman & Lust (1986)	Elicited Imitation and Act Out	3;0–7;11	36	Developmental trend but all children preferred object over subject.	Leads to subject had no effect.
McDaniel, Cairns & Hsu (1990/91)	Act Out & Grammaticality Judgement	3;9 – 5;4	20	Two stages (a) arbitrary (b) object. 18/20 children chose object.	N/A
McDaniel, Cairns & Hsu (1990/91)	Grammaticality Judgement	4;1 - 4;10	14	Longitudinal evidence presented for stages above.	N/A
Goodluck & Behne (1992)	Act Out	4 - 6	42	Children chose object consistently. Very few errors.	N/A
Cohen Sherman & Lust (1993)	Act Out	3 - 8	72	N/A	Leads to subject had no effect.
Cairns, McDaniel, Hsu & Rapp (1994)	Act Out & Grammaticality Judgement	3;10–4;11	14	Children chose external referent, subjects and objects.	N/A
Eisenberg & Cairns (1994)	Story Completion and Act Out	3;7 – 5;4	25	Only 2 trials resulted in external referent interpretations.	N/A

[2] These were a group of typically developing children, whose performance had been compared with high-functioning children with autism. Here we refer only to the TD group.

[3] The summaries focus purely on those aspects of the experiments that assessed referent choice.

Janke & Perovic (2016)	Picture Selection	5;7 – 13;8	14	Children chose the object uniformly.	Leads to subject had no effect.

Temporal adjunct control presents a different picture. Children produce these sentences later and far less frequently than complement control (see Broihier & Wexler 1995). The literature is in agreement that a proportion of children between the ages of three and five pass through a so-called free interpretation stage for temporal adjunct control. This means that during this period, the child allows the *ec* to be linked to the subject, the object or a sentence-external referent (Hsu et al 1989; McDaniels et al 1990/1991; Broihier & Wexler 1995; Cairns et al 1994; Goodluck 2001) in examples such as (15) and (16) below.

(15) The zebra touched the deer after *ec* jumping over the fence.

(No 2; p 600 in Hsu et al 1989)

(16) Bert scratched Wonder Woman before *ec* drinking a gulp of water.

(p212 in Broihier & Wexler 1995)

This permissibility in adjunct control has also been tested with pragmatic leads. Lust, Solan, Flynn, Cross & Schuetz (1986) tested whether introducing the object as the forthcoming topic could steer young children towards an object-oriented reading of the *ec*.

(17) Now I'm going to tell you a story about Fozzie Bear. Scooter kicked Fozzie Bear when *ec* dropping the tissue.

In contrast to what the authors had found for complement control, Lust et al (1986) reported that the leads did affect children's interpretations of the *ec* in adjunct control, a result that led the authors to question whether children treated the *ec* in adjunct control as an overt pronoun. This is an interesting possibility to which we will return in the discussion. After this period of free interpretation, it is not entirely resolved as to whether children progress to a stage during which

they reject sentence-external readings yet still permit object readings (Goodluck 1981; Goodluck 1986; Hsu et al 1989; McDaniels et al 1990/1) before converging on the adult subject-oriented grammar, or whether the free interpretation stage is more protracted and the child proceeds straight from this stage to the adult subject-oriented one (Goodluck & Behne 1992; Wexler 1992; Broihier & Wexler 1995; Goodluck 2001). What is agreed is that there exists an adult grammar for this construction that is subject-oriented, and that by about the age of seven, the majority of children will have reached it (Hsu et al 1989). Table 2 presents a summary of key studies undertaken on this construction. It describes the tasks that were administered, the age and number of children tested, as well as the studies' main findings. In it we can see the range of interpretations that young children from the age of three permit, varying between subject, object and external referent interpretations. It also shows how pragmatic leads are persuasive in temporal adjunct control, in contrast to what was seen above for complement control.

Table 2. A summary of experimental results on children's antecedent choices in sentence-final temporal adjunct control in English.

Study	Task	Age	No of children	No pragmatic lead	Pragmatic lead
Lust, Solan, Flynn, Cross & Schuetz (1986)	Act Out	3;1 –7;11	101	All children permitted object interpretations.	Lead increased object choices.
Hsu, Cairns, Eisenberg & Schlisselberg (1989)	Act Out	3;2 -8;3	81	5 stages: subject; object + low c-command score; object + high c-command score; subject & object; subject.	N/A
McDaniel, Cairns & Hsu (1990/91)	Act Out & Grammaticality Judgement	3;9 – 5;4	20	4 stages: arbitrary; object; subject & object; subject.	N/A
McDaniel, Cairns & Hsu (1990/91)	Grammaticality Judgement	4;1 - 4;10	14	Longitudinal evidence for stages above.	N/A
Goodluck & Behne (1992)	Act Out	4 - 6	42	Subject preferred but all age groups permitted object.	N/A
Cairns, McDaniel, Hsu & Rapp (1994)	Act Out & Grammaticality Judgement	3;10–4;11	14	Children chose external referent, object, object &	N/A

				subject and subject.	
Broihier & Wexler (1995)	Truth Value Judgement	3;10 -5;5	14	8 children chose subject, object or external referent	.N/A
Adler (2006)	Truth Value Judgement	3;0-5;11	23	Children accepted external-referent interpretations; youngest more than older ones	N/A

At this interim point, we have seen that although complement control can be produced as early as three, it can take some children a few more years to realise the obligatory nature of the relation between the antecedent and the anaphoric *ec*. From this age, however, children start to use discourse cues selectively, and from about five, they are largely ignoring them in complement control contexts yet attending to them for items whose references are pragmatically decided. In temporal adjunct control, for those children who go through a free interpretation stage, non-subject interpretations persist between three and five years but after seven, non-subject interpretations are reported as rare (Hsu et al, 1989). We now return to the current study, which compares attendance to pragmatic leads between these two sub-types of control in children aged six to eleven.

1.3 Study One

To examine the effect of pragmatic leads on 76 older children's interpretation of the *ec*s in complement control and temporal adjunct control, their preferred choice of referent in three picture-selection tasks was compared. Task 1 ascertained their base-line interpretations by presenting the critical sentences in isolation. On the basis of the acquisition literature outlined above, which argues that complement control is strictly object oriented and that adjunct control is strictly subject oriented, children in this age bracket were expected to demonstrate an overwhelming preference for the object in complement control and for the subject in temporal adjunct control. Specifically, the proportion of object choices in complement control and subject choices in adjunct control should not be significantly different in this base-line condition. Task 2 preceded the critical sentences with a weak pragmatic lead,

which cued the subject in complement control and the object in temporal adjunct control. This assessed whether the two constructions retained their baseline interpretations under the pressure of a weakly established alternative referent. If so, then children's choices should not differ significantly from those seen in Task 1. Conversely, if the constructions' interpretations were open to guidance from pragmatic cues, we would expect an interpretative shift similar to that witnessed for constructions that permit flexible interpretations, such as non-obligatory control. That is, children's choices in complement control should move towards the subject, whereas their choices in temporal adjunct control should move towards the object. In Task 3, the critical sentences were cued in the same direction as Task 2 but with a strong pragmatic lead. Once again, if the constructions are syntactically restricted rather than pragmatically decided, no difference between children's choices in this task and that of the baseline should be discerned but if they are open to pragmatic influence, then an increase of subject and object responses would be expected in complement and adjunct control respectively. The two different strengths of pragmatic lead in Tasks 2 and 3 is important as different sub-types of control have been shown to be susceptible to different strengths of discourse pressure in adults (Janke & Bailey 2016). Relying on a weak lead only might not suffice to ascertain whether interpretations of the constructions studied here are restricted to unique interpretations or not.

1.4 *Study Two*

Subsequent to the main study, a further experiment was carried out on 43 children ranging in age from 7;3 to 11;2 (mean 9;2) and on 14 of the 15 adults from study one. The objective was to test whether participants would permit external-referent interpretations in adjunct control in the same paradigm. Participants were tested on a set of un-cued adjunct control sentences and a set of adjunct control sentences preceded by a strong pragmatic lead towards a sentence-external referent. This extra task was a suggested by an anonymous reviewer to help rule out task-based effects. It could be, for example, that a parser sensitive to activation would be guided towards an ungrammatical antecedent in this particular paradigm. If, however, participants were not persuaded by the pragmatic

lead, this would provide some support for an analysis that restricted itself to sentence-internal arguments and their linguistic regulation. This study is reported on after study one.

2. Method for Study One

2.1 Participants

76 children (34 girls and 42 boys) aged 6;9 to 11;8 years (81 to 140 months; M = 112.19) from four different state primary schools (spread evenly between age groups from school years 2 to 6) in the South East of England took part.[4] None had any hearing impairments, neurological or genetic deficits and they were monolingual native English speakers. All were reported as typically developing by their respective schools' head teachers. Fifteen British adults from the same geographical region undertook the same tasks.

2.2 Materials

A two-choice picture-selection task used in Janke (2016) and Janke & Perovic (2016) was employed, these tasks having numerous precedents in the acquisition literature (e.g. Ring & Clahsen 2005; Perovic, Modyanova & Wexler 2013; Sanoudaki & Varlokosta 2014). Four examples of control were included in the test battery but this report is restricted to complement control and temporal adjunct control.[5] For each trial, children saw two pictures and had to select the one that best matched the

[4] The task was piloted on several younger children in Year 1 (aged 5 to 6) as it would have been interesting to see how children still at the age where temporal adjunct control can be free (for a sub-set) would have performed. But the task proved too difficult. They scored badly on the cued fillers, indicating they could not yet ignore an infelicitous context for a standard SVO sentence, as well as on 'persuade' and 'order' in complement control. They also struggled with the vocabulary check, giving responses for 'persuade' such as 'It's when you really like someone'. A subsequent study on younger children could design a shorter version of the task with different vocabulary items.

[5] Two types of non-obligatory control tested in the same battery are reported on in separate work.

accompanying sentence; this appeared at the bottom of the screen whilst also being presented auditorily through headphones. They were recorded in a sound-proof booth, using a native-speaking female researcher not involved with the project, who was instructed to maintain a nuclear stress throughout. Item presentation was randomized automatically for each participant, and location of the correct picture was balanced throughout (left or right) as were the figures in the pictures. Task demands were reduced by restricting the characters to four from the Harry Potter books (*Harry, Ron, Hermione* and *Luna*). In addition to the two critical sentence types, four control sentence sets were included. The first was a simple SVO sentence set, ensuring that the children understood the nature of the task. The second tested knowledge of 'while'. The third preceded an SVO sentence with a weak pragmatic lead towards an incorrect interpretation of an SVO embedded sentence; this tested whether children could ignore a weak cue in a sentence not involving a control relation. The fourth preceded an SVO sentence with a strong pragmatic lead towards an incorrect interpretation, which tested children's resilience to infelicitous pragmatic cueing under very strong discourse pressure. There were six trials in each condition. Thus, with the two critical sentence types (complement and temporal adjunct control), each of them occurring in three conditions (no lead, weak lead to the subject (for CC), weak lead to the object (for AC), strong lead to the subject (for CC), strong lead to the object (for AC)) and four control conditions (SVO, while, SVO_Weak Pragmatic Lead, SVO_Strong Pragmatic Lead), there were 60 trials for analysis.

2.3 Sentence Types

This section provides examples of each construction tested in the no lead and weak lead condition, as well as the four control conditions. For the complete set, the reader is referred to Appendix 1.

For complement control, the matrix verbs were *persuade*, *order* and *tell* and the verbs in the controlled clauses were *kick, mix* and *wave* respectively (see Appendix 2 for each verb's frequency). Each instantiation was used twice. The picture corresponding to the correct interpretation depicted the character represented by the matrix object engaged in an action, while the character represented by

the matrix subject stood by. The foil showed the matrix 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.

(18) Complement Control Test Sentence Examples

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.

For temporal adjunct control, the matrix verbs were *tap, kiss* and *lift* and the verbs in the controlled clause were *feed, fly* and *drink*. The picture corresponding to a subject interpretation depicted the character represented by the matrix subject engaged in an action, while the character represented by the matrix object stood by. In the alternative picture, the matrix object engaged in the action. For the sentences below, the picture aligned with a subject interpretation had *Harry* tapping *Luna* with *Harry* feeding the owl, and the picture aligned with an object reading had *Harry* tapping *Luna* with *Luna* feeding the owl.

(19) Temporal Adjunct Control Test Sentence Examples

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.

For the first control condition, which was an SVO sentence in the progressive, the corresponding picture showed the character represented by the subject engaged in the activity, whereas the foil depicted an unmentioned character as the agent of that activity. In the example below, the correct picture showed *Harry* mixing the flour with *Hermione* standing next to him and the foil showed the reverse.

(20) SVO Control Sentence Example

Harry is mixing the flour.

In the 'while' control condition, illustrated in (21), the corresponding picture showed both characters engaging in the actions described. In the foils, only one of the characters is engaged in the relevant activity while the other stands by passively. For half the trials, the character not meeting the description was in the main clause and for the other half this character was in the embedded clause.

(21) While Control Sentence Example

Hermione is feeding the owl while Harry is waving the wand.

The control condition for the weakly established topic consisted of an embedded SVO sentence preceded by a weak pragmatic lead. In the correct picture for (22), *Ron* is drinking the potion and *Hermione* is standing next to him. In the foil, *Hermione* is drinking the potion.

(22) Weak Pragmatic Lead SVO Control Sentence Example

Let me tell you something about Hermione. Hermione said that Ron is drinking the potion. Finally, the control condition for the strongly established topic preceded an SVO sentence with a strong pragmatic lead. For (23), in the correct picture, *Harry* is waving the wand with *Luna* standing nearby and in the foil, the reverse occurs.[6]

(23) Strong Pragmatic Lead SVO Control Sentence Example

[6] Two further control conditions were included in the battery (one testing an SVO-embedded sentence (e.g. Harry said that Hermione is waving the wand) and another testing understanding of a cause relation (e.g. The water made Harry wet). These are relevant to the aforementioned NOC sentences reported on in separate work.

Luna is learning a difficult spell for a class test. Luna says the magic words slowly. Harry is waving the wand.

2.4 Procedure

Testing occurred over three sessions, with a gap of seven to ten days between each task. Stimuli were presented on a laptop and randomized by computer software. Prior to the trials, children were introduced to the characters and shown pictures of them engaged in various activities. They pointed to each of the characters the experimenter named and identified various activities occurring in the pictures, for example, "Show me 'Luna is popping the balloon'" and "Show me 'Ron is reading the book'". All children succeeded with this phase. They were then told that they would see 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 their clicking on one of the large tabs by each picture, which only appeared once the sentence had played, preventing them from making a premature choice. All children completed all tasks.

2.5 Vocabulary Questions

Since children as young as six were included, we used a structured interview technique similar to Janke & Perovic (2015) to check children's understanding of *persuade* and *order*.[7] The questions children were asked, their responses and the way in which these were coded are in Appendix 3, where it is shown that knowledge of these vocabulary items as measured here did not contribute to performance on complement control.

3. Results

[7] The verb *tell* has been standardly used in acquisition studies on much younger children than those tested here so was not included. Three further words (*prepare*; *try*; *awkwardly*) were also tested. The latter two are not relevant to the OC trials so are omitted here. The results for *prepare*, a word used in one of the pragmatic leads, have been added to the appendix, as per the suggestion of an anonymous reviewer.

3.1 Children's Responses

The control conditions (SVO; while; weak pragmatic lead SVO; strong pragmatic lead SVO) were analysed first. Responses were summed according to the number of times the correct referent was chosen, giving a 7-point scale, ranging from 0 to 6. From a total of 1824 data points (76 participants on four conditions with six trials), 99% were correct responses. Table 4 below illustrates the near-ceiling results according to year group ((Years 2 (age 6;9 – 7;8), Year 3 (age 8;0 – 8;7), Year 3 (age 8;10 – 9;9), Year 5 (age 9;10 to 10;9) and Year 6 (age 10;9 – 11;8)).

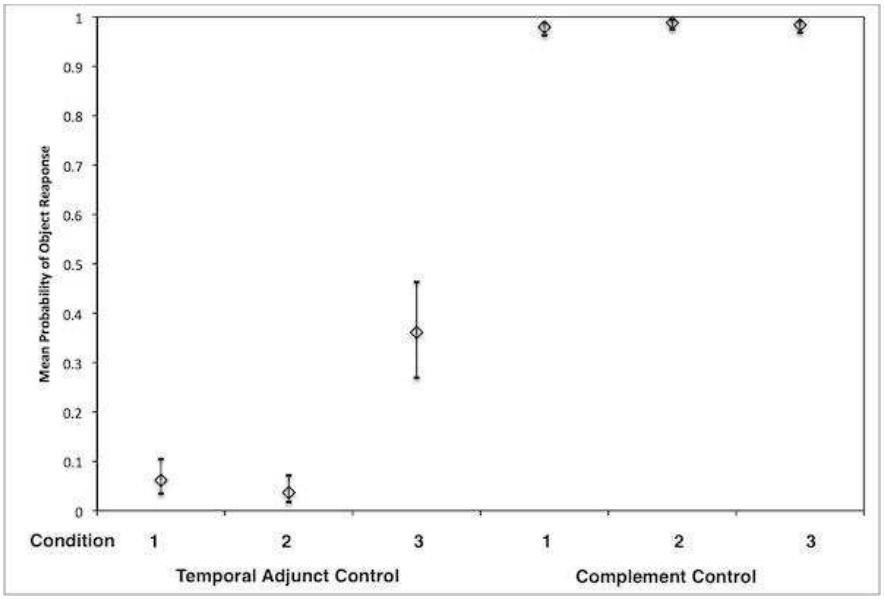
Table 3. Percentage of correct responses in control conditions by year group (Year 2 n=14; Year 3 n=15; Year 4 n=14; Year 5 n=16; Year 6 n=17).

Construction Across Age Group		% Correct
SVO	Year 2	98
	Year 3	100
	Year 4	98
	Year 5	100
	Year 6	100
While	Year 2	98
	Year 3	99
	Year 4	98
	Year 5	100
	Year 6	99
Weak Lead SVO	Year 2	100
	Year 3	98
	Year 4	100
	Year 5	100
	Year 6	100
Strong Lead SVO	Year 2	98
	Year 3	93
	Year 4	99
	Year 5	99
	Year 6	99

Responses to the critical sentences 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 CC), condition (No Pragmatic Lead, Weak Pragmatic Lead, Strong Pragmatic Lead) and year group ((Years 2 (age 6;9 – 7;8), Year 3 (age 8;0 – 8;7), 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. 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 1 shows the estimated mean probability of choosing the object in both constructions.

Figure 1. **Estimated mean probability of children's object responses in temporal adjunct control and complement control across all conditions.**



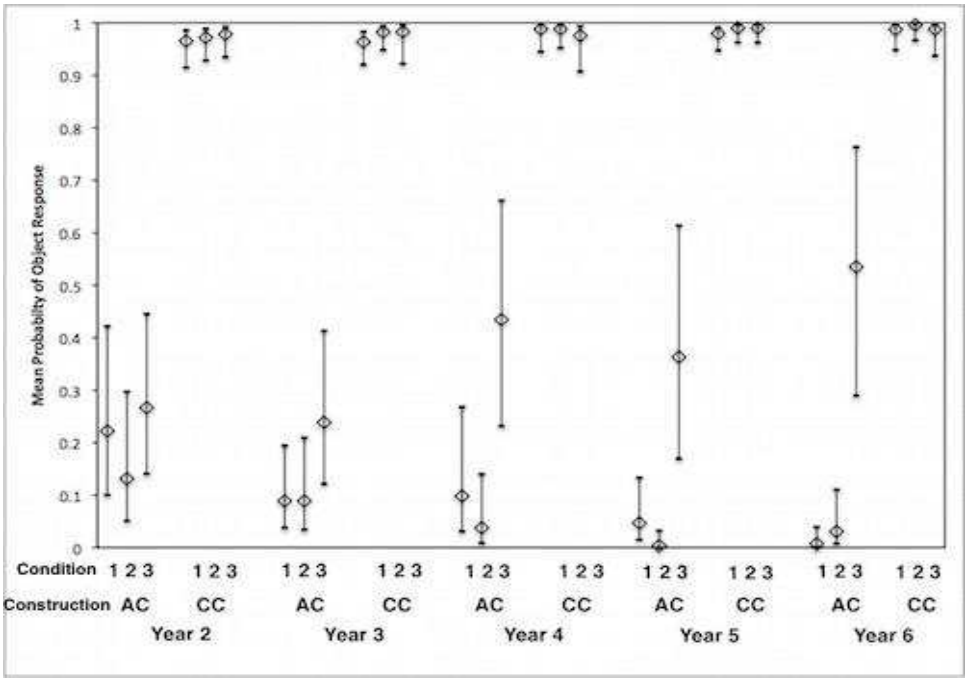
There was a two-way construction*condition interaction (F=12.47, df 2, 2260, p<0.001), and an age*construction interaction (F=3.81, df 4, 2260, p<0.001) but no condition*age interaction (F=1.58, df 8, 2260, p=0.13). Lastly, there was also a three-way construction*condition*age interaction (F=3.41, df 8, 2260, p<0.001). In temporal adjunct control, children showed a strong consensus for the subject in conditions 1 and 2 but this was not the case in condition 3. Table 4 illustrates the percentage of object responses for both constructions across the three tasks, where the object choices in task 3 for adjunct control are shown to rise markedly.

Table 4. **Percentage of children's object responses for CC and AC across conditions: no lead (Task 1), weak lead towards subject/object (Task 2) and strong lead towards subject/object (Task 3).**

Construction Type (6 items in each)	**Percentage of Object Responses**		
	Task One	*Task Two*	*Task Three*
Complement Control	95.2	98.0	96.5
Adjunct Control	13.4	9.6	40.6

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) and between conditions 2 and 3 (Wald t = 7.34, df 2260, p<0.001). Figure 2 presents responses by age group, which shows that for each year, there are no differences between conditions on complement 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 is also evident.

Figure 2. Estimated mean probability of object responses across year groups in temporal adjunct control (AC) and complement control (CC).



In a further analysis, the difference between the number of subject responses in adjunct control and of object responses in complement control was compared. This was primarily to see whether responses were already different in the baseline. Importantly, these not only showed the expected significant differences between the constructions in conditions 2 (Wald t =2.96, df 2260, p=0.003) and 3 (Wald t=8.83, df 2260, p<0.001), which had used pragmatic leads, but also in condition 1 (Wald t=3.25, df, 2260, p<0.001), which had used no lead at all.

The final analysis focused on whether the drop in subject choices found in adjunct control in condition 3 relative to condition 1 was visible for each verb (*drink, fly, feed*) and so included verb as a fixed effect, along with condition and year. There was a main effect of verb (F=4.36; df 2, 1252; p=0.013) and an interaction between condition and verb (F=5.71; df 4, 1252; p=0.001) but no 3-way interaction between condition, verb and year (p=0.12). There was a significant difference between *drink* in AC condition 1 and 3 (Wald t=3.42; df 1252, p=0.02), between *fly* in AC condition 1 and 3 (Wald t= 4.20 df 1252, p=0.001) and a marginal difference for *feed* in condition 1 and 3 (Walt t = 5.37, df 1252, p<0.07), which, when considered with the other results, demonstrates the same trend. This meant that despite

there being variability within condition 3 with respect to the effect of each verb, the significant drop in subject responses in condition 3 relative to condition 1 was visible for each one.

3.2 Adults' Responses

Analyses of the adults' data also used a generalized linear mixed model in the GLIMMIX procedure of SAS. Fixed factors were construction (AC and CC), condition (No Pragmatic Lead, Weak Pragmatic Lead, Strong Pragmatic Lead) and random factors were participant and verb. There was a main effect of construction ($F = 25.05$, df 1, 446, $p<0.001$) but not condition ($F=2.65$, df 2, 446, $p=0.072$), nor was there a construction*condition interaction ($F=1.41$, df 2, 446, $p=0.245$). Across all three conditions in complement control, the adults chose the object uniformly yet like the children, responses in temporal adjunct control showed a different pattern. There was a strong preference for the subject in condition 1, which reduced slightly in condition 2 and substantially so in condition 3. Table 5 illustrates the percentage of adults' object responses for both constructions across the three tasks.

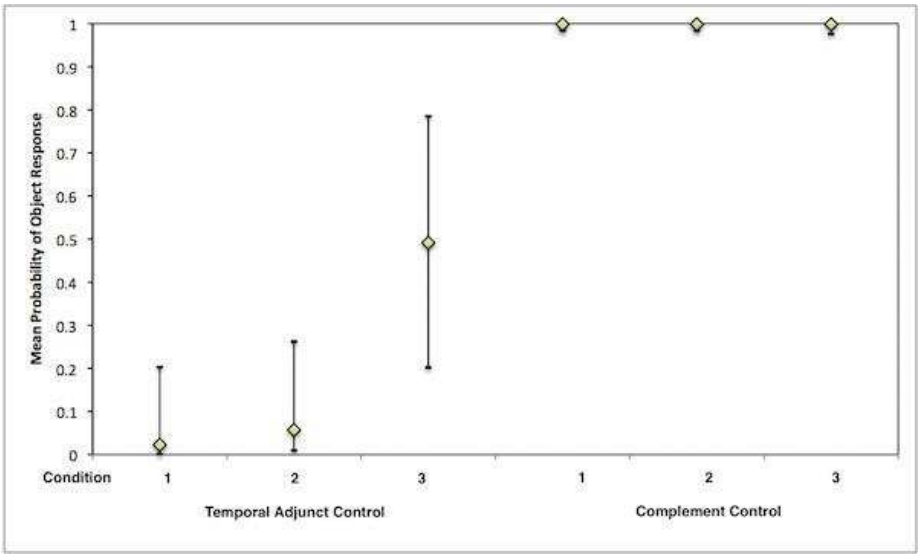
Table 5. Percentage of adults' object responses for CC and AC across Task 1 (no lead), 2 (weak lead to subject/object) and 3 (strong lead to subject/object).

Construction Type (6 items in each)	**Percentage of Object Responses**		
	Task One	*Task Two*	*Task Three*
Complement Control	98.9	98.9	98.9
Adjunct Control	11.1	18.9	51.1

There was a significant interaction between object choices in adjunct control in conditions 1 and 3 (Wald $t = 3.51$, df 446, $p<0.001$) and conditions 2 and 3 (Wald $t = 6.01$, df 446, $p<0.001$). Figure 4 shows the relevant confidence intervals, which highlight the lack of any difference in complement control

across conditions in juxtaposition to the contrasts evident in temporal adjunct control between conditions 1 and 3 and conditions 2 and 3.

Figure 4. Estimated mean probability of adults' object responses in temporal adjunct control and complement control.



As with the children, a further analysis was conducted on the number of subject responses in adjunct control and the number of object responses in complement control, the primary interest being responses in the baseline. Again, these showed that not only were the responses to these constructions significantly different in condition 2 (Wald t=3.11, df 446, p= 0.02) and condition 3 (Wald t=4.87, df 446, p<0.001), which had included pragmatic leads, but also in 1, which had not (Wald t = -3.38, df 446, p=0.01), [8] so even in the baseline, the two constructions behaved differently.

The final analysis checked whether the drop in subject choices found in adjunct control in condition 3 relative to condition 1 was visible for all verbs (*drink*, *feed*, *fly*). Verb was entered as a fixed effect, along with condition and year. There was a marginal main effect of verb (F=2.63; df 2, 247; p=0.07)

[8] All p-values are sidak-corrected.

and an interaction between condition and verb (F=5.71; df 4, 247; p=0.002) but no 3-way interaction between condition, verb and year (p=0.12). There was a significant difference between *drink* in condition 1 and 3 (Wald t=2.05; df 247, p=0.04), between *feed* in condition 1 and 3 (Wald t= 2.95 df 247, p=0.003) and also between *fly* in condition 1 and 3 (Walt t = 5.37, df 1252, p<0.001). As with the children, this meant that despite there being variability within condition 3, in terms of the relative effect of each verb, the significant drop in subject responses in condition 3 was visible for all verbs. The next section reports on the results of study two, deferring discussion of both studies until section 5.

3. Method for Study Two

3.1 Participants

43 typically developing monolingual children (25 girls) aged 7;3 to 11.2 years (Mean age = 9.2) from two state primary schools (from years 3 to 6) in the South East of England took part.[9] The mean age of each year group was: Year 3 (7.7); Year 4 (8.7); Year 5 (9.6) and Year 6 (10.7). 14 of the original 15 adults also participated.

3.2 Materials

The same picture-selection design was used, where participants needed to click on one of two tabs. There were two critical sentence types (AC and AC_SPL) and four sentence sets from study one, serving as control items (CC, CC_SPL, SVO and while). With six trials in each condition, this task had 36 trials.

3.3 Sentence Sets

[9] Testing for this second study took place at the beginning of the academic year, unlike the testing for study one, which was undertaken over the summer. For this reason, only years 3, 4, 5, and 6 children were included as the year 2 children were too near in age to the children who were not able to ignore infelicitous leads (i.e. in fillers and CC) in study one. See footnote 4.

Two critical sentence sets with adjunct control were used, namely adjunct control without a pragmatic lead and adjunct control with a strong pragmatic lead towards an external referent. An example of each appears below.

(24) Temporal Adjunct Control Test Sentence Examples

(a) Hermione held the balloon while flying the broom.

(b) Ron is preparing for a competition. Ron practises in the air. Hermione held the balloon while flying the broom.

The matrix object in the adjunct control sentences was inanimate so that the children's choices would be limited to two, thereby paralleling the previous study. Grappling with three possible referents would have complicated the task considerably relative to study one. In both examples, the correct picture depicted *Hermione* sitting on a broomstick with a balloon in her hand with *Ron* standing by. The foil depicted *Hermione* standing and holding the balloon and *Ron* on the broomstick. The pragmatic lead sentences were taken from the adjunct control sentences in study one and so provide exactly the same strength of lead, only towards an external referent rather than the matrix object. The procedure mirrored that of study one.

4. Results for Study Two

4.1 Children's Results

As a whole group, the children performed at near ceiling on all conditions. These included the trials serving as control conditions in this task, namely SVO (99% correct), while (99% correct), complement control (98%) and complement control with a strong lead towards the subject (98% correct), as well as the two critical conditions: adjunct control (99% correct) and adjunct control with a strong lead towards the object (97%). Of particular note is that the condition strongly cueing complement control

towards the subject and the condition strongly cueing an external referent in adjunct control received exactly the same score. Table 6 below illustrates performance across age groups.

Table 6. Percentage of correct responses (SVO, While, CC, CC_Strong Pragmatic Lead, AC_No Pragmatic Lead and AC_Strong Pragmatic Lead) by year group (Year 3 n=9; Year 4 n=12; Year 5 n=10; Year 6 n=12).

Construction Across Year Group (6 items in each)		% Correct
SVO	Year 3	100
	Year 4	100
	Year 5	99
	Year 6	100
While	Year 3	98
	Year 4	100
	Year 5	100
	Year 6	100
CC	Year 3	95
	Year 4	100
	Year 5	99
	Year 6	100
CC_SPL	Year 3	96
	Year 4	100
	Year 5	97
	Year 6	97
AC	Year 3	100
	Year 4	99
	Year 5	100
	Year 6	99
AC_ext ref_SPL	Year 3	96
	Year 4	96
	Year 5	99
	Year 6	99

4.2 Adults' Results

The 14 adults scored 100%. That is, the control items were all correct and for the critical items they only permitted an internal referent (i.e. subject) response.

5. Discussion

This study took a group of 76 children aged between six and eleven and tested whether two pragmatic leads of different strengths could affect referent choices for the *ec* in complement control and temporal adjunct control. The main finding was that all children demonstrated a very high degree of resilience to both weakly and strongly established discourse topics for complement control yet consulted the strongly established topics to make interpretative judgements in temporal adjunct control. Results from 15 adults who completed the same tasks patterned with the children, ignoring the topics for complement control, yet attending to them for temporal adjunct control. A follow-up study tested whether children and adults would accept an external referent in adjunct control in a condition with no pragmatic lead and one with a strong pragmatic lead. This was found not to be so for the children or the adults.

The discussion starts with the SVO control sentences, continuing to complement control, indicating how the current results map with the literature on this construction's acquisition. It then turns to temporal adjunct control, where several possible interpretations of the results are considered. In particular, it is asked whether an approach based upon an activation-based procedure for antecedent retrieval can on its own provide a full account of the pattern of results or whether the categorisation of temporal adjunct control as a strictly subject-oriented construction needs to be reconsidered. For both proposals, the challenge is to account for the availability of two sentence-internal readings for a substantial minority under strong discourse pressure without losing sight of why one reading is so highly preferred.

Focusing first on the control items, children across all five age groups performed nearly at ceiling on the four control conditions. The SVO sentence set demonstrated that the children understood the task, whereas the 'while' sentence set showed that they knew that the meaning of 'while' required both referents to be engaging in activities simultaneously. The weak pragmatic lead sentence set and the strong pragmatic lead sentence set tested whether they could ignore weak and strong infelicitous

contextual cues for constructions whose grammatically set interpretations are uncontroversial. Their responses confirmed that they were. The very high scores on these tasks across all year groups allow us to progress to their performance on the test conditions.

Children across all year groups demonstrated a very high level of comprehension of complement control (with a total of 95% from a possible 456 data points correct in Task 1, 98% in Task 2, and 97% in Task 3), indicating that they did not consult the discourse to determine referents. There were no significant age differences across tasks. Thus, neither a weak lead nor a strong one could veer children from the age of six onwards away from the grammatically determined antecedent. This was also true of the 15 adults, who opted for the object uniformly. These results support and build upon the complement control literature set out in the introduction on younger children (Eisenberg & Cairns 1994; Lust et al 1986; Cohen Sherman & Lust 1993), where upwards from the age of five, children largely ignored a weakly established topic in complement control. The current addition of a strongly established topic demonstrates that even under severe discourse pressure, interpretation choice remains unaffected, thereby replicating Janke & Perovic's (2016) results on a smaller sample.

The results for temporal adjunct control reveal a strikingly different pattern. Firstly in Task 1, although there was a strong tendency for the children to choose the subject, this was not absolutely so, and we saw that already in the base-line, complement and adjunct control were behaving significantly differently from each other, signalling a fragility in one construction that was absent in the other. The youngest age group made the highest number of object-oriented choices in this base-line (Yr2: 29%, Yr3: 14%, Yr4: 15%, Yr5: 9%, Yr6: 2%). This cross-sectional pattern might support the direction of argumentation in previous longitudinal literature, namely of an interim stage, where younger children permit either the subject or object to be equated with the *ec*, prior to converging on an adult subject-oriented grammar. It could be that the youngest age group are still at this stage but this cannot account for the majority of the year groups or the 15 adults, who did not opt for a subject-oriented reading in the baseline condition uniformly either. Specifically, 11% of their 90 data points were

object-oriented responses, which is a flexibility they did not show in complement control (or any of the control items). And as with the children, their proportion of subject choices in adjunct control was significantly lower than that of their object choices in complement control in this baseline condition. If we turn now to Task 2, when faced with a weak pragmatic lead to the object, children retained a strong preference for a subject-oriented reading but there was still a degree of flexibility in referent choice that was absent from their responses in the parallel complement control condition, whose object-oriented responses were at ceiling. Specifically, in adjunct control, the object-oriented choices sat at 9%. The 15 adults did show a slight rise in object choices, namely 19% - a rise of 8% from Task 1, suggesting a marginal effect of the weak lead. However, it was the strong lead in Task 3 that induced the largest shift. Overall, 41% of children's responses were object-oriented ones (Yr2: 32%, Yr3: 30%, Yr4: 45%, Yr5: 40%, Yr6: 53%) and these percentages should be compared to those reported above for the baseline. Recall that no effect from this strength of lead was found in either complement control or the two control sentence sets. In addition, the adults' object choices increased similarly, with overall object responses totalling 46%, suggesting that from Year 4 onwards, the children's responses look adult-like. The parallels found here between the adults and the children from year 3 onwards across both constructions are suggestive of their approaching the judgements similarly and one possibility that needs to be considered is whether the results can be explained in terms of the specific task used. There is a growing body of work, for example, showing that just as the child's developing grammar is not identical to the adult one, nor is the child's immature parser. This could mean that what appears to be a child's grammatical judgement could in fact be the product of the developing parser's sensitivity to activation and inability to revise a first parse, rather than demonstrating something about the child's grammatical knowledge (see Omaki & Lidz 2015 for a review). Given the very similar results, however, between the different child age groups (at least from Year 3), between the children and the adults, and the 70 adults' results from Janke & Bailey (2017), it seems more likely that their patterns of errors stem from the same source. However, the adult parser can be sensitive to activation, too, so the question just raised regarding the children's parser might also apply to the adult one. More

specifically, could an activation-based procedure for antecedent retrieval account alone for the whole set of results? There are a number of predictions that arise from such an account, which can help us decide whether it is sufficiently motivated.

First, it could be that the parser converges on the object in adjunct control due to both the subject and the object having been recently activated, making them both contenders as antecedents, and that this alone answers for the data. On this account, the object is at an advantage over the subject as it is the most recently activated (not forgetting it has also been strongly reinforced by the strong pragmatic lead), which might explain the shift towards object choices. However, a question arising from this proposal is why the subject remains the preferred choice overall and why some participants never entertain the object as a potential antecedent no matter how strong a lead. In addition, if it were the case that the sole reason for the parser converging on the object were due to both the subject and object having been recently activated, we might expect to see effects of this in complement control, too. On parsing such a sentence, both the subject and object would be activated and on reaching the non-finite clause, a search is triggered for an antecedent. Although the object (i.e. the correct antecedent) is the nearest, the activated subject is also a contender, sharing some features with the object, and, in the strongly cued condition, it would have been reinforced to the point of receiving sufficient activation to trigger the grammatically incorrect subject response. The competition thus arising between these two arguments suggests that we might expect to find a number of subject choices in the complement control trials, despite the object being the most recently activated (as with adjunct control above). Crucially, these errors never occurred. The object was chosen by children and adults uniformly across all three conditions, a result that maps with Janke & Bailey (2017), which found the same pattern in a much larger group. These 70 adults were presented with the same three levels of contextual cue in a two-choice questionnaire. In adjunct control, they largely ignored the object in the base-line condition (only 4% of 420 data points), a figure which rose to 11% in the face of a weakly established topic. Under the pressure of a strongly established topic, however, 47% of trials resulted in object-oriented interpretations. In contrast, object responses to complement control remained

constant throughout. One possible reason for this is that the parser can expect an antecedent on reaching the matrix control verb. Yet verbs that take controlled complements do not do so exclusively, (see 24 b and c), although in a task such as this, they can be anticipated.

(24) (a) Johnnie ordered Peter to dance.

(b) Johnnie ordered Peter a taxi.

(c) Johnnie ordered a pizza.

A second question is whether this approach is consonant with the pattern of responses found for adjunct control. Several response patterns are important to note. There are child and adult participants in this study and adults in Janke & Bailey (2017) who reject an object interpretation in all three conditions, a very small minority of adults in Janke & Bailey (2017) who preferred the object in the baseline condition (see also Mc Daniel et al 1990/1991; Eisenberg and Cairns 1994), and a third group, who choose the object on 4/6 or more occasions under the influence of the strong cue in both the current study and the aforementioned one. These profiles seem rather different from the more systematic responses expected from a parser sensitive to activation levels. Assuming people do not have vastly different lexicons or hugely different frequency counts for words (and the fact that we rely on corpus frequencies suggests that this is not an unreasonable assumption), the same string of words should give rise to approximately the same activation pattern across participants so on its own, this approach might not be able to explain the different sub-groups identified here.

A third question is whether an account in which the data are the consequence of activation sensitivity would predict the strongly cued control (i.e. filler) condition to induce at least some errors. Here, an incorrect referent is strongly cued, hence highly activated; this could potentially distract the participant from the correct referent in the critical SVO sentences. As the interference is across a sentence boundary, and participants are not searching for a syntactic antecedent, they should be much less susceptible to error than in the critical conditions, but would we still expect a few errors?

When participants do not pay sufficient attention, are 'lazy' or tired, they are renowned for making odd judgements. In Buchstaller & Corrigan (2011), for example, a participant produced ungrammatical questions when asked to reformulate interrogatives as declaratives because he was following a so-called 'lazy' strategy. Distracted participants also give incorrect syntactic judgements in uncontroversial fillers. For this reason it is standard practice to remove any participant who scores below a certain threshold on filler stimuli, which was not necessary for this task.

Finally, we can consider the results from Study 2 in which children and adults did not opt for an ungrammatical, sentence-external referent in adjunct control. This was shown in a base-line condition and in a condition that included a strong pragmatic lead towards an external referent. As an anonymous reviewer points out, in this scenario, the paradigm employed an inanimate object in the matrix clause (to keep the task requirements constant with study one) so it is the subject that is the most recently activated contender, purportedly giving it an advantage. The question that remains, however, is whether this advantage can account for all participants giving subject responses. Recall that an advantage for the object in study one (where the object was not only the most recently activated but also supported by the strong pragmatic lead in task 3, unlike here, where it is an external referent that is cued) did not result in all participants choosing the object. Why then, could this activation command such a strong influence on the subject in this latter study but not on the object in study one if competition were the only factor? This issue is left open at this point but what this follow-up study does support is a proposal that derives the data distribution by restricting itself to relations between sentence-internal arguments. The account to be considered now attempts to do this by appealing to syntactic structure.

The alternative proposal to be considered is that the fragility found with temporal adjunct control is indicative of a structural ambiguity. On this view, the nature of the effect cannot be fully explained by activation-based retrieval and calls for a reanalysis of this construction such that a more accurate formulation of the child's ultimate target can be reached. Unlike complement control, the

interpretation of the *ec* in temporal adjunct control is susceptible to pragmatic manipulation. One possibility is to re-categorise temporal adjunct control as non-obligatory control, on a par with the controlled verbal gerund subjects illustrated in the introduction. But based upon work conducted on children and adults on this construction, this seems to be the wrong direction. Firstly, the adults in Janke & Bailey above were tested on examples of non-obligatory control in the same task, and their response pattern was markedly different from complement and adjunct control. For controlled verbal gerund subjects, the topic decided the referent definitively, unlike in temporal adjunct control, where many people remained subject-oriented under this same pressure. A similar pattern for controlled verbal gerund subjects was evident in the aforementioned 17 children tested in Janke & Perovic (2016). With no lead, children chose the sentence-internal referent as the *ec*'s antecedent for 64% of trials. With a weak lead cueing a sentence-external referent, this figure dropped to 11%, and with a strong lead, it fell still further to 7%, a pattern that is markedly different from adjunct control.

At first sight then, temporal adjunct control seems not to sit neatly with obligatory control or non-obligatory control. Unlike complement control, it allows the choice between two sentence-internal referents to be guided by the discourse, when this discourse is strongly cued. Yet unlike non-obligatory control, it generally disallows external referents (see Landau 2013 for a review), a claim that the current study has corroborated, and contextual pressures do not affect everyone's choices. So its pattern is different. The results of study two are important to reintroduce in relation to this point. The 14 adults and the children never opted for external-referent readings for adjunct control either in the baseline or when there was a strong lead towards the external referent, which is a strong indication that temporal adjunct control is not an NOC-relation, as in this relation, sentence-external referents and generic readings are readily available. At this point, we can also return to Lust et al (1986), which showed that young children were as susceptible to pragmatic leads cueing sentence-internal referents with temporal adjunct control as they were with pronouns. Their suggestion was that children at this age do not apply control rules to the *ec* in adjunct control, treating it instead as a pronoun. Given that we have now seen that unlike pronouns, the *ec* in temporal adjunct control does not permit external

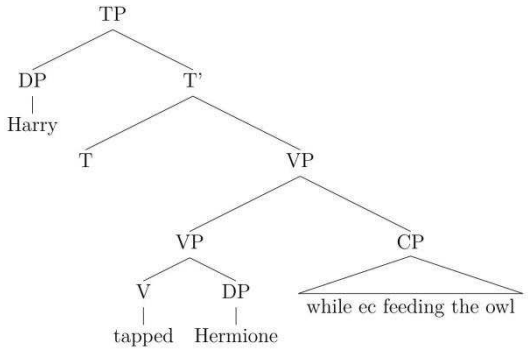
referents, the flexibility in adjunct control calls for a different analysis for the age groups tested here, although we cannot disentangle this issue for the very youngest group, who simultaneously demonstrate an acceptance of object readings for adjunct control as well as a reluctance to attend to the pragmatic leads (see Janke 2016 and Janke in press) for this age group's pattern in non-obligatory control).

An account that might capture this data pattern exploits an existing analysis of the English VP (Larson 2004; Janke & Neeleman 2012). It attempts to accommodate the nature of the within-sentence ambiguity we have seen, whilst still excluding an external reference. Sentences that host adjuncts are conventionally analysed as having multiple possible attachments sites for an adjunct. It is this availability that answers for their permitting more than one interpretation. In (25), for example, the referent denoted by the subject or the object could be associated with the prepositional phrase.

(25) The policeman interrogated the suspect in his pyjamas.

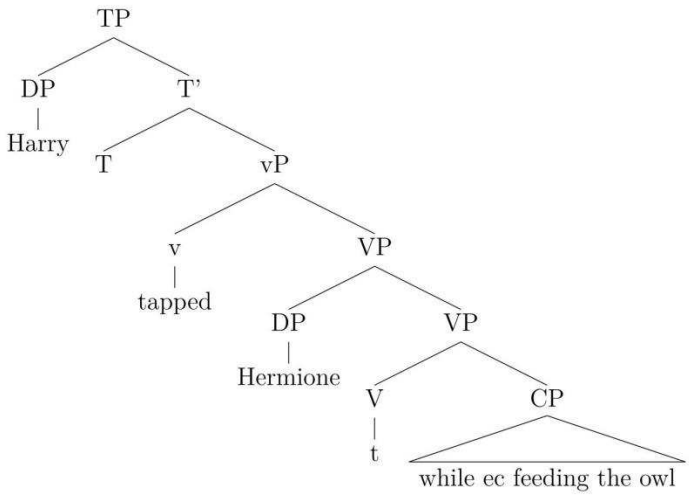
When associated with the object, the adjunct attaches inside the VP within the domain of the object (see Larson 2004) but when linked to the subject, the adjunct attaches higher, at the VP level, which is within the subject's structural domain. If we now turn back to adjunct control, we would first like to account for the majority of people, both children over seven and adults, who have a strong preference for a subject reading, but also for the minority of individuals (see Mc Daniel et al 1990/1991; Eisenberg and Cairns 1994; Janke & Bailey 2017) who prefer the object. An analysis in which sentence-final temporal adjunct control is viewed as a structurally constrained relation with two available attachment sites can capture both possibilities. When the adjunct attaches at the VP level, only the subject c-commands into it. The resulting structure, illustrated in (26), allows only a subject-oriented reading, and represents speakers whose subject-oriented readings are rigid.

(26)



However, an alternative structure is needed to represent those speakers who defer to the object under extreme discourse pressure, because in (26), the object does not c-command into the adjunct. Adopting an analysis proposed independently for English VP structure in Janke & Neeleman (2012), the suggestion is that this group of speakers permit the adjunct to attach low, merging directly with the verb (see also Larson 2004). When such low attachment occurs, a VP-shell is generated because in English a verb must be left-adjacent to an argument that is dependent on it for accusative case (see Janke & Neeleman 2012 for full motivation). Under this configuration, both the subject and object c-command into the adjunct but the object is the most local to the *ec* and so controls it.

(27)



As most people opt for a subject-oriented reading, there must be a general preference not to attach these modifiers low. However, if sufficient pressure is put upon the system, as with the strongly

established topics in condition 3, an increasing number of speakers choose the object as the *ec*'s antecedent. Importantly, it is the fact that adjuncts permit more than one structure that makes this choice between two sentence-internal referents possible: when the syntax provides more than one structural configuration, it is then that pragmatics can influence the way in which the string is parsed. In contrast, in complement control, only the VP-shell structure is available since control verbs select a CP that is obligatorily merged as the verb's complement (see Larson 1991). Note also that this analysis correctly predicts that this type of temporal adjunct control does not allow an external-referent reading, as corroborated by the results of study two.

Having suggested a proposal for the two available readings in temporal adjunct control, it remains to consider why one parse is so much preferred over the other. In Janke & Neeleman (2012), it is argued that VP-shell formation is subject to a principle of economy, where a structure with no movement is more economical than one with movement:

(28) Economy

(a) Two structures are in competition if and only if (i) they are well formed, and (ii) they are characterised by identical hierarchical relations, except for those hierarchical relations created by movement.

(b) From a set of competing structures, choose the one with the fewest movements.

(Janke & Neeleman 2012: exx. (6))

We saw above that the subject-oriented reading of the *ec* is possible when no VP-shell has been generated. This in turn predicts that it should be preferred over the object-oriented reading, which is marked because of the verb movement it requires. Janke & Bailey (2017) tested a prediction that arose from this structural account, namely that adults who opted for an object reading of the *ec* in adjunct control should no longer do so when the c-command relation between the object and the *ec* had been disrupted. Specifically, if the object reading surfaces via low attachment, when such low attachment is blocked by some independent factor, the object reading should cease, no matter how persuasive the context. The authors used ellipsis as a constituency test, since being sensitive to VP-structure, it disallows omission or replacement of the moved verb and the post-verbal DP in a VP-shell structure.

This means that if VP-shell formation has taken place, such as in (29), neither *do so*-substitution nor VP-ellipsis is possible:

(29) (a) *If he [$_{V}$ gave [$_{VP}$ Mary [$_{V}$ t_{v} anything]]], he did so a woollen scarf.

(b) *If he [$_{V}$ gave [$_{VP}$ Mary [$_{V}$ t_{v} anything]]], he did *e* a woollen scarf.

(Janke & Neeleman 2012: exx. (13 a, b))

The relevance to the current study is that by performing this VP-fronting test on adjunct control, the authors could prevent a VP-shell from being generated and so also the possibility of an object-oriented reading of the adjunct if the reading did come about as a product of low attachment. That is to say, these speakers should not permit an object reading of examples such as (30). Their results showed that all the participants who accepted the test sentences met this expectation.[10]

(30) Harry is looking after the birds. Harry takes out the food. Harry expected Hermione to tap him and tap Harry Hermione did while *ec*$_{?}$ feeding the owl.

An advantage of appealing to a structural analysis such as this is that it permits both readings of the adjunct yet predicts the subject-oriented one to be the highly favoured one, as is the case. The availability of two representations captures the evident ambiguity of the construction and provides an accurate target for children to reach for this syntactically regulated dependency.

5. Summary

Children up to the age of eleven continue to be affected by pragmatic leads that cue the object in temporal adjunct control, which is long after the period at which these constructions are reported to have been acquired. The same is true of adults. Pragmatic leads towards an external referent do not affect children's or adults' interpretation of adjunct control and nor do pragmatic leads towards the

[10] Some participants rejected the test sentences altogether. See Janke & Bailey (2016) for another experiment testing the same phenomenon on a sub-set of those participants.

subject in complement control, which remains strictly object-oriented. Even in a base-line condition, which tested the sentences in isolation, the two constructions behaved differently: the proportion of object-oriented responses in complement control was significantly different from the proportion of subject-oriented responses in temporal adjunct control. Two interpretations of the data have been discussed, one based solely on competition during antecedent retrieval, and one that proposes an ambiguous syntactic structure. If the latter is correct, then the target grammar should be reformulated to reflect this pattern. The syntactic proposal that has been considered accommodates the attested sentence-internal readings, whilst giving precedence to the highly preferred subject-oriented one. What the current paradigm has exposed is a fragility in adjunct control that is absent from complement control - a finding that future studies on these constructions should take on board. However, whether a revised structure for adjunct control is necessary depends on the degree to which the specific pattern of results found can be explained away by task effects, as also discussed.

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References

Adler, Alison. 2006. *Syntax and Discourse in the Acquisition of Adjunct Control*. Boston, Massachusetts: MIT dissertation.

Ariel, Mira. 2001. Accessibility theory: An overview. In Ted Sanders, Joost Schilperoord & Wilbert Spooren, (eds.), *Text representation: Linguistic and psycholinguistic aspects*, 29–87, Amsterdam, John Benjamins.

Broihier, Kevin & Ken Wexler. 1995. Children's acquisition of control in temporal adjuncts. In: Carson Schutze, Jennifer Ganger and Kevin Broihier (eds.), *MITWPL 26*, pp193–220. Cambridge, Mass: MIT.

Buchstaller, Isabelle., & Karen Corrigan 2011. Making intuitions work: Testing instruments for measuring dialect syntax". In Warren Maguire and April McMahon (eds.), *Analysing Variation in English*. Cambridge University Press, 30-48.

Cairns, Helen., Dana McDaniel, Jennifer Hsu & Michelle Rapp.1994. A longitudinal study of principles of control and pronominal reference in child English. *Language*, 70, 260-288.

Chomsky, Carol. 1969. *The acquisition of syntax in children from 5 to 10.* Research Monograph No. 57. Cambridge, Mass: MIT Press.

Clackson, Kali., Felser, Claudia and Harald Clahsen. 2011. Children's processing of reflexives and pronouns in English: evidence from eye-movement during listening. *Journal of Memory and Language, 65, 128-144.*

Clark, Herbert & William Chase, W. 1972. On the process of comparing sentences against pictures. *Cognitive Psychology* 3 (3): 472–517.

Eisenberg, Sarita & Helen Cairns. 1994. The development of infinitives from three to five. *Journal of Child Language,* 21, 713-734.

Erteschik-Shir, Nomi. 1993. *The Dynamics of Focus Structure*. Ms. Ben Gurion University of the Negev, Israel.

Givón, Talmy. (ed.) 1983. *Topic continuity in discourse: A quantitative cross-language study.* Amsterdam: John Benjamins.

Goodluck, Helen. 1981. Children's grammar of complement-subject interpretation. In Susan Tavakolian (ed.), *Language acquisition and linguistic theory*, 139-166. Cambridge, Mass: MIT Press.

Goodluck. Helen. 1987. Children's interpretations of pronouns and NPs: an alternative view. In Barbara Lust (ed.), *Studies in the Acquisition of Anaphora. Volume II. Applying the constraints,* 247-269. Dordrecht: Kluwer Academic Publishing.

Goodluck, Helen., Terzi, Arhonto., Gema Chocano Diaz. 2000. The acquisition of control cross-linguistically: structural and lexical factors in learning to license PRO. *Journal of Child Language,* 28, 153-172.

Goodluck, Helen. 2001. The nominal analysis of children's interpretations of adjunct PRO clauses. *Language*, 77, 494-509.

Goodluck, Helen & Eyton Zweig. 2013. Introduction: formal versus processing explanations of linguistic phenomena. *Language and Cognition,* 28, 1-2, 1 – 8.

Guasti, Maria. 2004. *Language Acquisition: The growth of grammar.* Cambridge, Mass: MIT Press.

Hsu, Jennifer, Helen Cairns, Sarita Eisenberg & Gloria Schlisselberg. 1989. Control and co-reference in early child language. *Journal of Child Language*, 16, 599–622.

Janke, Vikki. 2008. Control without a subject. *Lingua* 118 (1): 82 -118.

Janke, Vikki. 2016. Pragmatic leads and null subjects: when children consult leads and when they do not' In: Scott, Jennifer and Waughtal, Deb, eds. *Boston University Conference on Language Development Proceedings Series, 40*. Cascadilla Press, Somerville, MA, United States, pp. 184-204.

Janke, Vikki. In press. Who is the agent? The influence of pragmatic leads on children's reference assignment in non-obligatory control. *Journal of Child Language.*

Janke, Vikki. & Laura Bailey. 2017. Effects of discourse on control. *Journal of Linguistics.* (Available First View, 1 -33).

Janke, Vikki & Ad Neeleman. 2012. Ascending and descending VPs in English. *Linguistic Inquiry* 43 (2): 151–190.

Janke, Vikki. & Alexandra Perovic. 2015. Intact Grammar in HFA? Evidence from control and binding. *Lingua* 164, 68-86.

Janke, Vikki & Alexandra Perovic. 2016. Advanced syntax and primary pragmatics in children with ASD. In Naigles, L. (Ed). *Innovative Investigations of Language in Autism*. *Language and the Human Lifespan series.* Washington, DC: American Psychological Association and de Gruyter Mouton, pp 141 – 162.

Kawasaki, Noriko. 1993. *Control and arbitrary interpretation in English.* Amherst: University of Massachusetts dissertation.

Kirby, Susannah, William Davies & Stanley Dubinsky. 2010. Up to D(eb)ate on raising and control Part 2: The empirical range of the constructions and research on their acquisition. *Language and Linguistics Compass* 4 (6), 401 – 416.

Koster, Jan. 1987. *Domains and Dynasties.* Foris, Dordrecht.

Landau, Idan. 2000. *Elements of control: structure and meaning in infinitival constructions*. Dordrecht: Kluwer.

Landau, Idan. 2013. *Control in generative grammar: a research companion*. Cambridge, UK: Cambridge University Press.

Larson, Richard. 1991. *Promise* and the Theory of Control. *Linguistic Inquiry* 22, 1, 103-139.

Larson, Richard. 2004. Sentence-final Adverbs and "Scope". In Matthew Wolf & Keir Moulton (eds.) *Proceedings of NELS 34*, 23 – 43. University of Massachusetts: GLSA.

Lust, Barbara. 1987. (ed.), *Studies in the acquisition of anaphora*. *Volume 1*. *Defining the constraints*. Dordrecht: Kluwer Academic Publishers.

Lust, Barbara., Larry Solan, Suzanne Flynn, Catherine Cross & Elaine Schuetz. 1987. A comparison of null and pronoun anaphora in first language acquisition. In Barbara Lust (ed.), *Studies in the Acquisition of Anaphora. Volume I. Defining the constraints,* 245-277.Dordrecht: Kluwer Academic Publishers.

Manzini, Rita. 1983. On control and control theory. *Linguistic Inquiry* 14, 421-446.

McDaniel, Dana., Helen Cairns & Jennifer Hsu. 1990/1991. Control principles in the grammar of young children *Language Acquisition,* 1: 297–335.

Neeleman, Ad., Elena Titov, Hans van de Koot & Reiko Vermeulen. 2009. A syntactic typology of topic, focus and contrast. (pp 15 – 52). In Jeroen van Craenenbroeck (ed.), *Alternatives to Cartography* (Studies in Generative Grammar). Place: Mouton De Gruyter.

Omaki, Akira & Jeffrey Lidz. 2015. Linking parser development to acquisition of syntactic knowledge. *Language Acquisition,* 22, 158-192.

Perovic, Alexandra., Nadya Modyanova & Kenneth Wexler. 2013. Comparison of reflexive and personal pronouns in children with autism: A syntactic or pragmatic deficit*? Applied Psycholinguistics*, 34 (4), 813-835.

Reinhart, Tanya. 1981. Pragmatics and linguistics: An analysis of sentence topics. *Philosophica* 27: 53 – 94.

Ring, Melanie & Harald Clahsen. 2005. Distinct patterns of language impairment in down syndrome, Williams syndrome and SLI: the case of syntactic chains. *Journal of Neurolinguistics*, 19, 479–501.

Samek-Lodovici, Vieri. 1996. *Constraints on subjects: an optimality theoretic analysis*. New Brunswick: Rutgers University dissertation.

SAS for Windows. 2011. Version 9,3. SAS Institute Inc., Cary, N, USA.

Sanoudaki, Eirini & Spyridoula Varlokosta. 2014. Pronoun comprehension in individuals with down syndrome: deviance or delay? *Journal of Speech, Language and Hearing Research*, 57, 1442–1452.

Sherman, Janet. 1983. *The Acquisition of Control in Complement Sentences: The Role of Structural and Lexical Factors*. New York, Cornell University dissertation.

Sherman, Janet & Barbara Lust. 1986. Syntactic and Lexical Constraints on the Acquisition of Control in Complement Sentences. In Barbara Lust (ed.), *Studies in the Acquisition of*

Anaphora. Volume I. Defining the constraints, 279-310. Dordrecht: Kluwer Academic Publishers.

Sherman, Janet, & Barbara Lust. 1993. Children are in control. *Cognition,* 43, 1-51.

Strawson, Peter. 1964. Identifying Reference and Truth Values. *Theoria* 30 (2):96-118.

Tavakolian, Susan. 1978. Children's comprehension of pronominal subjects and missing subjects in complicated sentences. In Helen Goodluck & Larry Solan (eds.), *Papers in the Structure and Development of Child Language.* University of Massachusetts Occasional Papers in Linguistics 4, 145-152, Amherst: University of Massachusetts.

Vallduví, Enric. 1992. *The Informational Component.* New York/London: Garland.

Wexler, Ken. 1992. Issues in the growth of control. In Richard, Larson, Sabina Iatridou, Utpal Lahiri, & James Higginbotham (Eds.), *Control and Grammar*. *Studies in Linguistics and Philosophy.* (pp 253–295) Dordrecht: Kluwer Academic Publishers.

Appendices

Appendix 1. Test and Control Sentences Study One

Task One (No Pragmatic Lead)

Complement Control Test Sentences
Hermione ordered Harry to mix the flour.
Harry ordered Hermione to mix the flour.
Ron persuaded Hermione to kick the ball.
Hermione persuaded Ron to kick the ball.
Luna told Harry to pop the balloon.
Harry told Luna to pop the balloon.

Temporal Adjunct Control Test Sentences
Ron kissed Hermione while flying the broom.
Hermione kissed Ron while flying the broom.

Harry tapped Hermione while feeding the owl.
Hermione tapped Harry while feeding the owl.
Ron lifted Luna while drinking the potion.
Luna lifted Ron while drinking the potion.

SVO Control Sentences
Hermione is feeding the owl.
Harry is lifting the book.
Hermione is kicking the ball.
Ron is rowing the boat.
Harry is mixing the flour.
Luna is kissing the owl.

While Control Sentences
Hermione is feeding the owl while Harry is waving the wand.
Harry is feeding the owl while Hermione is waving the wand.
Luna is flying the broom while Harry is lifting the book.
Harry is flying the broom while Luna is lifting the book.
Luna is kissing the owl while Ron is popping the balloon.
Ron is kissing the owl while Luna is popping the balloon.

Task Two (Weak Pragmatic Lead)

Complement Control Test Sentences
Let me tell you something about Hermione. Hermione ordered Harry to mix the flour.
Let me tell you something about Harry. Harry ordered Hermione to mix the flour.
Let me tell you something about Ron. Ron persuaded Hermione to kick the ball.
Let me tell you something about Hermione. Hermione persuaded Ron to kick the ball.
Let me tell you something about Luna. Luna told Harry to pop the balloon.
Let me tell you something about Harry. Harry told Luna to pop the balloon.

Temporal Adjunct Control Test Sentences
Let me tell you something about Hermione. Ron kissed Hermione while flying the broom.
Let me tell you something about Ron. Hermione kissed Ron while flying the broom.
Let me tell you something about Hermione. Harry tapped Hermione while feeding the owl.
Let me tell you something about Harry. Hermione tapped Harry while feeding the owl.
Let me tell you something about Luna. Ron lifted Luna while drinking the potion.
Let me tell you something about Ron. Luna lifted Ron while drinking the potion.

SVO Control Sentences
Let me tell you something about Ron. Ron said that Hermione is feeding the owl.
Let me tell you something about Luna. Luna said that Harry is waving the wand.
Let me tell you something about Harry. Harry said that Luna is pouring the water.
Let me tell you something about Hermione. Hermione said that Harry is mixing the flour.
Let me tell you something about Ron. Ron said that Luna is rowing the boat.
Let me tell you something about Hermione. Hermione said that Ron is drinking the potion.

Task Three (Strong Pragmatic Lead)

Complement Control Test Sentences

Hermione is having a party. Hermione prepares all the food. Hermione ordered Harry to mix the flour.
Harry is having a party. Harry prepares all the food. Harry ordered Hermione to mix the flour.
Ron is learning a new game. Ron practises the rules. Ron persuaded Hermione to kick the ball.
Hermione is learning a new game. Hermione practises the rules. Hermione persuaded Ron to kick the ball.
Luna is performing a new trick. Luna takes out the pin. Luna told Harry to pop the balloon.
Harry is performing a new trick. Harry takes out the pin. Harry told Luna to pop the balloon.

Temporal Adjunct Control Test Sentences

Hermione is preparing for a competition. Hermione practises in the air. Ron kissed Hermione while flying the broom.
Ron is preparing for a competition. Ron practises in the air. Hermione kissed Ron while flying the broom.
Hermione is looking after the birds. Hermione takes out the food. Harry tapped Hermione while feeding the owl.
Harry is looking after the birds. Harry takes out the food. Hermione tapped Harry while feeding the owl.
Luna is preparing an invisibility spell. Luna holds up the goblet. Ron lifted Luna while drinking the potion.
Ron is preparing an invisibility spell. Ron holds up the goblet. Luna lifted Ron while drinking the potion.

SVO Control Sentences

Ron is looking after the birds for the day. Ron puts the food into the bowl. Hermione is feeding the owl.
Luna is learning a difficult spell for a class test. Luna says the magic words slowly. Harry is waving the wand.
Harry is making a magic potion in front of the whole class. Harry lifts up the yellow cup. Luna is pouring the water.
Hermione is inviting the whole class to a birthday party. Hermione prepares a beautiful chocolate cake. Harry is mixing the flour.
Ron is taking a trip out onto Hogwarts lake. Ron takes hold of the wooden oars. Luna is rowing the boat.
Hermione is mixing the ingredients for a spell. Hermione takes up the small blue goblet.
Ron is drinking the potion.

Appendix 2. Test and Control Sentences Study Two

Temporal Adjunct Control Test Sentences

Ron held the balloon while flying the broom.
Hermione held the balloon while flying the broom.
Harry carried the book while feeding the owl.
Luna carried the book while feeding the owl.
Ron lifted the wand while drinking the potion.
Luna lifted the wand while drinking the potion.

Adjunct Control with Strong Pragmatic Lead to External Referent Test Sentences

Hermione is preparing for a competition. Hermione practises in the air. Ron held the balloon while flying the broom.
Ron is preparing for a competition. Ron practises in the air. Hermione held the balloon while flying the broom.
Luna is looking after the birds for the day. Luna takes out the food. Harry carried the book while feeding the owl.
Harry is looking after the birds for the day. Harry takes out the food. Luna carried the book while feeding the owl.
Luna is preparing an invisibility spell. Luna holds up the goblet. Ron lifted the wand while drinking the potion.
Ron is preparing an invisibility spell. Ron holds up the goblet. Luna lifted the wand while drinking the potion.

Appendix 3. *Verb Frequencies* (http://ucrel.lancs.ac.uk/bncfreq/)

Persuade	52	Mix	41
Order	76	Kick	36
Tell	775	Pop	20
Kiss	19	Fly	70
Tap	22	Feed	67
Lift	71	Drink	70

Appendix 4. *Structured Interview Results*

We included the two control verbs (*persuade* and *order*) and a verb used in one of the primes

(prepare) in a structured interview to check whether any problems with the constructions stemmed from insufficient knowledge of these lexical items. Children were probed with questions that avoided control constructions: 'What does it mean when you persuade someone?', 'What does it mean when you order someone?', 'What does it mean when you prepare something?'.

Coding Scheme

0 No response given or response considered to bear insufficient/no relation to the meaning.

- Examples for *persuade*: I don't know; Helping you out?
- Examples for *order*: Don't know; They want to talk to me about something.
- Example for *prepare*: Try and keep stuff safe.

1 Explanation and/or example given that approximates the meaning but is lacking a key component yet (for persuade and order) demonstrates an awareness that the object links to the agent in the embedded clause.

- Examples for *persuade*: Like you ask someone to do something; It means they do what you tell them.
- Example for *order*: They get the things that you wanted.
- Example for *prepare*: It's like building something.

2 Explanation and/or example given that reaches at least an adequate meaning of the word and (for persuade and order) demonstrates an awareness that the object links to the agent in the embedded clause.

- Examples for *persuade*: You make someone do it but in a nice way; You convince them to do it.
- Examples for *order*: You tell them what to do; You tell someone to do something and that means they have to do it.

- Example for *prepare*: Get everything ready for that certain event or thing; you get everything ready like when you're getting ready for a party and you put all the decorations up.

Children's responses were coded by two coders independently. It was agreed to resolve any areas of disagreement through discussion, however, agreement was 100%. Table 3 shows that five children in Year 2 had problems describing *persuade*. Despite these five being coded as 0, this year group achieved a score of 95% correct in complement control in all three tasks and the particular five children scored 17/18; 17/18; 18/18; 18/18 and 18/18, indicating that although they may not have been able to describe the meaning of these verbs, they still knew it was the object that linked with the *ec* in the infinitival clause.

Table 8. Coding frequencies across year groups.

Coding	Year 2 (n=14)	Year 3 (n=16)	Year 4 (n=14)	Year 5 (n=16)	Year 6 (n=17)
Persuade 0	5	0	0	0	0
Persuade 1	5	2	1	0	1
Persuade 2	4	14	13	16	16
Order 0	1	1	0	0	0
Order 1	0	0	0	0	1
Order 2	13	15	14	16	16
Prepare 0	1	0	0	0	0
Prepare 1	1	0	0	0	0
Prepare 2	12	15	14	16	16