

Competition all the way down: How children learn word order cues to sentence

meaning

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Abstract

Most work on competing cues in language acquisition has focussed on what happens when cues compete within a certain construction. There has been far less work on what happens when constructions themselves compete. The aim of the present chapter was to explore how the acquisition mechanism copes when constructions compete in a language. We present three experimental studies, all of which focus on the acquisition of the syntactic function of word order as a marker of the Theme-Recipient relation in ditransitives (form-meaning mapping). In Study 1 we investigated how quickly English children acquire form-meaning mappings when there are two competing structures in the language. We demonstrated that English speaking 4-year-olds, but not 3-year-olds, correctly interpreted both prepositional and double object datives, assigning Theme and Recipient participant roles on the basis of word order cues. There was no advantage for the double object dative despite its greater frequency in child directed speech. In Study 2 we looked at acquisition in a language which has no dative alternation – Welsh – to investigate how quickly children acquire form-meaning mapping when there is no competing structure. We demonstrated that Welsh children (Study 2) acquired the prepositional dative at age 3 years, which was much earlier than English children. Finally, in Study 3 we examined *bei2* (*give*) ditransitives in Cantonese, to investigate what happens when there is no dative alternation (as in Welsh), but when the child hears alternative, and possibly competing, word orders in the input. Like the English 3-year-olds, the Cantonese 3-year-olds had not yet acquired the word order marking constraints of *bei2* ditransitives. We conclude that there is not only competition between cues but competition between constructions in language acquisition. We suggest an extension to the competition model (Bates & MacWhinney, 1982) whereby generalisations take place across constructions as easily as they take place within constructions, whenever there are salient similarities to form the basis of the generalisation.

1. Introduction

A central task for children learning language is working out how the individual words in a sentence combine to convey meaning. For example, English uses word order to assign meaning, which means that the order of words in the sentence *the dog bit the man* tells us that the dog is the biter (or agent) and the man is the one who is bitten (or patient of the action). However, languages such as Turkish assign meaning using case marking. Thus, the same sentence – *the dog bit the man* - in Turkish could also mean that the **man** (agent) bit the **dog** (patient) depending on how the nouns are marked for case (e.g. which inflection or postposition they take).

The child's task is complicated by the fact that multiple, sometimes competing, cues to meaning are often present in a sentence. However, the child's problem works to the researcher's advantage; we can study how children weight different cues when they compete, and whether these weightings change as children develop. And this, in turn, allows us to test different theories about what cognitive mechanisms are co-opted into the language acquisition process, and how such mechanisms process the input. For example, if we find that children rely on the cues that are the most frequent and salient in the language that they are hearing, we would want to build theories around a mechanism that prioritises frequently occurring patterns. Alternatively, children may preferentially pay attention to particular cues regardless of their frequency or salience in the input, in which case, we would want to build some particular sensitivity to these cues into the learning mechanism.

Most work on competing cues has focussed on what happens when cues compete within a certain construction (i.e. word order and animacy cues within the transitive; see e.g. Bates & MacWhinney, 1989; Bates, MacWhinney, Caselli, Devescovi, Natale & Venza, 1984). There has been far less work on what happens when constructions themselves

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compete, despite this being an equally informative question. The aim of the present chapter was to explore how the acquisition mechanism copes when constructions compete in a language, with the goal of adding to our knowledge of how the language learning mechanism works. We present three experimental studies, all of which focus on the acquisition of the syntactic function of word order as a marker of the Theme-Recipient relation in ditransitives (form-meaning mappings). In Study 1 we investigated how quickly children acquire form-meaning mappings when there are two competing structures in the language. We focussed here on English, which has dative alternation between two relatively frequent dative structures (the double object dative and the prepositional dative), which convey similar meanings but order the Theme and Recipient arguments differently. In Study 2 we looked at acquisition in a language which has no dative alternation – Welsh – to investigate how quickly children acquire form-meaning mappings when there is no competing structure. Finally, in Study 3 we examined *bei2* (*give*) ditransitives in Cantonese, which allow us to investigate what happens when there is no dative alternation (as in Welsh), but when the child hears alternative, and possibly competing, word order structures in the input.

1.1. Competing constructions in language acquisition

There is a large literature on what happens when cues compete, much of it framed within a Competition Model framework, which suggests that ‘decisions in sentence interpretation are made by evaluating the relative weights of the cues present in the stimulus’ (Bates et al., 1984: 344, see also Bates & MacWhinney, 1982; MacWhinney, 1987). For example, Bates et al. (1984) report that English adults and children will choose word order over animacy cues when interpreting transitive sentences with conflicting cues (e.g. *the chair pushed the tiger*) but that Italians will choose to interpret the sentence according to the animacy cues. Both

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decisions are consistent with the most reliable cues in the English and Italian language (see also Chan, Lieven & Tomasello, 2009; Dittmar, Abbot-Smith, Lieven & Tomasello, 2008; Ibbotson & Tomasello, 2009).

However, this work has focussed only on the competition between cues within a particular sentence structure. Far fewer studies look at what happens when there is competition between structures – in other words, how the language acquisition mechanism behaves when there are two syntactic options to convey the same semantic information at the level of the argument structure construction. For example, English allows dative alternation - there are two ditransitive structures that express similar meaning but use different word orders to do so (Siewierska, 1998). One of these structures – the prepositional dative - uses the word order donor-verb-**Theme-Recipient**. So in *the boy gave the book to the girl*, the Theme role (the object transferred) occupies the first post-verbal position, followed by the Recipient (who receives the object). The other structure - the double object dative (e.g. *the boy gave the girl the book*) - requires the speaker/listener to assign the roles in the opposite order - donor-verb-**Recipient-Theme** - the Recipient (who receives the object) occupies the first post-verbal position and the Theme comes afterwards. In order to identify the semantic roles in the two datives correctly, English children have to learn two diametrically opposed (post-verbal) word orders, differentiated by the presence or absence of the preposition *to*.¹

Assessing the effect of such competing constructions is important for distinguishing between two different models of acquisition. On the one hand is the idea that children are conservative generalisers, initially reluctant to move away from the instances they hear or to impose more abstract generalisations on the language (conservative learning; see e.g. Tomasello, 2000a, 2000b). On this model, acquisition starts with children building up a store of lexically-constrained schemas, many of which are centred around particular verbs. For example, the child might learn the double object dative schemas *giver-give-givee-object.given*

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and *sender-send-sendee-object.sent*. These schemas are at first isolated, in the sense that the children have not yet generalised across them to extract semantic or syntactic commonalities (e.g. children will not initially register commonalities across givers and senders, or across objects given and objects sent). Generalisation, based on both syntactic and semantic commonalities, only occurs once a sufficiently large store of lexically-based schemas has been acquired. The generalisation process links lexically-specific schemas together to build more abstract constructions (e.g. *pronoun-Ving-pronoun-NP*) which themselves are linked to other constructions until higher first-order constructions such as the double object dative (*NP-V-NP-NP*) are acquired.

According to this theory, the more instances of schemas a child hears, and the more often she hears them, the earlier in acquisition she will extract the commonalities necessary to generalise across them and link them together. Thus, input frequency is an important predictor of acquisition. In English, the double object dative is substantially more frequent than the prepositional dative in children's input. Studies based on analyses of speech to children in naturalistic conversations have reported that about two-thirds of all dative utterances in speech to children are double object datives (Campbell & Tomasello, 2001; Snyder & Stromswold, 1997). We confirmed this by performing our own counts of dative use in the ICE-GB corpus (Greenbaum, 1996) and in the speech to two 3-year-old UK children (Billy and Helen, see Theakston & Rowland, 2009). Our counts included all 301 alternating and non-alternating dative verbs identified by Levin (1993) and Pinker (1989). Between 65% (Billy) and 89% (ICE-GB) of all dative utterances were double object datives, confirming that the double object dative is substantially more frequent. We also checked the figures for verb types (i.e. the number of different verbs that occur in the two datives) because the ability to generalize across lexically-specific frames requires that the child hears the structure not only frequently but with a number of different verbs. Verb type counts indicate that both

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datives occur with a range of different verbs, both in adult-to-adult speech and adult-to-child speech. There were 12 different verbs in double object datives in the sample of Billy's input and 14 in prepositional datives (the figures for Helen are 15 and 9 respectively; for ICE-GB; 44 and 52). In sum, not only is the double object dative more frequent, but it is also heard with the wide range of different verb types that is required for generalization.

This theory also predicts that there will be little competition between the two dative forms at the initial stages of development. Within the theory, links between first order constructions such as the double object and prepositional datives are only made later on in acquisition, on the basis of second order structure mapping. Since the first order constructions must logically be learnt first, generalisation within a construction (necessary to create the first order construction) must precede generalisation across constructions (necessary to link first order constructions together). In other words, it is only 'older children [who] can, by a process of second order structure mapping, construct some higher order constructions such as the Subject-Predicate constructions' (Tomasello, 2000a: 242). As a result, the theory predicts very little competition between the two dative constructions at first, with the speed of acquisition of each dependent simply on the frequency with which it occurs in children's input. Since the double object dative is more frequent than the prepositional dative, and also occurs with a wide range of verbs, the theory predicts that the double object dative will be acquired first.

An alternative theory proposes that children generalise more widely across both verbs and constructions in acquisition from early on, especially across constructions that share salient syntactic or semantic properties. This idea that constructions influence the acquisition of other constructions has been proposed both for language learning (Abbot-Smith & Behrens, 2006; Morris, Cottrell & Elman, 2000; Ruhland, Winjnen & van Geert, 1995) and for non-linguistic tasks (see Rehder, 2001 for work on inference between learned problem-

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answer associations). According to this theory, the presence of two constructions in the input that denote similar meanings but are expressed using different syntactic structures might be expected to *hinder* acquisition. This is because the learner is receiving conflicting information about what semantic role should be assigned to a noun, given the meaning of the construction, the noun's position in the sentence and its surface form. For example, the two English dative constructions occur with relatively high frequency in the child's input but require a different ordering of the Theme and Recipient roles. This might be expected to hinder children's ability to learn these word order constraints and to assign Theme and Recipient roles correctly. This would be a competing constructions account, which could be seen as an extension of Bates and MacWhinney's competition model (1989).

One illustration of how this type of construction-general learning might work is presented by Chang (Chang, 2002; Chang, Dell & Bock, 2006). Their dual-route connectionist model contained built-in pre-linguistic architectural constraints: both a meaning system (for encoding concepts and semantic roles) and a sequencing system (a simple recurrent network that learned to predict the next word in a sentence). The model was then exposed to sentences with real verbs in a learning phase. In its learning phase, the model gradually developed knowledge of the meaning constraints of each syntactic construction as the outcome of increasing experience with specific sentence-message pairs. Importantly, the model did not discriminate between constructions. Instead, it built up a store of both cross-verb and cross-construction information about what role was most likely to be assigned to a noun, given both its position in the sentence and its surface form. Thus, it was capable of generalising from the start across constructions on the basis of commonalities in either form or meaning.

If children are generalising across constructions in the way predicted by the competing constructions approach, competition between semantically similar forms should hinder

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acquisition. In fact, there is already some evidence to support this idea from German. Abbot-Smith & Behrens (2006) reported that the child's acquisition of the *werden-future* construction was delayed because of the prior acquisition of the semantically similar (but structurally different) *präsens-future* construction. If this is the case, there should be a similar type of competition between the two dative forms in English. In other words, the similarity in meaning between the two dative constructions, both of which occur with relatively high frequency in the child's input, should hinder children's ability to learn the different word order constraints of these constructions. This is particularly likely to be the case for the dative because the pragmatic and functional features that might help children distinguish between them are subtle and probably opaque to young children; for alternating verbs, the choice of dative is determined by features such as the degree to which the Recipient is affected and the length or heaviness of the arguments (e.g. long/heavy NP Themes select for the double object dative; Bresnan, Cueni, Nikitina & Baayan, 2007; Malchukov, Haspelmath & Comrie, 2010). We suggest that, on this model, children would be predicted not only to acquire the datives relatively late but also to acquire the two datives simultaneously, once they have learnt how to distinguish between them.

The aim of our first study was, then, to test these two different ideas of how children's linguistic knowledge may be represented by assessing at what age English preschool aged children learn to assign the thematic roles of Theme and Recipient in prepositional and double object datives. We tested two accounts:

a. A conservative learner account. According to this account, children are conservative learners who only slowly impose more abstract generalisations on the language they hear (Tomasello, 2000a, 2000b). The prediction here is that the more frequent double object dative should be acquired before the less frequent prepositional dative because there is very little

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competition between the two structures at first, so the speed of acquisition of each depends simply on the frequency with which it occurs in children's input.

b. A competing constructions account. According to this account, children generalize across both verbs and constructions which share salient syntactic, functional and/or semantic properties (Abbot-Smith & Behrens, 2006; Chang et al., 2006; MacWhinney, 1987). The presence of two constructions in the input that denote similar meanings but are expressed using different syntactic structures will hinder acquisition as the learner is receiving conflicting information about how to express a particular meaning. English children are therefore predicted not only to acquire both prepositional and double object datives relatively late but perhaps to acquire both simultaneously.

2. Study 1: English prepositional and double object datives

In study 1, we assessed whether English 3- and 4-year-old children can use word order cues to assign Theme and Recipient roles correctly in prepositional and double object datives (analogous to the work on the transitive by Gertner, Fisher & Eisengart, 2006).

It is important to note that three previous studies have reported that English children can interpret both prepositional and double object datives by the age of 3 years (Conwell & Demuth, 2007; Shimpi, Gamez, Huttenlocher & Vasilyeva, 2007; Thothathiri & Snedeker, 2008). However, the stimuli in all of these studies contained familiar verbs and/or animacy contrasts between the Theme (e.g. a ball) and the Recipient (e.g. a bird) roles. In other words, the tasks provided the children with correlated non-structural, as well as structural, cues to meaning. There is substantial evidence that even very young children can use these cues to interpret sentences successfully (see Chan et al., 2009; Dittmar et al., 2008). Children parsing sentences with familiar verbs have a number of advantages over those parsing sentences with

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novel verbs, including familiarity with typical semantic roles and potential referents, frequency of exposure to particular form-meaning mappings and the availability of well-established mappings between word and world knowledge (Bowerman, 1983; Campbell & Tomasello, 2001; Gropen, Pinker, Hollander, Goldberg & Wilson, 1989; Shimpi et al., 2007; Snyder & Stromswold, 1997; Thothathiri & Snedeker, 2008). Similarly, the presence of animacy contrast can guide children's sentence interpretation strategies, particularly of the double object dative: Roeper, Lapointe, Bing & Tavakolian (1981), Cook (1976) and Osgood & Zehler (1981) have all demonstrated that children are much better at interpreting the double object dative when the semantic roles have prototypical animacy. In fact, there is robust evidence that in some tasks, younger children **require** that semantic roles adhere to certain high frequency animacy characteristics (see Chan et al., 2009; Meints, Plunkett & Harris, 2008). As a result, we still do not know at what age children, like adults, can interpret the double object and prepositional datives on the basis of structural cues alone. Crucially, then, we designed the current task so that there were no non-structural cues to meaning. In particular, we used novel verbs to ensure that we are tapping into knowledge that is independent of specific lexical verbs and we ensured that all characters were animate to ensure that the children could not use animacy cues to parse the sentences.

Eighty English-speaking children took part; 39 3-year-olds (mean age = 3;8, range = 2;11 to 4;3) and 41 4-year-olds (mean age = 4;9, range = 4;4 to 5;4). We used a forced choice comprehension task in which children had to choose which of the two actions corresponded to a sentence being spoken by a toy rabbit. The children saw two videos of transfer actions side by side and listened as the rabbit 'asked' them to point to a particular picture (e.g. *point to where I'm bilking the frog to the teddy*). Training trials were used to familiarise the children with the procedure and the task. During the training trials, the child was taught to point at the corresponding picture by prompts from the investigator such as *Which picture?* or

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Can you point to the picture?? The children easily learnt what to do after only one or two training trials.

The procedure, including details of training, is illustrated in Figure 1. There were four test trials using four novel verbs (*glorping, bilking, jemming, meeping*). For each test trial, the child saw two video animations side by side and heard a toy rabbit speak a pre-recorded sentence – either a double object or prepositional dative sentence. All the animations depicted prototypical transfer actions - the transfer of an object from a Donor to a Recipient – with animal participants (e.g. a rabbit, a frog and a duck). The transferred animal was always portrayed as smaller than the Donor and Recipient animals and it never expressed any self-generated movement in order to ensure that it was unambiguously capable of being possessed by the Recipient. The Recipient always actively received the object animal (e.g. picked it up from the conveyer belt, caught it, etc.). For each test trial, one animation was assigned as the Target and one as the Foil event. Importantly, the Foil animation depicted a transfer event taking place between the same characters as depicted in the Target animation, but with the Theme and Recipient roles reversed. For example, if the Target animation showed a rabbit catapulting a frog (Theme) to a duck (Recipient), the Foil showed a rabbit sending a duck (Theme) to a frog (Recipient) across the screen on a conveyer belt². This meant that the child's knowledge of the word order constraints of the dative constructions was crucial in determining their ability to point to the correct screen.

FIGURE 1 ABOUT HERE

There were two conditions, both with novel verbs - a prepositional dative condition (e.g. *I'm glorping the frog to the duck*) and a double object dative condition (e.g. *I'm glorping the duck the frog*). The audio stimuli were set up to be spoken by the toy rabbit, which

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enabled us to present the test sentence with a first person pronoun subject (I'm ...). This helped engage the children in the task as well as shortening the length of the sentence, thus reducing working memory load. The children heard three sentences for each trial; for example, 1. *Look, I'm gonna glorp the frog to the duck* (accompanied by a blank screen), 2. *Look, I'm glorping the frog to the duck* and 3. *Point to where I'm glorping the frog to the duck* (both accompanied by the visual scene). In order to reduce the length of each testing session for each child, we used a between-subjects design, so children heard either double object or prepositional dative sentences.

FIGURE 2 ABOUT HERE

Figure 2 illustrates the mean number of times the children pointed to the video showing the correct target action, broken down by age group and dative type. Since all children completed all four test trials, the total possible score was four, with chance performance indicated by a score of two (50%). A simple linear regression was applied to the data, since regression is robust with respect to missing data and unbalanced cells and allows us to use Age in months (35 – 64 months) as a continuous variable. Dative type was the fixed effect (Prepositional/Double object dative; coded as a dummy variable). To map the dependent measure (number of points to target) into the range of the real numbers, the figures were transformed with the empirical logit ($\log(\text{points to the target} + 0.5)/(\text{points to the foil} + 0.5)$) (Agresti, 2002). Age in months was centered in order to reduce multicollinearity (Neter, Wasserman & Kutner, 1985).

The results showed that only Age in months significantly predicted performance; $\beta = 0.05$ ($SE = 0.02$), $t = 2.27$, $p = .03$. There were no other main effects or interactions. Most notable is the fact that there was no interaction between Dative type and Age in months; $\beta =$

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0.004 (SE = 0.03), $t = 0.14$, $p = .89$. In other words, although the children produced more correct points to the target screen with development, there was no difference in their performance with double object and prepositional datives at any age.

One-sample t-tests were then used to investigate whether the children were able to interpret both structures successfully at above chance levels (chance = 2). For this analysis, the children were divided into the two age groups; 3-year-olds and 4-year-olds. The 3-year-olds could not interpret either structure correctly (prepositional dative: $M = 2.00$, $SD = 0.77$, $t = 0.00$, $df = 20$, $p = 1.00$; double object dative: $M = 2.00$, $SD = 1.03$, $t = 0.00$ $df = 17$, $p = 1.00$). The 4-year-olds, however, interpreted both structures correctly (prepositional dative; $M = 2.70$, $SD = 1.26$, $t = 2.48$, $df = 19$, $p = .02$; double object dative; $M = 2.67$, $SD = 0.97$, $t = 3.16$, $df = 20$, $p = .005$).

The results suggest that 4-year-old, but not 3-year-old, English children have acquired the ability to use structural cues to interpret prepositional and double object datives, and that they acquire both datives at approximately the same time. However, we were worried by the possibility that our use of definite determiner noun phrases in the audio stimuli (e.g. ... *bllicking the teddy the frog*) may have depressed performance with the double object dative. This is because it is difficult to parse identically marked noun phrases that are presented in sequence (Gordon, Hendrick & Johnson, 2001). This has been shown to be the case for adults parsing complex sentences such as double embedded sentences (Gibson, 1998) and cleft sentences (Warren & Gibson, 2005) as well as for children parsing moderately complex sentences like double object datives (see Gropen et al., 1989). This is not a factor that could have affected the children's interpretation of prepositional datives, as the Recipient and Theme noun phrases are separated by a preposition, but it may have applied to the double object condition.

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Thus, we repeated the double object condition of Study 1 using sentences in which the post-verbal nouns were marked distinctively and canonically - the Theme with a determiner noun phrase (*the teddy*) and the Recipient with a proper noun (e.g. *Frog*; see Rowland & Noble, 2011, for evidence that this solves the problem in an analogous task). Thirty-three English-speaking children took part; fourteen 3-year-olds (mean age = 3;7, range = 2;5 to 4;1) and nineteen 4-year-olds (age = 4;5, range = 4;2 to 4;10). The materials and procedure were identical to those for the double object condition of the original study except that the Recipient was marked with a proper noun and the Theme with a determiner + noun phrase. In other words, the children heard *I'm verbing NOUN the NOUN* (e.g. *I'm blicking Teddy the frog*). The results showed that the modification made no difference to the children's ability to interpret the sentences. One-sample t-tests revealed that once again, the 3-year-olds were not able to identify the Theme and Recipient roles at above chance levels ($M = 2.14$, $SD = 0.86$; $p = .55$). The 4-year-olds, however, were, once again, successful at the task ($M = 2.42$, $SD = 0.90$; $t = 2.04$, $df = 18$, $p < .057$).³

In sum, 4-year-old, but not 3-year-old, English children have acquired the ability to use structural word order cues alone to interpret double object and prepositional datives. There was no indication that the children acquired the more frequent double object dative construction first. This is contrary to what we would predict according to a conservative learner theory that sees children as conservative generalisers, with little cross-construction generalization and with the speed of acquisition of each dative dependent simply on its frequency in the input (Tomasello, 2000a, 2000b). Instead, the results support a competing constructions account, which suggests that English children acquire the ability to interpret the word order cues of both datives at the same time, as predicted by the competing constructions account.

3. Study 2: Welsh prepositional datives

Although the English data support the competing constructions account, an alternative explanation for the results is that it is simply difficult to learn the word order constraints of complex structures like the ditransitive, which requires the child to process three semantic roles. This may be a particularly difficult task in studies like ours, which strip out all the non-structural cues to meaning (e.g. animacy contrasts). Thus, it is possible that children do not acquire these structures until age 4 years even in languages in which there are no competing constructions.

In order to assess this explanation we compared our English data with data from a language that does not allow dative alternation – Welsh (Primus, 1998). Like English, Welsh ditransitives refer to transfer events involving three semantic roles – Agent (or Donor), Theme and Recipient, and syntactically involve three grammatical functions (Subject, Direct Object, Indirect Object). Like the English prepositional dative, the Welsh prepositional dative has Theme-Recipient word order and requires a prepositional dative marker (*to* in English, *i* in Welsh) before the Recipient noun (see 1 below). However, unlike English, there is no competing double object dative structure.

- (1) Y bachgen rhoddodd y llyfr i'r ferch
the boy give-PAST the book to-the girl
'The boy gave the book to the girl.'

This enables us to assess whether the absence of a competing form in Welsh leads to earlier acquisition than in English. If Welsh children acquire the prepositional dative at the same time as English children, we might attribute late acquisition simply to the fact that it is

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difficult to learn the word order marking in structures with three participant roles. If Welsh children acquire the dative earlier, however, the findings would be consistent with our hypothesis that the acquisition of the correct word order in English is delayed because of the presence of two competing constructions.

Another aim of the Welsh study was to look at what happens when word order cues compete with the position of the preposition. It is possible that it is the position of the preposition, not word order, that is central to children's ability to interpret prepositional datives; children may simply assign the Recipient role to the noun following the preposition, without any consideration of the order of the nouns. If this were the case, children would be predicted to assign the Recipient role to the noun after the preposition, no matter what the order of the nouns (e.g. *I glorped to the teddy the frog*).

In Welsh, it is possible to use a reversed Recipient-Theme word order in marked contexts that require heavy focal stress on the Recipient or when the Theme NP is heavy/long (see Primus, 1998). Here, the word order is similar to the English double object dative but the grammar requires a prepositional marker in front of the Recipient, overtly marking the Recipient role (see 2).

(2)	Y	bachgen	rhoddodd	i'r	ferch	y	llyfr
	The	boy	give-PAST	to-the	girl	the	book
‘The boy gave to the girl the book.’							

The use of this reversed order dative is rare in informal spoken Welsh but the fact that it exists and, most importantly, can be correctly interpreted by Welsh adult speakers, means that we can use it to investigate the role of the preposition in children's acquisition of the dative. If Welsh children are paying attention to the position of the preposition in semantic role

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assignment (as Welsh adults are), they should assign the Recipient role to the noun following the preposition, whatever its position in the sentence (as Welsh adults do). However, if children are parsing the sentences on the basis of word order, and ignoring the position of the preposition, we would expect them to misinterpret the (rarely attested) reversed order datives and assign the Theme roles to the first post-verbal noun.

The method of Study 2 was identical to that of Study 1, except that the audio stimuli were recorded in Welsh by a Welsh native speaker. We also created new novel ‘Welsh-sounding’ novel verbs (*rhidon, dasgru, llemu, orioni*). To ensure that the only cues within the Welsh audio were word order and the preposition, we used sentences in which the nouns were marked with definite articles. In Welsh, direct object nouns undergo soft mutation (in which the first consonant of the word changes) when the object immediately follows the subject and is indefinite (and, thus, carries no article because there is no indefinite article in Welsh). Thus, mutation is a potential cue to objecthood (Gathercole, Laporte & Thomas, 2005; Thomas & Gathercole, 2007). Since feminine nouns, such as *cat* (*cath*), for example, are also subject to soft mutation after the definite article ‘r, we only used masculine nouns.

Sixty-five Welsh-speaking children took part; 34 3-year-olds (mean age = 3;8, range = 2;11 to 4;3) and 29 4-year-olds (mean age = 4;9, range = 4;4 to 5;4). All were native speakers of Welsh with no recorded language or learning difficulties. It is impossible to recruit Welsh-speaking children who have had no contact with English but we minimized the influence of English by recruiting only children who spoke Welsh as the home language and who were attending Welsh speaking nurseries or schools.

Figure 3 illustrates the data from the Welsh children, alongside the data from the English children from Study 1. We ran a simple linear regression with Age in months (35 – 64 months) and Dative type (coded as a dummy variable) as fixed effects, and the empirical logit of points to target as the dependent measure. Age in months was again centered. The

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model showed that, unlike in English, there was a significant effect of dative type in Welsh; $\beta = 1.31$ ($SE = 0.25$), $t = 5.29$, $p < .001$. There was also a near-significant interaction between age and dative type: $\beta = 0.07$ ($SE = 0.04$), $t = 1.91$, $p = .06$, again unlike English, indicating that the standard and reversed order datives followed different developmental paths in Welsh. There were no other significant effects.

FIGURE 3 ABOUT HERE

We then used a series of one-sample t-tests to establish when the Welsh children were able to interpret both structures at above chance levels (chance = 2). The Welsh 3-year olds (mean age = 3;8) were already able to interpret the standard Theme-Recipient prepositional datives ($M = 2.63$, $SD = 0.90$, $t = 3.08$, $df = 8$, $p = .007$), an effect that remained in the 4-year-old age group ($M = 3.27$, $SD = 0.96$, $t = 45.10$, $df = 14$, $p < .001$). However, neither age group was able to interpret the reversed Recipient-Theme order datives correctly. The 3-year-old Welsh children were at chance levels ($M = 1.76$, $SD = 1.15$, $t = 0.85$, $df = 16$, $p = .41$) and the 4-year-olds performed significantly below chance ($M = 1.43$, $SD = 0.76$, $t = 2.83$, $df = 13$, $p = .01$). In other words, the Welsh 4-year-olds were interpreting reversed order Recipient-Theme datives as if they were standard prepositional Theme-Recipient datives, incorrectly interpreting the first post verbal noun as the Theme, and the second as the Recipient, of the action.

In sum, the results of Study 2 suggest that children can acquire the word order marking of the prepositional dative by age 3 as long as there are no competing constructions in their input. Welsh children effectively hear only one dative type – the standard prepositional dative – and, as predicted, were able to interpret this dative at a much earlier age than the English

Competing constructions

children. Thus, the delayed acquisition of the word order constraints of the two datives in English cannot be attributed to the complexity of the structures.

Also, the Welsh children were not able to interpret the reversed order dative even at age 4. In fact, the Welsh 4-year-olds misinterpreted reversed order datives as if they were standard prepositional datives. In other words, the Welsh children were not interpreting datives simply by paying attention to the presence of the prepositional dative marker. Instead, they were using the most frequent word order cues of their language to assign semantic roles.

These data are consistent with the competing constructions model. On this model, children are generalizing across both verbs and constructions in acquisition, especially across constructions that express similar meanings. Because the two datives are both relatively frequent in the English language and because they are used to express roughly similar meaning through two different syntactic options, they compete with each other, hindering the acquisition of the word order marking of both. In order to learn to interpret these structures correctly, the children must learn to distinguish between them. This may require substantial exposure to both structures and may rely on the children learning the significance of the position of the preposition with respect to the two nouns. This, as the Welsh data attest, may be late acquired.

4. Study 3: Cantonese *bei2* ditransitives

Studies 1 and 2 investigated what happens when two different structures compete and what happens when there is only one attested structure in the input. The aim of Study 3 was to investigate what happens when there is no dative alternation (as in English), but when children hear different combinations of Verb, Theme and Recipient ordering.

Competing constructions

In Cantonese, when adults express a transfer event with the word *give* (*bei2*) in pragmatically neutral contexts, they use a double object ditransitive construction, in which the Theme is expressed first, followed by the Recipient (see 3). The word order of the two objects is identical to that of the English prepositional dative, but it is not necessary to have a dative marker, like the prepositional dative marker *to* in English, between the Theme and the Recipient⁴.

(3)	Ngo5	bei2	jat1	bun2	syu1	lei5	laa1
	I	give	one	CL	book	you	SFP

‘I give you a book.’

In Cantonese, there is also a serial verb dative construction used with other transfer verbs (e.g. take, see example 4), with the verb *bei2* (give) functioning as a dative marker before the recipient. This serial verb dative construction is similar to the English prepositional dative, in terms of surface form [Verb-Theme-Dative.marker-Recipient].

(4)	Ngo5	lo2	bun2	syu1	bei2	keoi5
	I	take	CL	book	give	3.SG

‘I take a book for him/her.’

However, unlike English, there is not a subset of verbs in Cantonese that can occur in both the serial verb [Verb-Theme-*bei2*-Recipient] schema and the double object [Verb-Recipient-Theme] construction involving the same thematic roles (Donor, Theme, Recipient/Beneficiary). Thus, there is no dative alternation between the serial verb construction and its double object counterpart in Cantonese comparable to that in English.

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However, although the canonical word order is *bei2* (*give*)-Theme-Recipient in pragmatically neutral contexts, Cantonese children are also exposed to different, possibly competing, word orders. In pragmatically marked contexts and when the Theme NP is long/heavy, the reversed order (*bei2*-Recipient-Theme) can be used (in neutral contexts and when the Theme NP is not long/heavy, this order is non-target like). Alternatively, in these situations, speakers can use the serial verb construction (*bei2*-Theme-*bei2*-Recipient), which is also the construction used with other transfer verbs (e.g. *take*, see example 4). It is also possible to displace the Theme role (in topic, right-dislocated and relative clause constructions, for example), which results in the Recipient coming after the verb (see (5) for an example of a Theme in topicalised position).

(5)	Lei1	bun2	syu1	ngo5	bei2	lei5	aa1
	DET	CL	book	I	give	you	SFP

‘This book, I give you.’

Finally, widespread argument ellipsis means that children rarely hear both Theme and Recipient roles expressed together in the same utterance. In fact Chan (2010) reported that only about 30% of *bei2* ditransitives in monolingual Cantonese children’s input contain both Theme and Recipient in the canonical Theme-Recipient order. Much of the time (48% of *bei2* datives) the Theme role is omitted because it is easily retrievable from prior discourse or context, so Cantonese children hear only the verb and the Recipient noun phrase (*bei2*-Recipient). Thus, although there is no competition from dative alternation (as in English), there are still competing structures in the input as a result of frequent ellipsis, use of a serial verb construction or displacement of the Theme argument. This means that sometimes the first postverbal argument after *bei2*(*give*) is the Theme but sometime it is the Recipient⁵.

Competing constructions

If our competing constructions model is correct, these competing structures in the input might delay acquisition of the canonical Theme-Recipient word order marking with *bei2* (*give*) ditransitives. In fact, there is some evidence that this might be the case from spontaneous production data. Chan (2010) reports data showing that before age 3 years, Cantonese children make word order errors producing non-target *bei2*-Recipient-Theme forms in their early speech. However, there is as yet no experimental evidence to support this conclusion.

In Study 3, we investigated whether the presence of competing word order structures in the input would delay acquisition of word order marking of the Cantonese *bei2* (*give*) ditransitive. We tested 64 3-year-olds (mean 3;5, range 3;2 - 3;10) using our forced-choice pointing task. One group of children heard full, two noun canonical *bei2* ditransitives (e.g. *I-bei2(give)-monkey-rabbit*). If the children had knowledge of the word order marking of Cantonese, we expected them to assign the Theme role to the first noun and the Recipient role to the second (interpreting the sentence correctly as *I give the monkey to the rabbit*). Another group heard elliptical utterances (*I-bei2(give)-monkey*), in which only one noun was expressed. This condition tested whether children would follow the most frequently heard interpretation of such sentences in their language and assign the Recipient role to the noun (interpreting the sentence as *I give the rabbit to the monkey*). We also tested the children's ability to interpret unambiguously marked serial verb dative constructions (both with real verbs like *sung3* [give as a present] and novel verbs like *tam1*) for comparison and to ensure that any problems could not be attributed to task difficulty⁶.

The method was very similar to that of Studies 1 and 2 except for three modifications that we introduced after discussion and piloting. First, we created new animations with animals that were designed to be familiar to Cantonese children. Second, the children first saw the two animations individually before seeing them concurrently. Third, there were eight

Competing constructions

items per condition not four. Figure 4 illustrates an example of the visual and auditory stimulus for one of the items.

FIGURE 4 ABOUT HERE

Figure 5 illustrates the mean number of correct points to the target screen, and demonstrates how often the children correctly interpreted the full ditransitives (*bei2-Noun-Noun*), how often they interpreted the elliptical (*bei2-Noun*) sentences as expressing the Theme and how often they correctly interpreted the serial verb construction (Verb-Noun-*bei2-Noun*). We tested whether the children's performance was significantly above chance in a series of one-sample t-tests. The children were above chance with the (unambiguous) serial verb constructions with real and novel verbs ($t = 6.39$, $df = 31$, $p < .001$). Thus, we know that the task is not too difficult for 3-year-old Cantonese children. However, the children were at chance for both the full two-noun construction (*bei2-Noun-Noun*; $t = 1.16$, $df = 15$, $p = .26$) and for the elliptical construction (*bei2-Noun*; $t = 10.85$, $df = 15$, $p = .41$).

FIGURE 5 ABOUT HERE

In other words, the children were equally likely to assign the Recipient role to the first (or only) noun as they were to assign the Theme role. When we repeated the study on a control sample of adults, however, they interpreted all the sentences in the predicted direction (*bei2-Theme-Recipient* for the full ditransitives and *bei2-Recipient* for the elliptical utterances). In sum, though there is no competition from dative alternation in Cantonese, we suggest that the competing word order structures in the input meant that, like English 3-year-olds, the Cantonese 3-year-olds have not yet acquired the word order marking constraints of *bei2* ditransitives.

5. Discussion

The conclusion we draw from these studies is that there is competition between constructions as well as competition between cues in language acquisition. The English data tell us that the existence of two constructions expressing similar meanings with different word orders delays acquisition. The Cantonese data tell us that competition does not necessarily come from a dative alternation; delayed acquisition also occurs when there are other competing word order structures in the input. The ease with which Welsh 3- and 4-year-olds passed the task with prepositional datives tells us that these delays cannot be attributed to the difficulty of the task or to the fact that ditransitives require children to process three separate participant roles. In fact, the 4-year-old Welsh children's knowledge of the word order marking of prepositional datives was so robust that they used the canonical word order of their language even when it conflicted with another, salient cue to meaning in reversed order datives: the position of the preposition.

These results suggest that children may be generalising across constructions from early on, constructing both verb- and construction-general representations. They, thus, count against a conservative learner account that predicts that a significant amount of learning must take place before generalisation across constructions can take place (e.g. Tomasello, 2000a; 2000b). On this model, links between first order constructions such as the double object and prepositional dative are only made later on in acquisition, on the basis of second order structure mapping. Since the first order constructions must logically be learnt first, generalisation within a construction must precede generalisation across constructions. Thus, the theory predicts that there will be little competition between the two dative forms at the initial stages of development so that the order of acquisition will correlate with the relative frequency of the constructions in the input. This prediction was not supported by our data.

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Instead the data suggest that children generalise more widely across both verbs and constructions from early on, especially across constructions that share salient syntactic or semantic properties (for example, those that express similar meanings). These data are compatible with a competing constructions account. According to this account, the presence of two constructions in the input that denote similar meanings but are expressed using different syntactic structures will hinder acquisition. This is because the learner is receiving conflicting information about what semantic role should be assigned to a noun, given the meaning of the construction, the noun's position in the sentence and its surface form.

This idea that children quickly generalise across specific instances in acquisition is neither new nor controversial. As Bates & MacWhinney (1989) argue, there is an impressive body of evidence showing that children can pick up quite abstract cues in their language very quickly – a process that must involve generalisation. There is also evidence that such cues are quite specific to the language being learnt, suggesting that the process is one of rapid learning rather than resulting from innate predispositions (e.g. Bates et al., 1984, demonstrated that English children rely on word order but Italian children on animacy when the two cues conflict). What we are suggesting, however, is an extension to the competition model, whereby such generalisations can take place across constructions as easily as they take place within constructions, whenever there are salient similarities to form the basis of the generalisation.

This idea is also consistent with other models of similarity-based generalisation. For example, in structural alignment models of similarity matching in non-linguistic domains (see Gentner, 1983, 1989), the process of analogy required for generalisation is facilitated when the instances being compared are similar on **any** dimension. In language acquisition, cross-situational (and thus cross-constructional) similarity matching is highly likely to play a role in the acquisition of the meaning of novel words and, may in fact, be required in order for the

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child to converge on the correct meaning (Childers & Paik, 2009). We simply extend this mechanism to the acquisition of form-meaning mappings. In other words, we suggest that both in syntax and in word learning, the language acquisition mechanism can generalise across specific instances both within and across construction boundaries from early on because it is sensitive to similarities in structure and meaning wherever they occur.

The final question we want to address is how to reconcile our results, that show that children generalise both within and across constructions, with the large body of work demonstrating that children's early productions are lexically specific (see e.g. Lieven, 2008; Pine & Lieven, 1997; Pine, Lieven & Rowland, 1998). In the literature, there has traditionally been a dichotomy between those who argue for lexically specific learning and those who argue that children are generalising across specific instances, extracting verb- and construction-general information about the regularities of their language from early on. We would like to suggest that these are not mutually exclusive. Children are undoubtedly building up their knowledge of the language from the specific utterances they hear. As a result, children will learn those lexically specific patterns that occur with high frequency (e.g. *where's X going*), they will use these patterns in their production (see Pine et al., 1998) and they will be faster (Bannard & Matthews, 2008) and more accurate (Theakston, Lieven, Pine & Rowland, 2005; Rowland, 2007) at using them. However, this does not prevent the learner from generalising across them on the basis of shared commonalities in form and meaning, extracting relevant cues such as word order cues and applying them across construction boundaries. In fact, some of the papers that have traditionally been cited as providing evidence for lexically specific learning simultaneously report evidence for more abstract knowledge. For example, Akhtar (1999) reported that although 2-year-olds were less likely to correct ungrammatical word orders than older children, some 2-year-olds were capable of correcting them. In addition, Akhtar's 2-year-olds never produced an ungrammatical word

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order if the sentence modelled was grammatical (e.g. they never produced *Elmo the car dacking* if they had heard *Elmo dacking the car*). Similarly, although Rowland (2007) demonstrated that children's early wh-questions seem to coalesce around lexically specific patterns (e.g. *where's X going*), she also proposed that children's errors be explained in terms of inappropriately applied generalisation strategies. In other words, at any one point in developmental time, children's knowledge is the product both of the learning of lexically specific patterns and of generalisations across these patterns in an attempt to extract commonalities in form and meaning.

We conclude by proposing two characteristics that future models of the acquisition mechanism must exhibit. First, models must be capable of both cross-verb and cross-structural generalizations on the basis of structural and semantic similarities. For example, models must be capable of building up a store of information about what semantic role is most likely to be assigned to a noun, given both its position in the sentence and its surface form. This generalisation must be constrained in order to minimise the production of ungrammatical or unconventional utterances but it must occur from early on. Second, the model must also incorporate a mechanism that allows for earlier and easier identification of sentences containing correlated cues to meaning and for delayed acquisition when cues compete. It must, thus, make predictions about what cues will be available to children at different stages of development, as well as how these cues might interact throughout development. It will also be important to make cross-linguistic comparisons in order to identify what factors influence competition (e.g. Hungarian children may acquire negation earlier than German children because of the large number of negative constructions and forms in German⁷). Models with these characteristics will allow us to test predictions about how the child's developing knowledge across different syntactic structures might interact, as

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well as allowing us to make predictions about when similarities across structures and meanings will help, and when they will hinder, acquisition.

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FIGURE CAPTIONS

Fig. 1. Example procedure for prepositional dative condition (English)

Fig. 2. Mean number of correct points to the target screen by age group for English children
(maximum score = 4, error bars show standard error)

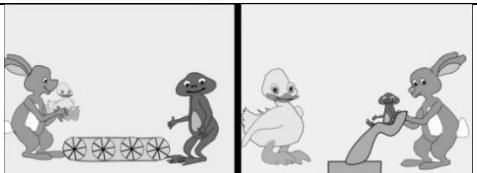
Fig. 3. Mean number of correct points to the target screen by age group (maximum score = 4)
for Welsh children, with English children from study 1 for comparison (error bars illustrate
standard error)

Fig. 4. Example test trial for Cantonese study (original videos were in colour)

Fig. 5. Mean number of correct points to the target screen by dative condition (maximum
score = 8, error bars illustrate standard error)

Competing constructions

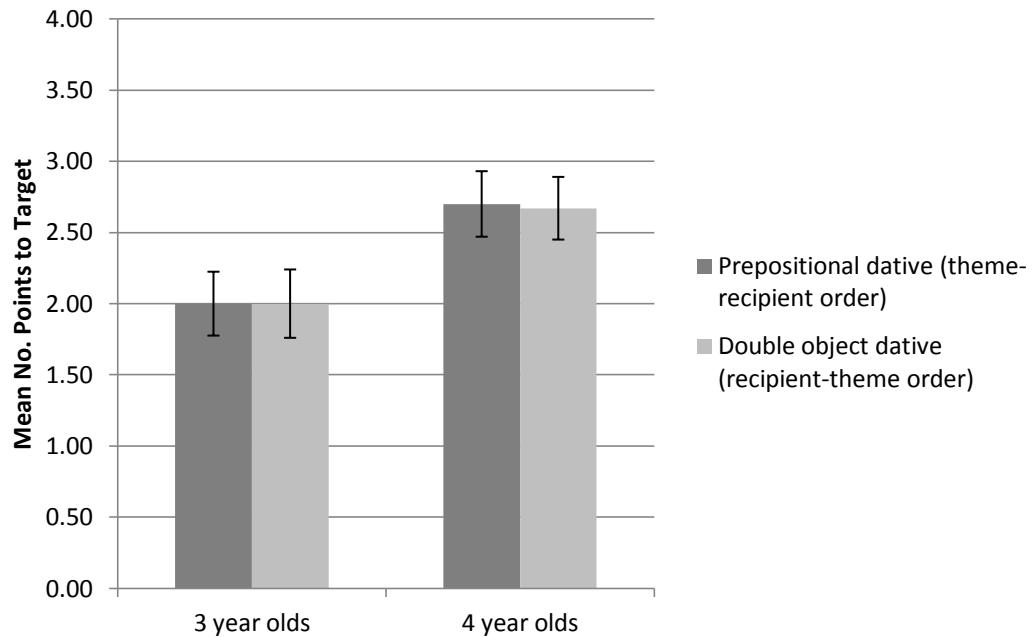
Fig 1. Example procedure for prepositional dative condition

Trial	Example of visual stimuli (items depicted in greyscale but presented in colour)	Example of accompanying audio stimulus
Character identification		Where's the/can you point to the ... duck/teddy/frog/rabbit.
Training (4 different items; one example given here)		I'm the rabbit. I'm gonna be bilked. I'm being bilked. Point to where I'm being bilked
Test (4 different items; one example given here)		I'm gonna glorp the frog to the duck. I'm glorpding the frog to the duck. Point to where I'm glorpding the frog to the duck.

Competing constructions

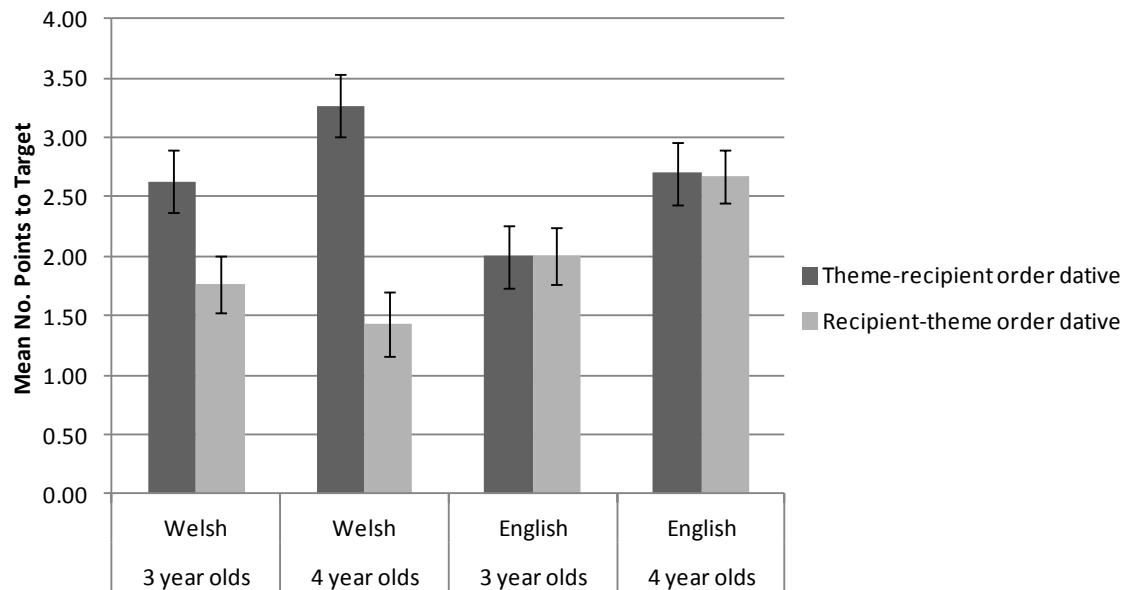
Fig 2. Mean number of correct points to the target screen by age group for English children

(maximum score = 4, error bars show standard error)



Competing constructions

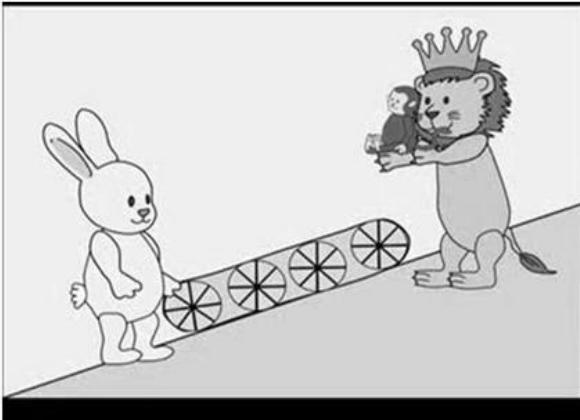
Fig 3. Mean number of correct points to the target screen by age group (maximum score = 4) for Welsh children, with English children from study 1 for comparison (error bars illustrate standard error).



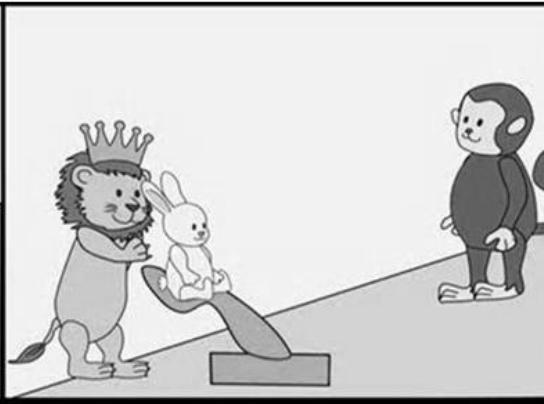
Competing constructions

Fig. 4. Example test trial for Cantonese study (original videos were in colour)

TARGET TRANSFER SCENE



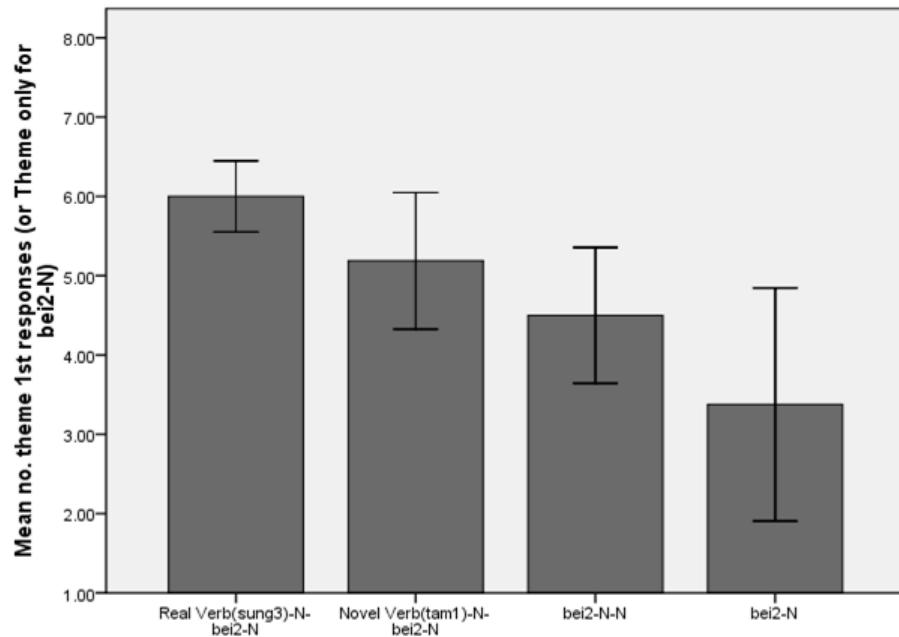
FOIL TRANSFER SCENE



Footnote to figure 4. The audio for this trial translates as *Point and let me see: which picture is I give (bei2) monkey rabbit?*

Competing constructions

Fig 5. Mean number of correct points to the target screen by dative condition (maximum score = 8, error bars illustrate standard error)



FOOTNOTES

¹ There are subtle pragmatic and functional differences between the meanings of the two datives, which means that they are not wholly equivalent (Bresnan & Tatiana, 2008; Haspelmath, 2007; Pinker, 1989; Rappaport Hovav, 2008). However, it is very unlikely that young children are aware of these distinctions, especially since children incorrectly overgeneralise verbs into both constructions (e.g. they produce both *don't say that to me* and **don't say me that*; see Bowerman, 1988).

² Pilot data demonstrated that children have difficulty identifying the salient differences between the two visual scenes if the actions on both screens are the same. Using different actions in the two scenes ensures that we do not underestimate children's linguistic knowledge.

³ In fact, the 4-year-olds in Study 2 were slightly less successful at interpreting double object datives than the 4-year-olds in Study 1, although the difference was not significant ($t = 0.74$, $df = 39$, $p = .46$).

⁴ Tang (1998) calls this the 'inverted' double object construction, on the basis that the usual order in double object datives is that used in English and Mandarin double object datives - Recipient before Theme.

⁵ There might also be competition from ditransitives with *teach* verbs which take Recipient-Theme order in Cantonese. The presence of *teach* verb constructions does not provide Cantonese with a ditransitive alternation like English but a lexical split: "A split is the situation where different verbs use different constructions, while an alternation is the

situation where one and the same verb can occur with different constructions with roughly the same meaning” (Malchukov et al., 2010: 13). However, it is possible that lexical splits may act as competing constructions in acquisition.

⁶ This time it was not possible to use novel verbs because in contemporary Cantonese the [Verb-Noun-Noun] double object configuration is: (i) only natural/grammatical with the verb *bei2* among dative verbs which depict physical transfer events of tangible entities; and (ii) although possible with *teach* verbs, these verbs and their argument roles are hard to depict clearly in the visual pointing paradigm, and it is impossible to neutralize non-structural animacy cues in such case (having both Theme and Recipient being animate).

⁷ We thank one of the editors for this suggestion.