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Ditransitives in Germanic Languages

Synchronic and diachronic aspects

Edited by
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Table of contents

Acquiring feature-based ordering preferences in English ditransitives

Daniel Bürkle

The system of features affecting adults' dative construction choices in English is well established in recent research. Less is known about how children might acquire this system. The two experiments in this chapter add data to this question. They map out the effects of length, animacy, and grammatical number on these choices in first language acquisition. The first experiment combines an act-out task with eye-tracking and finds that children as young as four years of age expect the animate-before-inanimate order. The second experiment asks the same participants to reproduce ditransitive sentences and finds that participants reproduce sentences more easily if these conform to their ordering preferences. These results suggest that the harmonic alignment evident in dative ordering preferences is an epiphenomenon of cognitive ease.

Keywords: dative alternation, first language acquisition, psycholinguistics, English

1. Introduction

One strand in recent research on the dative alternation in English assumes that speakers have a choice between two constructions:[1] the double object construction, as in (1a), and the prepositional construction, as in (1b).

(1) a. Rick gave Kate a coffee.
b. Rick gave a coffee to Kate.

1. Depending on dialect and the definition of "construction", there may be more than two ditransitive constructions (Haspelmath 2007). Although this argument is not the focus of this chapter, the feature-based choice approach would arguably not need to be changed fundamentally in order to accommodate additional constructions. This chapter assumes that there are only two constructions.

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In this strand of research, the choice between these two constructions is seen as influenced by several factors. A universally accepted list of such factors has not yet emerged, but most of the proposed factors are features of the two objects (*Kate* and *a coffee* in (1)) – their animacy, length, grammatical number, grammatical category (pronoun or noun), and discourse availability (Bresnan et al. 2007), among others, including various contributions to this volume. Bresnan et al. (2007) interpret these factors as preferences for aligning features with position. For example, constructions that place an animate object before an inanimate object, as in (1a), are more common than the opposite, as in (1b). Similarly, it is preferred to place shorter objects before longer ones, so (2a) is more common than (2b); and it is preferred to place plural objects before singular ones, so (3a) is more common than (3b).

(2) a. Rick showed Kate an interesting book.
b. Rick showed an interesting book to Kate.

(3) a. Rick sent his colleagues a postcard.
b. Rick sent a postcard to his colleagues.

Most research in this feature-based choice strand has been based on corpus data, as this allows systematic investigation of multiple factors in a large dataset. These studies have found largely similar factors, though not without variation – for example, Bresnan and Hay (2008) find that the same factors are statistically significant predictors for the dative construction choice in different dialects of English, but that the strengths of some factors differ between dialects (also see Röthlisberger, this volume).

While these studies are insightful, it is necessary in any systematic investigation to use a range of different methods to investigate the same phenomenon. This not only verifies previous results but also tests for underlying assumptions, essentially leading to further insights into the phenomenon (Feyerabend 1993). This chapter presents two psycholinguistic experiments with precisely this aim of scrutinising and clarifying certain assumptions and findings common in the feature-based choice strand of dative alternation research, namely the idea that the features of importance are understood similarly by all speakers and that they influence dative choice separately.

It is reasonable to expect that any differences in feature processing would be likely to occur in the fluid process of language acquisition. If features influence the choice of construction separately, their effects may arise in sequence during language acquisition. Therefore, we study children's processing and production of datives (and compare their behaviour to adults' behaviour in the same experiments) in order to establish whether children exhibit ordering preferences different from adults in the dative alternation. The two experiments presented in this

chapter also test whether a length difference of one syllable can cause an effect of length on the dative alternation, and assess the less well-established effect of grammatical number. Other features, including the bias of individual verbs for one or the other construction, are not examined here in order to control for them when testing for effects of animacy, length, and number (see Kholodova and Allen, this volume, for an approach focussing on such verb-specific preferences in German). These individual effects are not always clear in corpora, so controlled experiments like the two experiments reported on in the present chapter are necessary.

Children of ages 4 and 8 were included as participants because the difference between these ages is large enough that any developmental difference should emerge clearly, and because it can reasonably be assumed that these children know and use both constructions (Gropen et al. 1989: 212–216). What is more, by including two different age groups in the study, the emergence of the two constructions vis-à-vis each other can be examined. Recent research in that regard suggests that double object constructions do no emerge after prepositional constructions (e.g. Gropen et al. 1989; Bürkle 2011; Jäschke and Plag 2016) as has been claimed earlier.

The first experiment uses an act-out task with concurrent eye-tracking to examine perception and processing and finds that children and adults expect inanimate objects to appear after animate ones, in line with Bresnan et al. (2007)'s harmonic alignment for animacy. The second experiment elicits production of sentences containing dative alternation constructions to test whether this expectation is due to a preference for the prototypical pattern of an inanimate theme object (such as *a coffee* in (1)) being transferred to an animate recipient (*Kate* in (1)). The second experiment finds that this pattern is more likely to be repeated correctly. Moreover, the youngest participants (ages around 4 years) are shown to repeat sentences with one animate and one inanimate object more quickly than sentences with two animate or two inanimate objects regardless of the roles of these objects, but older children (ages around 8 years) are additionally sensitive to the prototypical pattern. Specifically, the older children initiate reproduction of sentences with animate recipients more quickly than reproduction of sentences with inanimate recipients, suggesting that the preference for the prototypical pattern may develop after the age of 4 years. Together with the finding that these young children also prefer the more marked prepositional construction over the double object construction, this is presented as evidence for an effect of cognitive ease or prominence: more clearly marked or perceptually apparent forms and features are learned earlier in the complex system that determines the choice of construction. As these features are learned independently, they must be independent features – epiphenomena of cognitive ease, but not reducible to one phenomenon.

This chapter is divided into five sections. Section 1 presents and evaluates previous research, including psycholinguistic experiments. Section 2 summarises the aims of the present experiments against this background. Section 3 presents the act-out experiment and its result, and Section 4 does the same for the elicitation experiment. Drawing on the results of these experiments, Section 5 argues that cognitive ease and prominence may be an important factor in the dative alternation choices of adult speakers (following Malchukov, Haspelmath, and Comrie 2010).

2. Background

According to Wasow (2002: 8), dative alternation research has long focused on a purported difference in meaning between the two constructions: the double object construction encodes caused possession of an object by a recipient, whereas the prepositional construction encodes caused motion or another event that is "normally sufficient to bring [the theme] into the sphere of [the recipient]'s physical control" (Oehrle 1976: 129). This changed with Hawkins' principle of Early Immediate Constituents (EIC; Hawkins 1994: 77), which posits that the heads of a phrase's immediate constituents are kept as close as possible to the head of that larger phrase. In an SVO language with prepositions and right-branching phrases such as English, this equals the law of increasing constituents: placing a long head-initial phrase at the end means that all the material following the head of this phrase does not come between the head and subordinate phrase heads (Hawkins 1994: 211–212). For example, the subordinate phrase heads *her* and *to* are close to the phrase head *brought* in (4a), with only one other word (*dog*) intervening between the three heads. The alternative ordering in (4b) sees three other words between the three heads. Therefore, the EIC principle predicts (4a) to be preferred.

(4) a. Liz [brought [her dog] [to the school reunion]].
b. Liz [brought [to the school reunion] [her dog]]. (Bürkle 2011: 52)

In a left-branching, verb-final language such as Korean, the same principle explains the preference for longer phrases to be placed at the beginning (Hawkins 1994: 211–212). While the EIC principle explains much crosslinguistic data, Wasow (2002: 45–46) points out that it implicitly relies on utterances being planned out completely before ordering decisions are made and that this assumption is not supported by the data.

Thus, while length differences partly explain the dative alternation and similar weight phenomena (Wasow 2002: 2 found that 80 to 90% of his data observe

the rule of "nondecreasing length"), they are not the only factor (cf. also Dubois, Rauth, as well as Ussery and Petersen, this volume, on varying effects of length in different Germanic languages). The verb may be another factor: most verbs that participate in the dative alternation are more commonly used with one of the constructions than with the other. For example, the majority of *give* sentences use the double object construction, while the majority of ditransitive *take* sentences use the prepositional construction (Gries and Stefanowitsch 2004: 106; Bürkle 2011: 39). These verb biases could be idiosyncratic (Wasow 1997: 101–102), though some recent research (Gries and Stefanowitsch 2004: 104–107; Ambridge et al. 2014) supports the notion of these biases as representing systematic tendencies for meaning differences discussed above (transfer of possession versus spatial transfer), modulated by other factors and considerable variation within classes of verbs. Furthermore, it has been argued that the dative alternation is an epiphenomenon of prosodic preferences (Zec and Inkelas 1990). Previous (recent) use of one construction, even with different objects, has also been shown to increase the likelihood of that construction (e.g. Bock 1986).

Apart from these, the factors that have been claimed to affect the dative alternation are features of the two objects: their length, as mentioned above, as well as the animacy of their referents, their grammatical number, grammatical person, pronominality, and givenness in the context (Wasow 2002; Bresnan et al. 2007; Bresnan and Hay 2008; Bresnan and Ford 2010; de Marneffe et al. 2012). These features are not independent from each other, of course: short words tend to be more frequent and less morphologically complex; pronouns generally refer to 'given' material and tend to be short (McDonald, Bock, and Kelly 1993); and animates are more likely to be represented by pronouns. However, Bresnan et al. (2007) showed that these correlations do not reduce to fewer features, which means that speakers take all of these individual features into account. For the purposes of this chapter, we will focus on length, animacy, and grammatical number.

2.1 Length

The length of the two objects of a dative alternation verb has often been reported to affect the choice of construction. According to the more general law of increasing constituents (Cooper and Ross 1975; Behaghel 1928) or "principle of end-weight" (Biber et al. 1999: 898; also Wasow 2002), longer constituents are to be placed after shorter ones, at least in some languages. This law can be straightforwardly applied to the English dative alternation: apart from the addition of the preposition *to* in the prepositional construction, these two constructions are nothing more than the two possible orderings for two adjacent object phrases. The choice between constructions can thus also be understood as a choice

between orderings. All else being equal, the order that places a shorter object before a much longer one is preferred.

For example, while both (5a) and (5b) are quite acceptable, (6b) is strongly preferred to (6a). The difference between (5) and (6) is the greater length of the theme object in the latter pair of clauses, so it must be this length that triggers a preference for the double object construction and the associated order in (6) where there is no such preference (or not a strong one) in (5).

(5) a. Kate handed an apple to Rick.
b. Kate handed Rick an apple.

(6) a. ?Kate handed an apple that had been stored in a cool cellar and cut into quarters with care to Rick.
b. Kate handed Rick an apple that had been stored in a cool cellar and cut into quarters with care.

This length effect has been found to be significant in most dative alternation studies that included it in their analysis – in data from the (Canadian English) Aligned-Hansard corpus (Arnold et al. 2000), the (American English) Switchboard corpus (Bresnan et al. 2007; Snider 2011), the (New Zealand English) ONZE corpus (Bresnan and Hay 2008), the British English parts of the ICE corpus (Theijssen 2009), African American English (Kendall, Bresnan, and van Herk 2011), the historical ARCHER corpus (Wolk et al. 2013), the English-speaking children in CHILDES (de Marneffe et al. 2012), the (Indian English) Kolhapur corpus (de Cuypere and Verbeke 2013), and six South Asian varieties of English (Bernaisch, Gries, and Mukherjee 2014). Clearly, it is firmly established, though the definition and measurement of length may be a point of contention (see Bürkle 2015).

Similar length effects have been documented in other English alternation phenomena where different alternants can be analysed as different constituent orderings: the benefactive alternation (Theijssen et al. 2009), heavy NP shift (de Wind 1999; Wasow 2002), and particle placement (Dehé 2001; Lohse et al. 2004), for instance. It is reasonable to assume that one single underlying effect may manifest itself in all these phenomena.

Finally, length effects have also been reported to play a significant role in dative constructions in child language. De Marneffe et al. (2012) analysed the influence of length, pronominality, givenness and persistence on the choice of dative variant comparing corpus data from children with the care-takers' child-directed speech to assess the degree to which these factors are similar in their effect between the two groups. They show that theme length – besides pronominality of the recipient and the theme – has a different influence on the choice of dative variant with children preferring the prepositional dative more when theme

length increases than adults (who tend to avoid long themes in the prepositional dative, i.e. in first position). No difference in the effect of recipient length was reported. Interestingly, de Marneffe et al. (2012:34) found no significant improvement in their analysis by using the number of syllables as their measure of object length, rather than the number of words. However, this merely shows that the number of syllables is no better and no worse than the number of words in their corpus data. Corpus data has many advantages, many of them due to the large size of corpora, but the major disadvantage of corpus data is that it is messy: transcriptions are often somewhat idealised, which is a particular problem when the transcripts are based on the more variable speech of children. This is compounded by the fact that different transcribers will use different standards, and it is practically impossible to check inter-transcriber accuracy with large collaborative corpora (like CHILDES). For example, one child's utterance of *gimme* may be transcribed by one transcriber as "gimme" and thus be counted as one word in de Marneffe et al. (2012), whereas another child's *gimme* may be transcribed by another transcriber as "gi[ve] me" and thus be counted as two words. Thus, if there was an effect of word length, it might easily be buried by the noise inherent in corpus data. A controlled experimental study is therefore necessary to establish or disprove this possible word length effect.

2.2 Animacy

The animacy of the two objects in a dative sentence has been shown to affect the choice of construction: the construction that places an animate object before an inanimate one appears to be preferred (Bresnan et al. 2007).

The concept of animacy in linguistics is often described as gradient, using the well-established animacy hierarchy: Expressions can be ranked according to the animacy or sentience of their referents, and languages can reflect these hierarchical differences in their preferred word order. Some Bantu languages, for example, order the objects of certain verbs according to their position in the animacy hierarchy (Demuth et al. 2005): higher-ranked, 'more animate' objects must be placed before less animate ones, and thematic roles are assigned using information from the context or world knowledge. When both objects of a verb are equally animate according to the animacy hierarchy, both orderings are possible, and both allow both readings (e.g. first object as theme and second as beneficiary, or vice-versa). Demuth et al. (2005) showed that, in Sesotho, even four-year-olds observe this animacy ordering rule, at least for a three-tiered hierarchy of humans > animals > inanimates. This falls in line with what Malchukov, Haspelmath, and Comrie (2010) have pointed out, namely that animacy forms part of the prominence of an object and that highly animate objects are generally more prominent in speakers'

minds – hence they tend to be expressed first in an utterance. Since it is based on common knowledge and has been shown to have many different effects in many different languages, the animacy hierarchy as such may very well be universal; for a study of animacy in a particular language, however, it is crucial to bear in mind that languages can organize their animacy hierarchies differently (Gentner and Boroditsky 2001: 229).

As animacy is a complex concept, it is interesting to consider at what age these animacy effects arise in child language development. On the one hand, English-speaking six-year-olds seem to be sensitive to it: Dewart (1979) has shown that six- to eight-year-old children are more likely to change a passive (monotransitive) sentence to an active one when the agent is animate and the patient inanimate, i.e. when the active sentence has animate-before-inanimate order, than when the agent is inanimate and the patient animate. On the other hand, research in the Piagetian tradition finds that children acquire an adult-like or scientific concept of animacy around the age of 10 (Laurendeau and Pinard 1962: 141–159). The Piagetian methods are however unnecessarily complex (see Laurendeau and Pinard 1962: 67 and 265–266 as well as the criticism of Brainerd 1973) and only capture explicit knowledge about biology in any case. This knowledge is presumably taught in science classes, and it is thus no surprise that children as old as eight do not exhibit it (Schwartz 1980; Okita and Schwartz 2006; Leddon et al. 2009). Because of these methodological and theoretical shortcomings, as well as the lack of independent support for it, it is dubious to assume the age of 10 to be the earliest age for animacy effects. In fact, the earliest age of animacy effects in general is most likely much lower: research in the Piagetian tradition has shown that the attention of new-borns is drawn to animates or humans (see for example Legerstee 2001: 195–197). Linguistic tasks that use animacy implicitly show that children between two and a half years and four years of age are sensitive to the animacy of referents (Lempert 1989; Au and Romo 1999; Rakison and Poulin-Dubois 2001; Thal and Flores 2001; Becker 2007, 2009; Leddon et al. 2009). Children begin to use truly transitive sentences at roughly the same age (Ibbotson and Tomasello 2009: 66–68), which means that children who reliably use transitives will be attending to the animacy of the objects. Thus, we can agree with Gelman and Koenig (2001: 700) that "animacy seems to be a prelinguistic concept that is appreciated by children at a very young age".

Animacy stands apart from the other features of interest in this chapter. The length and grammatical number of the two objects do not usually affect the plausibility of a ditransitive sentence (except for semantically exceptional objects, such as *sending a letter to the Popes*). Unusual patterns of animacy, however, will make a ditransitive sentence implausible – while (7a) and (7b) follow the same rules of basic syntax, (7a) is undoubtedly more plausible than (7b).

(7) a. The mother gave the candle to the daughter.
b. The mother gave the daughter to the candle. (Gibson et al. 2013: 8052)

This difference in plausibility can clearly be ascribed to the animacy difference. Typical recipients are animate, and typical themes are inanimate.

Sandberg et al. (2012) confirm this, showing that listeners with and without aphasia have difficulty understanding the literal meaning of sentences with inanimate recipients and animate themes, like (7b). Gibson et al. (2013) found that listeners will often not interpret implausible sentences such as (7b) literally, but rather interpret them as more plausible, minimally different sentences like (7a). The rate of literal interpretations was higher when the experiment contained many implausible sentences, and lower when the experiment contained many grammatically incorrect (but not notably implausible) sentences. Any balanced experiment using different values of animacy in ditransitive sentences must take this into account, and we will return to this point in Section 4.

2.3 Number

The grammatical number of the two objects in a dative sentence affects the choice of construction: the construction that places a plural object before a singular one appears to be preferred (Bresnan et al. 2007). While Bresnan et al. make no strong claim regarding the independence of the number effect from other effects, the fact that removing number (and two other factors) slightly reduces the classification accuracy of their models B and C (Bresnan et al. 2007: 89) is suggestive of an independent effect. Of course, there are counterexamples of phenomena where language processing is affected by features other than number, but not by number: for example, reading time and comprehension in Basque are affected by NP case, but not number (Laka and Erdocia 2012; Santesteban, Pickering, and Branigan 2013). However, this does not mean that number categorically cannot affect word order.

Studies of comprehension and production of plural markers (both canonical, like *-s*, and non-canonical, like *two* with no plural morpheme on the noun) have shown that two-year-old children do understand the idea of a plural (Clark and Nikitina 2009; Zapf and Smith 2009; Barner, Lui, and Zapf 2012). Early concepts of plurality may be as simple as "two or more" (Clark and Nikitina 2009: 135), but at least for English this is unproblematic.

Thus, the effect of grammatical number on the choice of construction in the dative alternation is worthy of further investigation, especially in the realm of child language acquisition where research is still largely missing.

3. Act-out experiment

To investigate the development of the effects of length, animacy, and grammatical number in first language acquisition, this experiment elicits participants' choices for filling gaps in the instruction sentences of an act-out task. These choices measure participants' expectations and preferences not only with regard to animacy, grammatical number, and length of the words in these positions in relation to the animacy, grammatical number, and length of the other (non-gapped, explicit) object but also with regard to the order of the two objects.

3.1 Participants

Participants were recruited in three age groups: 4-year-old, 8-year-old, and adult. Adult participants ($N=22$; 18 female and 4 male; age range 18 to 41 years, median age 21 years) were recruited through notices posted on campus and the online course platform at the University of Canterbury, Christchurch (New Zealand). Their participation was incentivized with a NZD 10 shopping voucher. Four-year-old ($N=20$, 10 female and 10 male, mean age 4;3) and eight-year-old participants ($N=20$, 10 female and 10 male, mean age 8;4) were recruited through Christchurch kindergartens, schools and after-school programs as well as home education networks, the New Zealand Institute of Language, Brain and Behavior's participant pool 'Team Tamariki', notices posted on campus and the online learning platform, and word of mouth. Child participants were incentivized with their choice of one item from a 'box of treasures' (containing toy cars, bags of balloons, sheets of stickers, and the like; monetary value less than NZD 5 each); since parents or caregivers had to accompany the child participants to the experiment, they received a NZD 10 fuel voucher. All participants were being or had been raised in New Zealand. All participants named English or New Zealand English as their first and home language, and the impression of the experimenter, a native speaker of New Zealand English, was that all participants did indeed speak New Zealand English. Three participants (one in each age group) reported additional home languages, but not to the same level of use or proficiency as English. These participants were included in the analysis.

3.2 Materials

Images of animals and inanimate objects were obtained under Creative Commons license. These images were used to represent nouns in ditransitive sentences. In each trial, participants saw exactly four images. Each trial had either three small theme images and one larger recipient image, or one large theme and

three small recipients. The nouns represented by these images were balanced so that each of the three nouns represented by the smaller images matched the object represented by the larger image in exactly one of the three features of interest (length in number of syllables, binary a priori animacy, and grammatical number), but did not match it in the other two features. For example, the trial containing the monosyllabic animate plural recipient *dogs* as the explicit object had *lock* (length-match, but animacy- and number- mismatch), *camel* (animacy-match, but length- and number-mismatch), and *baskets* (number-match, but length- and animacy-mismatch) as the three options.

Each trial contained four audio stimuli. Three of them were the nouns for the three smaller images, while the fourth was an instruction sentence including the verb *give*, the noun for the larger image as one object (theme or recipient, depending on the type of trial – see the list of blocks below), and a gap in the place of the other object. The gap was filled with 500 ms of Brownian noise (generated with Audacity, version 2.0.2). Brownian (or 'brown') noise was chosen because Shirakawa (2013) showed that participants, particularly children, do not find it distracting or irritating. All audio stimuli were spoken by the same female New Zealand English speaker, recorded in a quiet room. See the appendix for all instruction sentences and accompanying nouns.

Only one verb, namely *give*, was used in order to control for the effect of lexical bias (Gries and Stefanowitsch 2004) and keep the experiment tolerably short for four-year-old participants. *Give* was used despite its strong bias for the double object construction because it is reasonable to assume that all participants are familiar with this verb (which cannot be said for other, less biased verbs like *allocate* or *leave*).

3.3 Procedure

Participants were seated at a desk with a HP EliteBook 2740p 12.1-inch touchscreen computer (displaying 1280 by 800 pixels) and a Tobii X120 head-free eyetracker. All visual presentation was on the touchscreen, which showed stimuli (explained below) on a black background. The experimenter explained to participants that they would be moving images on the touchscreen by simple touching and dragging, and that the eyetracker would be recording their eye gaze. After eyetracker calibration, the task (run in PsychoPy, version 1.80.00;50 see Peirce 2007 and 2009) was as follows: after a fixation dot (presented in the center of the screen for 500 ms), three images were shown in a horizontal row, either near the top of the screen (as 'themes') or near the bottom (as 'recipients'). For example, in a trial with *dogs* as the explicit recipient, these three images (representing possible themes) were of a padlock, a camel, and three baskets. The order of

images in this row was randomized per participant and trial. To reinforce that they were intended as recipients, the 'recipient' image or images were always near the bottom of the screen, had a white frame around each of them, and were not moveable. When each of the three images was first touched, the audio stimulus of the corresponding noun was played over headphones (Moshi VLH or Panasonic RT-HT 161, depending on head size). This ensured that participants registered all three objects and conceptualized them as the intended nouns (so that participants thought of the rabbit as a rabbit instead of, for example, a bunny-wabbit or Peter).

After all three of these images had been touched and the corresponding recordings had played, the larger image (of three dogs, in the example above) appeared. This image was centred horizontally and positioned near the bottom of the screen (as a recipient) if the three smaller images were themes, or near the top (as a theme) if the smaller images were recipients. The instruction audio stimulus was played as this larger image appeared. Once it had finished playing, the theme image(s) could be moved by dragging on the touchscreen. When a theme image was moved inside the white frame of a recipient image, orange and white stars were shown in the same position as that recipient accompanied by the sound of a trumpet fanfare, chimes, or drums as a reward stimulus. This reward stimulus was shown regardless of the choice that was made and concluded the trial.

Thus, participants made a series of choices to fill the gaps in the instruction sentences. The procedure did not allow them to choose one construction or the other – this was defined by the stimulus sentence. Participants' touchscreen input (touches and dragging paths) and eye gaze during each trial were also recorded, and these were analysed according to order of touching, the gaze percentages for each of the four images in that trial, the sequences of dragging and gaze, and the correlation between the two. This rather novel procedure was chosen to allow investigation of expectations or preferences in a controlled, fully crossed way, without possible issues introduced by unbalanced numbers of sentences or utterances typically found in corpora.

64 trials were presented in four blocks of 16 each. All trials within one block had the same type of instruction, and the order of blocks was the same for all participants (see appendix for full list of trials).

Block 1: prepositional construction with gap in place of the theme; Now give the _____ to the dogs.
Block 2: double object construction with gap in place of the recipient; Now give the _____ the keys
Block 3: double object construction with gap in place of the theme; Now give the hammer the _____.
Block 4: prepositional construction with gap in place of the recipient; Now give the monkey to the _____.

The first two blocks began with a non-interactive automatic demonstration followed by a practice phase of four trials. These practice trials were not included in the analysis of results.

3.4 Results

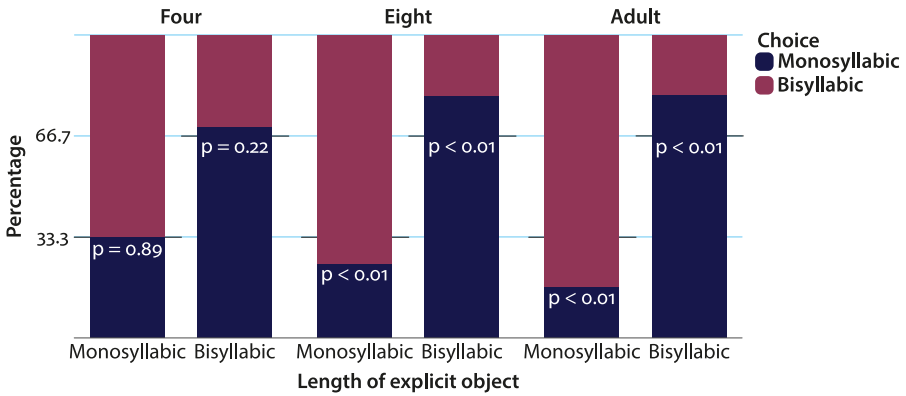

Figure 1. Percentage of choices by their length (split by length of the explicit object and by age group), with p-values of χ^2 tests (Holm-Bonferroni-corrected)

Figure 1 compares the percentages of monosyllabic and bisyllabic choices from trials with monosyllabic explicit objects to the same percentages from trials with bisyllabic explicit objects. If the choice was not affected by length, we would expect the proportion of monosyllabic to bisyllabic choices being made to be roughly the same as the proportion of monosyllabic to bisyllabic options available. Since there were two bisyllabic options when the explicit object was monosyllabic, and two monosyllabic options when the explicit object was bisyllabic, the expected percentages in case of no length effect would be 66.7% length-mismatching choices and 33.3% length-matching choices. The dotted lines with each bar in Figure 1 show these expected levels (or, in graphical terms, where the dividing line between the segments of each bar should be if the random expectation was true). The p-values given inside the bars in Figure 1 result from testing the respective bars against this expectation using Pearson's χ^2 goodness-of-fit test on the response counts, and applying Holm's sequential Bonferroni procedure for $m = 6$ comparisons to the resulting p-values in order to avoid falsely rejecting the null assumption in multiple comparisons. Because this analysis compares categorical data to expected values, a χ^2 test is appropriate.

The four-year-olds' choices do not differ significantly from the expected values ($p = 0.89$ and 0.22). The eight-year-olds' and adults' choices, on the other

hand, do: eight-year-olds and adults prefer bisyllabic options when presented with a monosyllabic explicit object and monosyllabic options when presented with a bisyllabic explicit object significantly more than expected by chance (all $p < 0.01$). There were no further apparent differences in this regard between trials with the gap in the instruction sentence in place of the theme and trials with the gap in place of the recipient, although a subsequent regression model shows that this difference is indeed statistically significant: if the gap in the instruction was a theme, participants tended to disprefer bisyllabic options. The regression model (see Table 1 in the appendix) further confirms that adults prefer bisyllabic options in trials with monosyllabic explicit objects and, conversely, monosyllabic options in trials with bisyllabic explicit objects. Regression is appropriate here because it allows investigation of several concurrent effects on one outcome.

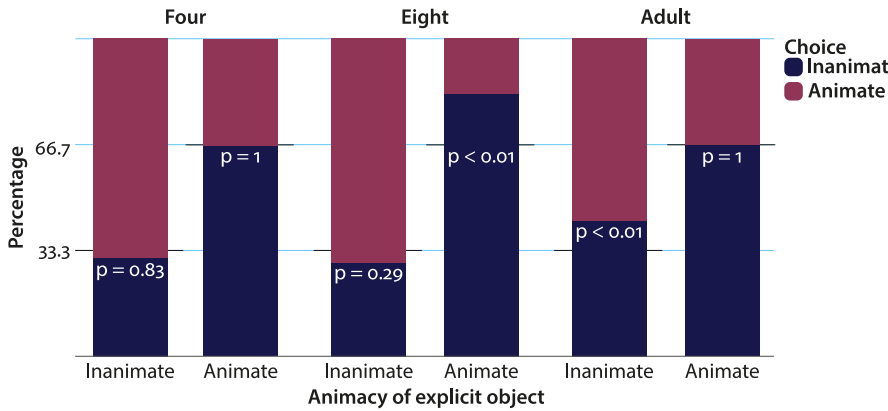

Figure 2. Percentage of choices by their animacy (split by animacy of the explicit object and by age group), with p-values of χ^2 tests (Holm-Bonferroni-corrected)

Four-year-olds were apparently not guided by animacy in their choices, as the two leftmost bars in Figure 2 show. Eight-year-olds were more likely to pick one of the two inanimate options when the explicit object was animate ($p < 0.01$) compared to chance, but did not show a preference for animates or inanimates when the explicit object was inanimate ($p = 0.29$). For adults, the reverse is true: when the explicit object was inanimate, adults chose significantly more inanimate options than expected by chance ($p < 0.01$), but with animate explicit objects, there was no significant preference. This apparent preference for inanimates is different from the other significant deviations from random chance discussed so far: the latter can all be described as feature-mismatching (bisyllabic choices for monosyllabic explicits, and so on), whereas this preference for inanimates is apparent only when the explicit object is also inanimate. In other words, adults apparently tend towards feature-matching choices in that case.

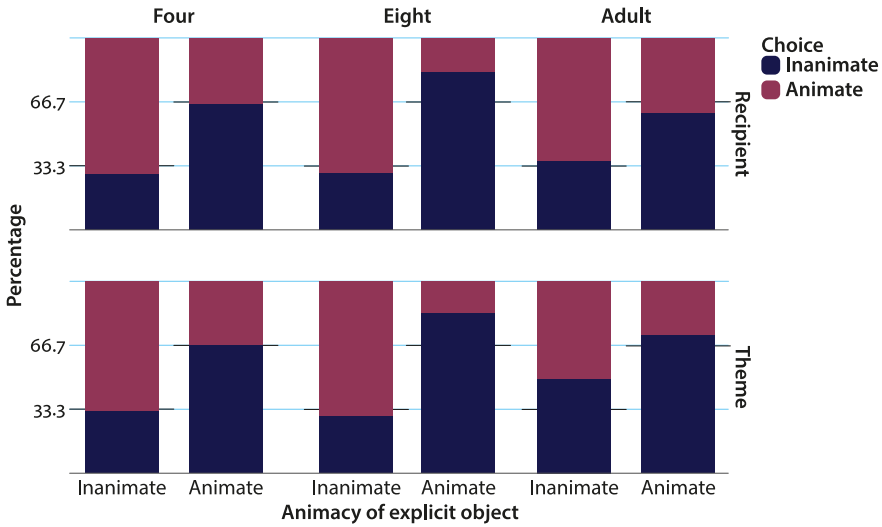

Figure 3. Percentage of choices by their animacy, split by animacy of the explicit object (inanimate/animate), by age group (four-year-olds, eight-year-olds, and adults), and by the function of the object that participants chose (recipient in Blocks 2 and 4, theme in Blocks 1 and 3)

When analysing these choices with respect to animacy, the only significant differences are in the choices made by adult participants: Figure 3 shows that adults chose more inanimates as themes (the two rightmost bars in the bottom row) than as recipients (two rightmost bars, top row) regardless of whether the explicit object was inanimate or animate, and two-sample χ^2 tests show both of these differences to be significant (corrected $p < 0.01$ and $p = 0.02$, respectively). In the children's age groups, these differences are not significant (all corrected $p > 0.1$ in two-sample χ^2 tests).

A regression model predicting the animacy of participants' choices was fitted to this choice data (see Table 2 in the appendix). This model shows that inanimate choices were more common in trials with an animate explicit object (coefficient −1.23). Since there were two inanimate options in all trials with an animate explicit object, this is not surprising. Likewise, it is apparent from Figure 2 that adults on the whole chose more inanimates, and that eight-year-olds chose significantly more inanimates when the explicit object was animate, so the significant main effect of adults and the significant interaction for eight-year-olds and animate explicit objects also serve as independent confirmation of that finding. The two remaining significant effects are more interesting: when the gap in the instruction sentence was the theme, participants tended to choose inanimates to fill it. Independent of this, when the gap in the instruction sentence was after an animate

explicit object, inanimates were also more likely to be chosen. The first of these effects is readily explained as a preference for (or prototypicality of) inanimate themes and animate recipients with *give*. The fact that there is no similar effect depending on length or number is readily explained by the absence of a prototypical pattern for those features – themes and recipients can be plural or singular, shorter or longer. The interaction between explicit animacy and relative position, finally, is an order effect as predicted by Bresnan et al. (2007) and as also tested in several of the contributions in this volume (e.g. Dubois, Röthlisberger): inanimate objects are preferred following animate ones.

The prepositional construction has been argued to be less restrictive with regard to what verbs it can be used with and what meanings it can encode (Oehrle 1976; Gropen et al. 1989; Rappaport Hovav and Levin 2008). Therefore, it is conceivable that these animacy preferences may be stronger in trials with double-object instruction sentences (the more restrictive construction). However, additional models using just half of the data set each (preposition instructions only, or double-object instructions only) do not show a significantly strong interaction between animacy and order, suggesting there is no difference between these two halves of the data set. The full model (using both halves of the data set) does not show a significant effect of construction, so the verb bias of *give* to favour the double-object construction does not appear to affect the results of this experiment.

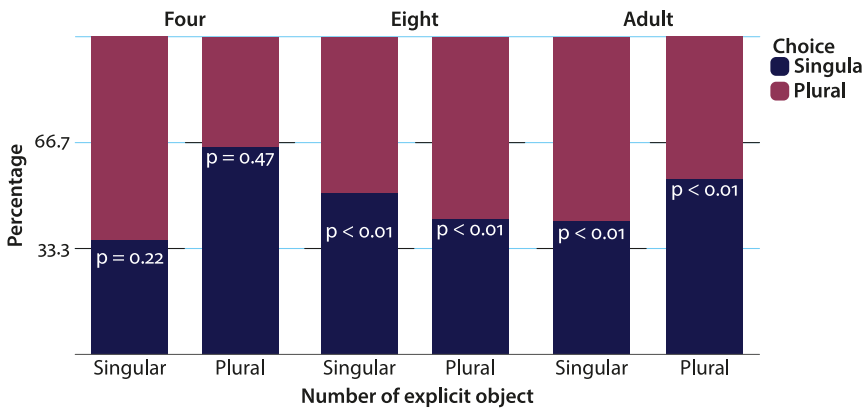

Figure 4. Percentage of choices by their grammatical number (split by number of the explicit object and by age group), with p-values of χ^2 tests (Holm-Bonferroni-corrected)

Feature-matching is also apparent in the percentages of singular and plural choices made by eight-year-olds and adults (all significant at $p < 0.01$), shown in Figure 4. The effect is particularly striking in the choices made by the eight-year-old age group: even though each trial offered two mismatching options and only one

matching one, eight-year-olds chose the single matching option in 54% of trials. The choices made by four-year-olds again do not differ significantly from random chance. This is confirmed in a regression model for the number of the choice.

Participants' eye gazes were analysed in age groups, by categorising gaze points according to which image they fell on, binned in 50 ms increments from the onset of the instruction sentence to 3 seconds after that point. A smoothing spline analysis of variance (SSANOVA; de Boor 2001; Davidson 2006; Gu 2013) model was fit to this binned data (separately for each of the three age groups). These models show that as early as 1 second after the start of the instruction sentence (which is during the instruction sentence still), adults are already much more likely to gaze at the image they will later choose as their response than at either of the other two options. Four- and eight-year-olds' gazes do not exhibit the same pattern to a significant degree.

In trials with an animate explicit object, adults (but not children) looked at the one animate option at least as much as at the other two options combined up to about 2 seconds after the start of the instruction sentence. This suggests that the adults' attention was attracted more by that single animate option. In the trials with an inanimate explicit object, all age groups looked at the two animate options significantly more than at the single inanimate one, which is in line with the absence of a significant preference for any one of the three images.

3.5 Discussion

Participants' choices out of the three options in each trial reveal several coexisting preferences: adults prefer inanimate options if the explicit object is also inanimate or if the gap in the instruction sentence was in place of the theme object. Eight-year-olds, on the other hand, prefer inanimate choices when the explicit object is animate. These two findings can be summarised as an animate-before-inanimate preference. The interaction effects in the regression model suggest that this preference does not differ significantly across age groups.

Previous studies of the dative alternation in child language (de Marneffe et al. 2012 and an unpublished analysis of the data in Bürkle 2011) did not find a significant animacy ordering effect in child speech corpus data, probably due to its uncontrolled and unbalanced nature. The fact that the present study did find this effect with child participants demonstrates the usefulness of the experimental approach as a supplement to corpus studies, and adds to an emerging literature converging on the idea that the dative alternation choice is just as complex in the language of children (from four years of age) as in the language of adults (Stephens 2010; de Marneffe et al. 2012; van den Bosch and Bresnan 2013). In the

words of de Marneffe et al. (2012: 54), "child speech only differs from the speech of their adult interlocutors in degree, not in kind".

Gaze behaviour in this experiment did not always match choices: for example, adults were not significantly more likely to gaze at the inanimate option in trials with an explicit inanimate object, but they were significantly more likely to choose that option. Explaining this discrepancy is beyond the scope of the present study but may be of methodological and psychological interest for further studies.

Turning to grammatical number, eight-year-olds and adults prefer to choose the option that matches the number of the explicit object. Grammatical number does not affect ordering choices, however: participants did not choose plural options more in trials where the gap preceded a singular object than in trials where the gap followed a singular object, and they did not choose singular options more when the gap followed a plural object than when it preceded a plural object.

In light of the plural-before-singular preference accepted in the literature following Bresnan et al. (2007), such preferences would have been expected (assuming the present experiment allows such effects to surface). There are two possible explanations for this negative finding: either the plural-before-singular ordering preference does not hold for the participants in this study, or this study's method was not suitable for testing for this effect. The first of these possibilities is not as far-fetched as it may appear, since most of the studies that reported a plural-before-singular ordering preference are based on corpus data and thus have to be interpreted with the limitations of corpora in mind. However, the second possibility is more likely. There are several confounding factors in this experiment (the task being relatively novel, participant fatigue, repetitive and matching features of experimental stimuli), and any of them could be expected to mask a subtle ordering preference. The fact that this study did not find the plural-before-singular preference attested in Bresnan et al. (2007) therefore does not constitute sufficient evidence against this ordering preference.

In terms of length, the results of this study are weak at best. There is some evidence that eight-year-olds prefer monosyllabic options when the gap in the instruction sentence is followed a bisyllabic explicit object, but this is a tendency rather than a strong effect.

The effect of length on the dative alternation and similar ordering phenomena is well established: speakers of all ages prefer shorter items to be ordered before longer items (Wasow 2002; Bresnan et al. 2007; de Marneffe et al. 2012). The question that this study aimed to address is whether a length difference of one syllable is enough to cause this effect. As with the number effects discussed above, there is some uncertainty inherent in interpreting the results, as this study may not be able to uncover more subtle ordering effects. In light of this, the fact that eight-year-olds' choices appear to manifest a bisyllabic-before-monosyllabic pref-

erence has to be treated with great caution. It seems unlikely that this one finding is evidence of a long-before-short preference, which would counter all previous research that documents a short-before-long preference. The finding does suggest, however, that a length difference of one syllable may not be enough to trigger the short-before-long effect.

There is a tendency apparent in adults' choices: they appear to choose objects that do not match the length of the explicit object. This is likely an epiphenomenon of an animacy-matching tendency, as these features are not independent by design.

4. Elicitation experiment

To investigate the development of the effects of animacy and grammatical number in language production, this second experiment elicits reproductions of ditransitive sentences which systematically vary by animacy and number of the two objects as well as their order. Three factors of these reproductions are analysed: the construction used, the time between end of target stimulus presentation and start of production, and any reactions that show the participant found a sentence odd.

4.1 Participants

All participants from the act-out experiment were asked to participate in this elicitation experiment. Two participants from the 4-year-old group did not cooperate (likely due to fatigue) and were therefore withdrawn. All others participated.

4.2 Materials

This elicitation experiment used 24 *give* sentences (see appendix) and 24 line drawings depicting the intended literal interpretation of these sentences. Sentences were balanced for construction (prepositional/double object), animacy of recipient and theme (animate/inanimate), and grammatical number of recipient and theme (plural/singular). This led to odd sentences such as (8).

(8) Mom gave the cushions Anne.

Although tasks like this one often elicit exact repetitions and literal interpretations (see for example Gibson et al. 2013), drawings were used to further reinforce literal interpretations. As only extreme violations would override this strong tendency to literal interpretation, this reveals what is and what is not extreme in participants' systems.

The drawing accompanying (8), for example, clarifies that *Anne* is the intended theme and *the cushions* the intended recipient. This is odd because animates (like *Anne*) are prototypical recipients and inanimates (like *the cushions*) prototypical themes of *give*. These odd sentences were included since they represent one of the possible combinations of dative alternation construction and object animacy and the aim of this experiment was finding the effect of order, regardless of the construction used or the role of either object. Models of adults' dative alternation choices appear to show a preference for the realization that places an animate object before an inanimate one and a plural object before a singular one. These two ordering principles are in conflict when one object is an animate singular and the other an inanimate plural, as in (8). This sentence and others that violate one or both of these principles were used to see which principle was easier to violate. As all possible combinations of animacy, number, and construction were used, all possible combinations of violation of principles occurred.

Sentences were recorded by the same speaker and presented using the same headphones used in the act-out experiment. Drawings were presented on the same screen used in that experiment. The experimental software was programmed and run in PsychoPy, version 1.80.00. As in the act-out experiment, only the verb *give* was used for control and simplicity of design.

4.3 Procedure

This experiment followed immediately after the act-out experiment in the same session. It presented target sentences aurally, accompanied by drawings depicting the intended meanings of these sentences. Participants were asked to repeat each sentence to a stuffed toy (presented as an alien, to encourage literal interpretation and repetition of odd sentences). After repetition (or refusal), the experimenter advanced the presentation program to the next trial. The order of trials was fixed to allow a narrative thread between them. Participants' speech during this experiment was recorded on the computer running the experiment software.

4.4 Results

The results of this experiment were analysed by three measures: construction used in the reproduction, time to begin reproduction, and indications that participants found a sentence odd.

Half of the target sentences used *give* in the double-object construction, the other half used the prepositional construction. Participants' productions for each trial were manually transcribed and subsequently tagged for the construction used and various features of the two objects. In 58 trials, the participant did not

produce a sentence at all, and with a further four, it was not possible to tell with certainty which construction the participant used (due to technical problems with the recording equipment). These 62 trials were excluded from the analysis.

Figure 5 shows the percentages of constructions used, split by age groups and further by the construction in the stimulus or target sentence. (The raw counts and totals differ between age groups: 18 four-year-olds, all 20 eight-year-olds, and all 22 adults cooperated during this experiment, although some trials from all age groups were removed as described.) The difference between the double object and prepositional target sentences is apparent, as are the differences between age groups: prepositional targets almost always elicited prepositional productions. Adults used the double object construction for almost all double object targets, but the children used the prepositional construction for those too, with four-year-olds doing so more often than eight-year-olds do.

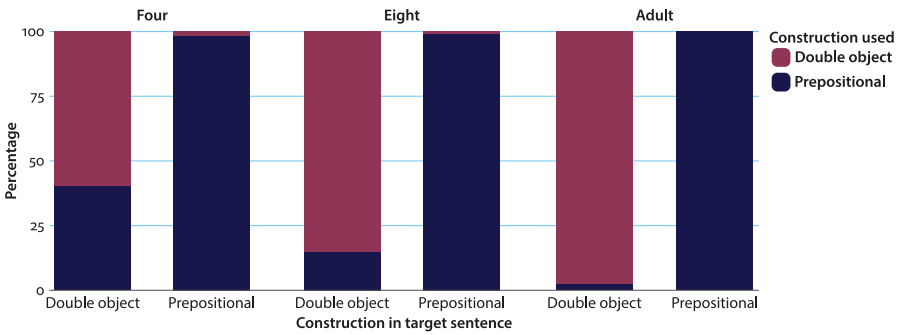

Figure 5. Percentages of reproductions by construction used, for each age group

In 110 trials, the participant used a different construction than the target sentence, but still produced a useable response. 102 of these had the double object construction in the target sentence (and thus the prepositional one in the reproduction). They are fairly balanced in terms of the grammatical number of the target objects but show an interesting imbalance for animacy: 61 of these 102 trials featured a target sentence with an animate theme and an inanimate recipient. (Fisher's exact test confirms this to be significantly different from an even distribution of animacy-role patterns in the 102 trials where participants changed the construction to prepositional; $p = 0.03$). In all but two of these 61 cases, the participant retained the order of objects, but inserted the preposition *to* and thus effectively changed the functions of the two objects. Therefore, it appears that this change is related to this specific combination of the double object construction, an inanimate recipient, and an animate theme. This combination is evidently harder to reproduce accurately.

Of the other 41 trials where participants changed the construction to a double object construction, 24 also had this *to*-insertion, 13 saw meaning-preserving construction changes (such as *Ben gave the kitten to the parents* for the *target Ben gave the parents the kitten*), and the remaining 4 had miscellaneous errors and interruptions.

A generalized logistic regression model was fit to the data (excluding the 62 trials with an unclear or no response) to model how the construction a participant used was affected by age group, the construction used in the target sentence, the animacy and number of both objects the participant used in their production, and the interaction between age group and all other variables named. The mean squared error of this model is 0.056, and the mean of 100 ten-fold cross-validation means of mean squared errors is 0.058. Effects with $|z| \geq 1.98$ (and thus $p \leq 0.05$) were deemed to be significant.

Unsurprisingly, the construction in the target sentence has a strong effect in this model: prepositional target sentences elicited more prepositional responses, and conversely double-object targets elicited mostly double-object responses. The model also shows that eight-year-olds were significantly less likely to choose a prepositional construction than four-year-olds. Inanimate recipients are significantly associated with the double object construction being produced. As discussed above, many target sentences with inanimate recipients were reproduced with *to*-insertion, which effectively reduces the number of reproductions with inanimate recipients (by turning inanimate recipients into themes) while also increasing the number of prepositional reproductions with animate recipients (and inanimate themes). Thus, the association of inanimate recipients with the double object construction (or, mutatis mutandis, of animate recipients with the prepositional construction) represents the imbalance in the reproductions caused by *to*-insertion. Finally, there was a significant interaction between age group and animacy: 8-year-olds produced significantly more prepositional construction sentences when the theme was inanimate. This means that the animacy of the theme and the construction used are more strongly correlated for eight-year-olds than for four-year-olds or adults.

The construction used is mostly the same as the construction in the target sentence. In terms of Gibson et al. (2013), most reproductions demonstrate literal interpretation. Notably, participants almost exclusively changed double object targets, whereas prepositional target sentences are hardly changed. This is broadly in line with Gibson et al.'s own results, which show a higher rate of literal interpretation with prepositional sentences, too.

Figure 6 shows that even the most implausible sentences were reproduced literally. 82 implausible double object target sentence trials saw participants changing them to the prepositional construction, while only 8 implausible prepositional target trials saw changes.

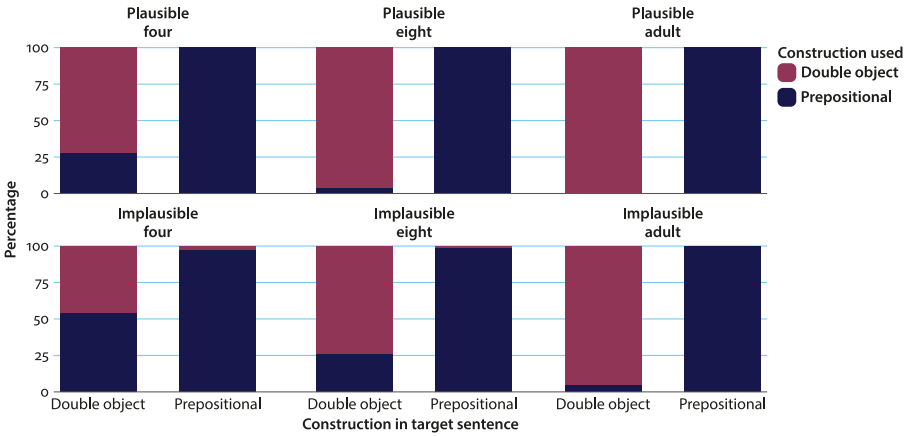

Figure 6. Percentages of reproductions by construction used, for each age group and target sentence plausibility

Participants may take longer to start reproducing sentences that are harder to process. The time from the end of the target sentence stimulus to the start of the participant's reproduction measures this. This reproduction initiation time was recorded for each trial, and a linear regression model was fit to this data to test whether response initiation time was affected by accuracy of reproduction, age group, target sentence construction, animacy and number of the two objects in the target sentence, and all two-way interactions between age group, target construction, object animacy, and object number. The mean squared error of this model is 0.57, and the mean of 100 ten-fold cross-validation means of mean squared errors is 0.62. Effects with $|z| \geq 1.98$ (and thus $p \leq 0.05$) were deemed to be significant.

This model shows that older participants were quicker to initiate their reproductions than younger participants, and accurate reproductions were initiated significantly more quickly than inaccurate ones. The only significant interaction in the model suggests that eight-year-olds were faster to initiate sentence reproduction when the target sentence contained an animate recipient than when the target sentence recipient was inanimate.

Participants sometimes added comments or other reactions to their reproductions – for example "That's silly!" or "That doesn't sound right.", laughter, and intonations that indicate questioning or disagreement. We will call these 'oddness reactions'. All trials were manually annotated for the presence or absence of oddness reactions. Oddness reactions were rare (24 from four-year-olds, 15 from eight-year-olds, and 9 from adults). Percentages of oddness reactions were calculated for each sentence and age group, and these percentages were analysed

using linear regression (percentage of oddness reactions as affected by target sentence construction type, age group, target sentence objects' animacy and number, and interactions between age group, target sentence objects' animacy, and target sentence objects' number). The mean squared error of this model is 0.001, and the mean of 100 ten-fold cross-validation means of mean squared errors is 0.003. Effects with $|z| \geq 1.98$ (and thus $p \leq 0.05$) were deemed to be significant.

This model shows a higher percentage of oddness reactions to inanimate recipient objects for all age groups. The grammatical number of objects has no significant effect, and neither does the type of construction used in the target sentence.

4.5 Discussion

Adult participants likely performed at ceiling in this experiment. With fully developed meta-linguistic skills, adults are capable of reproducing any sequence of words, so a violation of animacy patterns or any other unexpected or ungrammatical sentence in their native language poses no challenge for reproduction.

The typical animacy pattern for ditransitive sentences (animate recipient, inanimate theme) appears to be easier to process than any other pattern. This is reflected in the finding that sentences with animate recipients were overall more likely to be reproduced accurately in this experiment than sentences with inanimate recipients, which violate the typical pattern. Sentences with inanimate recipients met with more oddness reactions than other types of sentences.

Gibson et al. (2013) found that implausible sentences are more likely to be interpreted literally if they are presented as part of an experimental setting with many other implausible sentences. 31% of sentences in their experiment 3 were implausible. In the present elicitation study, 50% of sentences were implausible. We therefore would expect similarly high levels of literal interpretation and repetition in this study.

There are two key differences between the present experiment and Gibson et al. (2013), which arguably should lead to higher rates of literal interpretation: pictures that reinforce the implausible literal interpretation, and the use of elicited repetition rather than comprehension questions. Repetition arguably is a more literal task than comprehension by its very nature. Moreover, this elicited repetition is framed as repetition to an alien, which may license literal repetition of implausible sentences. Because of these points, we would predict higher levels of literal interpretation here than in Gibson et al. (2013).

This prediction is borne out, as Figure 6 shows. Prepositional target sentences were changed very rarely, which is in line with Gibson et al. (2013: 8053)'s prediction that "comprehenders should infer nonliteral meanings more readily when the change involves a deletion": implausible prepositional sentences have a clear

marker (the preposition *to*) that supports the implausible interpretation. Implausible double object sentences, however, have no such support, and it is sensible for participants to assume that *to* was deleted from a plausible prepositional sentence in these cases.

The finding that prepositional sentences were rarely changed could also be argued to support constructional meanings: implausible sentences in this experiment had inanimate recipient objects, which can be reconciled with a 'motion to target' meaning (associated, according to some, with the prepositional construction). Prepositional sentences with inanimate recipients would thus not be entirely implausible, though *give* typically requires an animate recipient and thus induces some implausibility here. However, this was not the focus of the present experiment, and other studies would be needed to substantiate this tentative conclusion further.

These findings explain why the documented verb bias of *give*, which is used more frequently in the double-object construction, is not represented in these results. We find more prepositional reproductions than double-object ones, but this is due to the implausibility of the constructions and possibly to constructional semantics.

As in the act-out study, there is no strong effect for grammatical number in this elicitation study. This may be because there is no such effect, or because other effects drown it out in the data.

5. General discussion

While the results of the two experiments presented in this chapter are somewhat equivocal, they show a clear preference for harmonic, typical patterns: all else being equal, listeners gaze at and choose potential objects that adhere to the animate-before-inanimate ordering, which suggests they know and expect this ordering. When asked to repeat sentences, listeners are more likely to repeat sentences exactly if these conform to this expectation and they are also more likely to change implausible sentences than plausible ones. Plausibility is determined by object animacy (inanimate recipients and animate themes are implausible) and construction in the target sentence (implausible sentences are rendered more implausible by the absence of a clear marker supporting the implausible reading, but more plausible by the presence of *to* as such a marker). Plausible sentences, by definition, meet a listener's expectations, and even novel plausible sentences are more predictable than implausible sentences. This explanation can be extended to include Bresnan et al. (2007)'s harmonic alignment and Hawkins (1994)'s EIC principle: speakers are more likely to produce predictable, expected, easily-processed constructions, and listeners actively expect such sentences.

Animate recipients are common in corpora (see de Marneffe et al. 2012), and presumably in the input of speakers. While there is no data available on the frequency of all four possible combinations of (binary) animacy for two objects, it appears likely that the patterns with animate recipients (or recipients that can be understood as animate) are most frequent by far, though it is less evident whether children's learning of this animacy pattern for transfer ditransitives is affected by inanimate referents in similar positions (e.g. as goals/locations for *put*). Regardless, it is not surprising that animate recipients should be expected.

Ditransitive sentences with an animate object before an inanimate one are also fairly common in corpora (see Bresnan et al. 2007), so the same argument applies. What is surprising is that these patterns are learned very early: even the youngest participants included in the present study, aged around 4 years, exhibit them. Further studies, focused on the earlier years of child language acquisition, would be needed to chart this development in detail. One possible explanation we suggest is that patterns that are frequent in the input are learned quickly – and ditransitives, especially with *give* taking an animate recipient and an inanimate theme, are frequent in child-directed speech as well as in child speech (Bürkle 2011: 39; de Marneffe et al. 2012: 47).

While it has been claimed that early language acquisition favours the prepositional construction, some research (Gropen et al. 1989; Bürkle 2011) casts doubt on this. This doubt extends to second-language acquisition, where Jäschke and Plag (2016) found that some speakers may favour the double object construction. Therefore, the present findings agree with this emerging literature that questions the supposed emergence of the prepositional construction before the double object construction. Further research should take into account the possibility that one construction may emerge earlier than the other, but this may well differ between individuals and originate in variation between caregivers (Campbell and Tomasello 2001: 266, Gries and Stefanowitsch 2004).

Jäschke and Plag (2016)'s findings from second-language acquisition suggest interesting possibilities. They found that learners of English as a second language were guided by some, but not all, documented factors in their dative construction choices: the objects' length, pronominality, definiteness, animacy, and grammatical person had effects in line with previous research. While there appear to be some differences with first language acquisition (cf. de Marneffe et al. 2012), this suggests a possible list of the most cognitively prominent factors. We agree with Jäschke and Plag (2016) that further studies with different first and second languages are needed to fully understand the patterns of development. Are the same features prominent in all languages, or is the degree of prominence language-specific? The former would support a general cognitive constraint as a crosslinguistic explanation.

Another task for future research is to investigate the frequencies of animacy patterns and their ease of acquisition. Syntactic and semantic accounts of the dative constructions may provide hypotheses for this research – for example, does the double object construction include the null preposition that encodes possession, as for example in Harley (2002)?

Finally, while it is intuitively appealing to claim that language acquisition is determined largely by cognitive ease, it will be necessary to define this ease more precisely than intuition may suggest: Rowland and Noble (2011) show that cues like *to* and the animacy of referents do help children as young as 3 years to understand ditransitive sentences as intended. This arguably suggests that these cues would also make constructions and animacy patterns easier to acquire – but stronger evidence will be needed to support this suggestion. Moreover, *to* is not the only cue to dative constructions; for instance, the presence or absence of a determiner can indicate the double object construction in some sentences (Rowland and Noble 2011: 68).

The hypothesis that cognitive ease drives dative alternation choices would also lead to predictions for other ordering alternations. The benefactive alternation and heavy NP shift are two cases in point, as they both include elements whose order could be determined by prominence and cognitive ease. Particle verbs may reveal effects of a noisy channel model of language (Gibson et al. 2013): Is the object-before-particle ordering more misleading with some particle verbs than with others, and if so, do speakers avoid this ordering? Do listeners misunderstand it? Future studies in English and other languages that answer these questions would further our understanding of these phenomena across languages, thus providing insights into the cognitive processing of alternations.

6. Conclusion

This chapter has aimed to provide insights into child acquisition of English dative constructions and the factors guiding the choice between them, an area which has so far received considerably less attention than the dative alternation as used by adult speakers. To investigate this question, and specifically to investigate the impact of length, animacy and grammatical number of the object arguments in ditransitive patterns on constructional choice, two experiments were conducted; one the one hand, a combination of an act-out task with eye-tracking, and on the other hand, a reproduction task. The results of the former experiment indicates that animacy is a strong predictor in the dative alternation in child acquisition: the tendency for animate objects to be placed before inanimates – which also impacts choice of construction – is established already at a very young age.

The latter experiment zoomed into the interaction between order and construction in more detail, finding that conformity to ordering preferences greatly influences reproducibility of ditransitive sentences. The chapter has argued that these findings support cognitive ease as a crucial factor in the acquisition of the English dative alternation, in line with earlier research into the phenomenon in adult communication.

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Appendix

Act-out experiment sentences

In the list of trials below, the instruction sentence is reproduced in full, with the gap represented by _____. The three nouns in brackets after each sentence represent the available options in that trials.

Block 1

Now give the ___ to the cows. (penguin, baskets, hat)
Now give the ___ to the dogs. (camel, baskets, lock)
Now give the ___ to the frog. (squirrels, bottle, hats)
Now give the ___ to the bear. (penguins, letter, balls)
Now give the ___ to the hedgehogs. (bee, hats, basket)
Now give the ___ to the monkeys. (crab, balls, basket)
Now give the ___ to the kiwi.[2] (pigs, hat, bottles)
Now give the ___ to the rabbit. (pigs, ball, bottles)
Now give the ___ to the keys. (letter, squirrels, crab)
Now give the ___ to the pears. (bottle, penguins, crab)
Now give the ___ to the pot. (letters, camel, bees)
Now give the ___ to the shirt. (letters, camel, crabs)
Now give the ___ to the hammers. (ball, pigs, squirrel)
Now give the ___ to the lemons. (lock, pigs, squirrel)
Now give the ___ to the pillow. (locks, bee, penguins)
Now give the ___ to the pencil. (locks, bee, camels)

2. *Kiwi* means the bird, not the fruit, in this study.

Block 2

Now give the ____ the cows. (penguin, baskets, hat)
Now give the ____ the dog. (camels, basket, locks)
Now give the ____ the frogs. (squirrel, bottles, hat)
Now give the ____ the bear. (penguins, letter, balls)
Now give the ____ the hedgehogs. (bee, hats, basket)
Now give the ____ the monkey. (crabs, ball, baskets)
Now give the ____ the kiwis. (pig, hats, bottle)
Now give the ____ the rabbit. (pigs, ball, bottles)
Now give the ____ the keys. (letter, squirrels, crab)
Now give the ____ the pear. (bottles, penguin, crabs)
Now give the ____ the pots. (letter, camels, bee)
Now give the ____ the shirt. (letters, camel, crabs)
Now give the ____ the hammers. (ball, pigs, squirrel)
Now give the ____ the lemon. (locks, pig, squirrels)
Now give the ____ the pillows. (lock, bees, penguin)
Now give the ____ the pencil. (locks, bee, camels)

Block 3

Now give the cow the ____. (penguins, basket, hats)
Now give the dogs the ____. (camel, baskets, lock)
Now give the frog the ____. (squirrels, bottle, hats)
Now give the bears the ____. (penguin, letters, ball)
Now give the hedgehog the ____. (bees, hat, baskets)
Now give the monkeys the ____. (crab, balls, basket)
Now give the kiwi the ____. (pigs, hat, bottles)
Now give the rabbits the ____. (pig, balls, bottle)
Now give the key the ____. (letters, squirrel, crabs)
Now give the pears the ____. (bottle, penguins, crab)
Now give the pot the ____. (letters, camel, bees)
Now give the shirts the ____. (letter, camels, crab)
Now give the hammer the ____. (balls, pig, squirrels)
Now give the lemons the ____. (lock, pigs, squirrel)
Now give the pillow the ____. (locks, bee, penguins)
Now give the pencils the ____. (lock, bees, camel)

Block 4

Now give the cow to the ____. (penguins, basket, hats)
Now give the dog to the ____. (camels, basket, locks)
Now give the frogs to the ____. (squirrel, bottles, hat)
Now give the bears to the ____. (penguin, letters, ball)
Now give the hedgehog to the ____. (bees, hat, baskets)
Now give the monkey to the ____. (crabs, ball, baskets)
Now give the kiwis to the ____. (pig, hats, bottle)
Now give the rabbits to the ____. (pig, balls, bottle)

Now give the key to the ____. (letters, squirrel, crabs)
Now give the pear to the ____. (bottles, penguin, crabs)
Now give the pots to the ____. (letter, camels, bee)
Now give the shirts to the ____. (letter, camels, crab)
Now give the hammer to the ____. (balls, pig, squirrels)
Now give the lemon to the ____. (locks, pig, squirrels)
Now give the pillows to the ____. (lock, bees, penguin)
Now give the pencils to the ____. (lock, bees, camel)

Regression tables

Table 1. Coefficients for the model of the length of choices (positive parameters indicate effects favouring bisyllabic choices; colons indicate interaction effects; *MSE* = 0.178)

Variable	Parameter estimate	Standard error	z	p
(Intercept)	0.65	0.14	4.70	< 0.01
bisyllabic explicit object	−1.63	0.17	−9.44	< 0.01
animate explicit object	−0.13	0.08	−1.71	0.09
plural explicit object	0.22	0.08	2.88	< 0.01
eight-year-olds	0.33	0.17	1.95	0.05
adults	0.86	0.18	4.79	< 0.01
gap after explicit	0.18	0.17	1.08	0.28
gap was theme	−0.17	0.08	−2.28	0.02
prepositional construction	−0.03	0.08	−0.45	0.65
bisyllabic explicit : gap after explicit	0.21	0.24	0.88	0.38
bisyllabic explicit : eight-year-olds	−0.50	0.25	−2.00	0.05
bisyllabic explicit : adults	−1.15	0.26	−4.50	< 0.01
gap after explicit : eight-year-olds	0.22	0.25	0.89	0.37
gap after explicit : adults	0.08	0.26	0.29	0.77
bisyllabic explicit : gap after explicit : eight-year-olds	−0.99	0.36	−2.72	0.01
bisyllabic explicit : gap after explicit : adults	−0.61	0.37	−1.67	0.10

Table 2. Coefficients for the model of the animacy of choices (positive parameters indicate effects favouring animate choices; colons indicate interaction effects; *MSE* = 0.209)

Variable	Parameter estimate	Standard error	z	p
(Intercept)	0.93	0.14	6.69	< 0.01
bisyllabic explicit object	−0.08	0.07	−1.09	0.28
animate explicit object	−1.23	0.17	−7.42	< 0.01
plural explicit object	−0.05	0.07	−0.72	0.47
eight-year-olds	−0.03	0.17	−0.17	0.87
adults	−0.55	0.16	−3.41	< 0.01
gap after explicit	0.17	0.17	0.98	0.33
gap was theme	−0.24	0.07	−3.52	< 0.01
prepositional construction	−0.07	0.07	−1.03	0.30
animate explicit : gap after explicit	−0.47	0.24	−1.98	0.05
animate explicit : eight-year-olds	−0.96	0.25	−3.83	< 0.01
animate explicit : adults	0.40	0.23	1.75	0.08
gap after explicit : eight-year-olds	0.19	0.24	0.77	0.44
gap after explicit : adults	0.10	0.23	0.43	0.67
animate explicit : gap after explicit : eight-year-olds	−0.01	0.36	−0.02	0.98
animate explicit : gap after explicit : adults	0.18	0.33	0.57	0.57

Elicitation experiment sentences

Dad gave Anne the coat.
Anne gave the drawing to the parents.
Mom gave the cushions Anne.
Dad gave the parents to the chairs.
Mom gave the shelves the drawing.
Dad gave the toys to Anne.
The cat gave the basket the kittens.
Mom gave the baby to the toys.
The parents gave the chairs the children.
Dad gave the kittens to the baby.
Mom gave the children the table.
Anne gave the cat to the parents.
The baby gave the car the blocks.
Dad gave the glasses to the children.

The cat gave the milk the kitten.
Mom gave the children to the sofa.
Ben gave the parents the kitten.
Anne gave the glass to Ben.
Dad gave the cat the kittens.
Anne gave the cat to the basket.
Mom gave the kittens the crackers.
The baby gave the cracker to the blocks.
Ben gave the cat the crackers.
The cat gave the crackers to the basket.

This volume brings together twelve empirical studies on ditransitive constructions in Germanic languages and their varieties, past and present. Specifically, the volume includes contributions on a wide variety of Germanic languages, including English, Dutch, and German, but also Danish, Swedish, and Norwegian, as well as lesser-studied ones such as Faroese. While the first part of the volume focuses on diachronic aspects, the second part showcases a variety of synchronic aspects relating to ditransitive patterns. Methodologically, the volume covers both experimental and corpus-based studies. Questions addressed by the papers in the volume are, among others, issues like the cross-linguistic pervasiveness and cognitive reality of factors involved in the choice between different ditransitive constructions, or differences and similarities in the diachronic development of ditransitives. The volume's broad scope and comparative perspective offers comprehensive insights into well-known phenomena and furthers our understanding of variation across languages of the same family.

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