



# Early syntactic productivity: Evidence from dative shift <sup>☆</sup>

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## Abstract

The abstractness of children's early syntactic representations has been questioned in the recent acquisition literature. While some research has suggested that children's knowledge of basic constructions such as the transitive is robust and abstract at a very young age, other work has proposed that young children only have constructions that are specific to individual lexical items. The present paper seeks to resolve this discrepancy by examining children's abstract knowledge of the English dative alternation via a production study. The studies ask whether young children who hear a sentence like *I pilked the cup to Petey* know that the same meaning can be expressed with the sentence *I pilked Petey the cup*. This generalization is well-attested in the language that children hear and represents a strong test-case for determining the nature of children's early syntactic representations. The results indicate that three-year-old children have productive knowledge of the English dative alternation, but that their performance can be influenced by small changes in the nature of the task. A preference for the prepositional dative form is also found and the possible reasons for this preference are discussed.

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## 1. Introduction

Recent discussions in the literature on the acquisition of syntax have centered on a debate regarding the nature of children's early syntactic representations (Fisher, 2002; Naigles, 2002; Tomasello, 2000; Tomasello & Akhtar, 2003). On one side of this debate are those who believe that early syntactic representations are abstract. This idea, the Generalization Hypothesis, rests on the claim that even very young children have formed generalizations about the syntax of their native languages that are not simply rote-learned formulae tied to specific lexical items. On the other side of the debate are those who suggest that young children's syntax develops in a piecemeal way. This Item-Based Hypothesis postulates that early syntax is based on knowledge of the argument structures of individual lexical items and that these item-specific representations persist into the fourth year of life.

Support for the Generalization Hypothesis comes from studies of early language comprehension. In these studies, comprehension paradigms such as the Intermodal Preferential Looking Paradigm (IPLP; Golinkoff, Hirsh-Pasek, Cauley, & Gordon, 1987) have demonstrated that young toddlers, even those too young to reliably produce certain sentence types, can understand sentences that require them to have abstract knowledge of their language. Naigles (1990) used IPLP to demonstrate that 25-month-olds have knowledge of the transitive/intransitive distinction in English. In this study, children who heard a sentence such as "Big Bird is kradding Cookie Monster" looked longer at a scene where Big Bird performed a novel action on Cookie Monster than at a scene where Big Bird and Cookie Monster performed an action independently. This preference was reversed when participants heard an intransitive sentence such as "Big Bird and Cookie Monster are kradding." Because this study used novel verbs in its stimuli, the children's success on this task must be due to their understanding of the semantics of the transitive and intransitive constructions rather than to their knowledge of the semantics of the particular verbs used. In a similar study, Gertner, Fisher, and Eisengart (*in press*) found that even 21-month-old toddlers were able to interpret transitive sentences with novel verbs correctly. Participants who heard a sentence such as "The duck is pilking the bunny" reliably looked to a scene where a duck performed a novel action on a bunny rather than a scene where the bunny acted on the duck. Again, the use of novel verbs in this study demonstrates that it is not the child's knowledge of the particular verb, but rather their understanding of the syntactic form, that allows them to succeed on this task.

Most of the criticism of these studies has been based on the fact that they do not test the strength of the child's understanding of the syntactic structure in question. In the case of Naigles (1990), the infants were not tested on their knowledge of a single construction, but rather on their ability to distinguish between the semantics of two distinct constructions (Tomasello & Abbot-Smith, 2002). While this ability is certainly vital to the language-learning process, it is unclear that children need to fully understand the syntax and semantics of both constructions in order to succeed. They could simply know to look for two actors upon hearing a sentence like "Big Bird and Cookie Monster are kradding" and only one actor when they hear the transitive sentence. Likewise, the study by Gertner et al. (*in press*) demonstrates that young

children have some knowledge of the semantics of the transitive construction, but given the well-documented tendency for comprehension to precede production (e.g., Shipley, Smith, & Gleitman, 1969), it may not be the case that comprehension is an appropriately robust test of children's syntactic productivity. Also, Gertner et al. (in press) included two "practice trials" using familiar verbs in transitive sentences, which could allow the participants to use online analogical reasoning to succeed at the task. Thus, although the comprehension studies point to an early ability to use syntactic cues to understand sentences containing novel verbs, they have not conclusively demonstrated that young infants have a fully abstract understanding of the syntactic generalizations of their native language.

In contrast, much of the work in support of the Item-Based Hypothesis comes from research examining children's productive language abilities. Olguin and Tomasello (1993) demonstrated that two-year-old children will not use a novel verb in a construction other than the one they heard it modeled in, even though further work by these authors finds syntactic generalization with novel nouns (Tomasello & Olguin, 1993). That is, two-year-old children will use a novel noun in a syntactic position they have not heard it attested in, but will not show the same behavior with novel verbs. Olguin and Tomasello take this as evidence that early syntactic representations are based on individual verbs, rather than more general syntactic frames, because they expect that an individual with generalized syntactic representations would use that knowledge to extend novel verbs to various syntactic frames. Further work by Akhtar and Tomasello (1997) demonstrated that it is not until children are well into their fourth year of life that they begin showing this kind of productive knowledge of the transitive construction. Corpus studies have also found that young children only very rarely use verbs in constructions that they have not been modeled in (Lieven, Pine, & Baldwin, 1997). This suggests a paradox in the data: children are able to interpret transitive sentences with novel verbs at the age of two, but they are not able to apply this knowledge to their own productions for another year or more.

Efforts to resolve this paradox have taken two approaches. Those whose work supports the Item-Based Hypothesis have suggested that comprehension tasks, where the participant need only attend to and understand the stimulus in question, are sufficiently easy that even children with only the weakest syntactic knowledge could succeed. In contrast, those whose work supports the Generalization Hypothesis criticize the work in support of the Item-Based Hypothesis partly on the basis of task complexity (see Fisher, 2002; Naigles, 2002 for reviews). For example, task demands of a production study involve attending to the stimulus, determining the semantics of the novel verb, remembering the verb, formulating the new sentence and producing the correct sentence.

Perhaps an even more important critique of the work in support of the Item-Based Hypothesis rests on the robustness of the syntactic generalizations being tested (Fisher, 2002; Naigles, 2002). In both the studies by Akhtar and Tomasello (1997) and those by Olguin and Tomasello (1993), it was predicted that children who have full, abstract syntactic representations will produce novel verbs heard in an intransitive frame in a transitive construction, even though they have never heard these verbs used transitively. However, the nature of the intransitive/transitive alternation in

English is complicated by the fact that unergative and unaccusative verbs have the same surface syntax when they are used intransitively (1a and 2a), but different surface structures when used transitively (1b and 2b). Unergative verbs have the same surface subject in both the intransitive and transitive constructions (compare 1a and 1b), while the “subject” of an intransitive unaccusative verb is realized as an object when the verb is used transitively (compare 2a and 2b). The alternative constructions in (1c and 2c) are ungrammatical.

- (1a) Varitek is hitting.
- (1b) Varitek is hitting the ball.
- (1c) \*The ball is hitting, (with the reading that the ball is the theme).
- (2a) The ball rolled.
- (2b) Wakefield rolled the ball.
- (2c) \*Wakefield rolled, (with the reading that Wakefield is the agent).

While such transitive/intransitive alternations are productive for many subclasses of verbs, the extent to which these alternations are attested in speech to children is not clear. Furthermore, it is not the case that one can always predict the nature of the alternation from the semantics of the verb (cf. [Levin, 1993](#)). For those verb subclasses that do alternate, semantic factors such as the thematic role of the intransitive subject can sometimes be used to predict the nature of the transitive/intransitive alternation. However, it is not clear from the results of either [Akhtar and Tomasello \(1997\)](#) or [Olguin and Tomasello \(1993\)](#) that the semantics of the actions the child observed were sufficiently well-defined to allow him to rely on these cues. [Gillette, Gleitman, Gleitman, and Lederer \(1999\)](#) have demonstrated that even adults have difficulty determining the semantics of a verb from real-world context alone. It is therefore not surprising that young children might have similar difficulties.

Further work by [Brooks and Tomasello \(1999\)](#) attempted to reduce the semantic ambiguity of the target alternation by using the active/passive alternation. They found that most three-year-old children were unable to produce a novel verb in a passive construction when they had only heard it modeled in the active construction (and vice versa). On the other hand, when children heard both active and passive forms in the same experimental session, they were able to produce more passives with novel verbs, an ability which the authors attribute to training. However, the passive construction is very late acquired by English-learning children ([Borer & Wexler, 1987](#)). More importantly, passives are rare in child-directed English ([Demuth, 1989](#)). It is therefore possible that the participants in the Brooks and Tomasello study had little, if any, experience with passives, making it unlikely that they could have developed an abstract understanding of the active/passive alternation. Therefore, before rejecting the idea that young children have abstract syntactic knowledge, it is important to remove the grammatical confounds that may impede children’s performance on production tasks.

The present study aims to address some of the problems in previous comprehension and production research. In particular, we wanted to elicit the production of novel verbs in an alternation that has fewer restrictions than the transitive/

intransitive alternation, but that is also frequent in speech to young children and used spontaneously by most children in the testing age range. The English dative alternation has these properties. This construction is characterized by the ability to change the relative order of the theme and recipient objects, while removing the preposition attached to the recipient, as in (3).

- (3a) Damon gave the ball to Ramirez.
- (3b) Damon gave Ramirez the ball.

Sentences such as (3a) are referred to as prepositional datives, while sentences like (3b) are called double object datives. Both forms have highly similar semantics, although there are a few subtle discourse/pragmatic differences between them, with pronomial recipients typically occurring in the double object form of the dative and goal-like recipients occurring in the prepositional form (cf. Bresnan & Nikitina, 2003; Oehrle, 1976). This may also be part of a tendency to prefer shorter objects after the verb (e.g., Hawkins, 1994; Wasow, 2002). This alternation is particularly robust for basic-level dative verbs such as *give* (as shown in (3) above), but does not apply to Latinate dative verbs, such as *donate*, as shown in (4).

- (4a) Schilling donated the ball to the hospital.
- (4b) \*Schilling donated the hospital the ball.

The most important characteristic restricting dative alternation has to do with the semantic characteristic of the verb. For example, verbs like *park* take a theme and a beneficiary argument (rather than a recipient argument), and are therefore characterized as benefactive, rather than dative verbs (compare ‘I parked the car for Sue’ vs. \*‘I parked Sue the car’). Also, dative verbs that require a substantial change in the physical location of the theme are somewhat restricted in this alternation. This may be due to the unclear status of the recipient in such cases. As illustrated below, arguments of these verbs that are unambiguously goals (rather than recipients) can only be used in the prepositional form (6a and 6b), while there is a great deal of speaker variation in whether these verbs can be used in both forms when the intended meaning more clearly involves a transfer of possession (5a and 5b).

- (5a) Ortiz hit the ball to Nixon.
- (5b) ?Ortiz hit Nixon the ball.
- (6a) Ortiz hit the ball to center field.
- (6b) \*Ortiz hit center field the ball.

Despite these issues, the English dative alternation represents a particularly good test of children’s abstract syntactic knowledge at age 3. Any native speaker of English who has an abstract understanding of the dative alternation and the semantic class of verbs to which it applies should be able to extend that knowledge for use with novel verbs, producing both forms of the alternation as appropriate. Furthermore, dative verbs are frequent in speech to children, and both forms appear in

children's spontaneous productions by the age of 3 (Campbell & Tomasello, 2001; Snyder & Stromswold, 1997). In the 12 CHILDES corpora analyzed by Snyder and Stromswold (1997), over 80,000 adult utterances contained a dative verb. Of those utterances that contained the verb *give* (the most frequent type), between 33% and 85% were in the double object form. Clearly, children have considerable experience with these verbs in both alternations. Campbell and Tomasello (2001) find that, while the majority of dative verbs in child-directed speech were used in the double object construction, all children in their study heard both forms of the alternation with multiple verbs. Although the alternation is restricted to non-latinate dative verbs, Gropen, Pinker, Hollander, Goldberg, and Wilson (1989) demonstrated that *donate*-type verbs are learned very late by children and do not typically appear in speech to them. In their analysis of five longitudinal corpora of child-directed speech they found only five ditransitive latinate verb tokens, each of a different type. It is therefore probable that three-year-olds are unaware of these strictly non-alternating verbs. They may be aware of the restrictions on change-of-location datives, but if the semantic properties of the verbs are carefully controlled, the magnitude of this problem is reduced. It is also possible that children are aware of the bias toward having shorter and/or pronominal objects placed immediately after the verb, but this can also be experimentally controlled.

In sum, the dative alternation is a robustly attested syntactic process that is frequently heard and used by English-speaking three-year-olds. Despite some preference for one form of the construction over the other in different discourse contexts, they are often used interchangeably. Thus, unlike many of the lexical and semantic restrictions found with previous intransitive/transitive production experiments, testing children on novel dative verbs should provide the opportunity for them to productively use novel verbs if their syntactic representations are sufficiently abstract. This construction therefore provides a particularly good test for assessing the Item-Based and Generalization Hypotheses.

## 2. Experiment 1

### 2.1. Participants

The participants in Experiment 1 were 16 children (8 boys and 8 girls), with an average age of 3;0.4 (years;months.days; range 2;11.4–3;1.2). Nine additional children were tested and not included for uncooperativity (6), parental interference (1), experimenter error (1), or equipment failure (1). Participants were recruited from an existing database of experimental participants who were originally contacted based on public birth records, newspaper birth announcements and referrals.

### 2.2. Procedure

This study used an elicited repetition paradigm to assess three-year-olds' productive abilities with the English dative alternation. Children were shown a novel dative

action involving a familiar object (a cup or a key) and a novel, named recipient (*Petey* or *Toby*). The objects were highly familiar to the participants and neither was used in any dative form in speech to three of the children in the Demuth Providence Corpus (Demuth, Culbertson, & Alter, *in press*). The recipient names were chosen to be equally complex phonologically (both CVCV). This was to ensure that there would be no length effects when full noun phrases were used, as both were two syllables long. Neither name occurred in either dative form in the Demuth Providence Corpus. The novel actions consisted of transferring an object from the child to one of the recipients. This was carried out via a conveyor belt or a catapult, both of which had been built of Legos for the purpose of this research. The novel words *pilk* and *gorp* were used, one for each action, and the actions assigned to these labels were balanced across participants.

Individual children came into the testing room with their caregivers and were invited to read a picture book with the experimenter (the first author), in order to make them feel more comfortable. The experimenter encouraged the children to name various animals pictured in the book. After reading the book, the experimenter invited the participants to play with a set of toys consisting of the two novel machines, the two familiar objects and the two recipients. They were shown how to use one of the machines, asked to use it to transfer one of the objects to one of the recipients and given a label for the action, which they were asked to repeat. (*There's a word for what you just did; it's 'pilk'! Can you say 'pilk'?*) After children successfully repeated the word, the experimenter modeled the verb in the dative form that was appropriate for the condition that the participant was in (e.g., *You pilked the cup to Toby!*). The experimenter then invited the children to repeat the action with a different recipient or theme. After the verb was modeled twice in this way, the children were asked to perform the action again with the machine in question, told what they had done and asked to describe their actions to their caregiver. After two such “trials”, the other machine was introduced in the same way as the first. The machines were alternated in blocks of two to four “trials”, depending on attention span, for a target of eight utterances per verb. All participants were audio and videotaped for later coding. Each child received a picture book for participating.

Half of the children heard both novel verbs modeled in the prepositional dative form, and the other half heard both novel verbs modeled in the double object form. Children in the prepositional condition heard no double object datives involving the novel verbs. For children in the double object condition, the novel verbs were never used in the prepositional form. All dative uses of the novel verbs were included in the analysis, even those which were produced spontaneously by a participant outside of a trial (e.g., *No, I want to pilk the cup to Toby!*). In order to be counted as a dative use, the utterance had to contain the verb, a recipient noun phrase and a theme noun phrase. Only argument order was considered for coding purposes. Thus, the occasional substitution of *Toby* for *Petey* was not counted as an error. The occasional omission of *to* in the prepositional dative was also permitted. This elicited repetition paradigm was used to reduce task demands for the children.

In order to ensure reliability in coding, sessions for two of the children were completely recoded by an experienced transcriber. Agreement between coders was 96%.



### 2.3. Predictions

If children possess abstract knowledge of the dative alternation, they should be able to use the novel verbs in either dative form, regardless of how it was modeled. This would provide support for the Generalization Hypothesis. However, if children's representations are based on individual lexical items, they should only use the novel verbs in the modeled form. This would provide support for the Item-Based Hypothesis. Because this study removes some of the semantic confounds inherent in previous production studies, we expect children to use the novel verbs in either dative form, showing evidence of abstract knowledge of the syntactic generalization.

### 2.4. Results

The results of this study are shown in Fig. 1. Recall that the target number of productions was eight for each of the two verbs, for a total of 16 novel verb uses per child. Of the 220 total responses across both conditions, children averaged 13.75 dative uses of the novel verbs (range 8–23), nearly all of them occurring in the modeled form. Participants in the prepositional condition produced an average of 13.12 dative sentences with the novel verbs (range 8–21), but showed no evidence of productive ability with the dative alternation. They used the novel verbs only in the form that they had heard them modeled in. Participants in the double object condition showed an almost identical pattern, producing an average of 14.3 datives (range 11–23), but only one instance of productive use of the novel verbs. This was in a WH-question, which the child produced after forgetting the recipient's name (*Who did I pilk it to again?*). The preference for the modeled form across both conditions

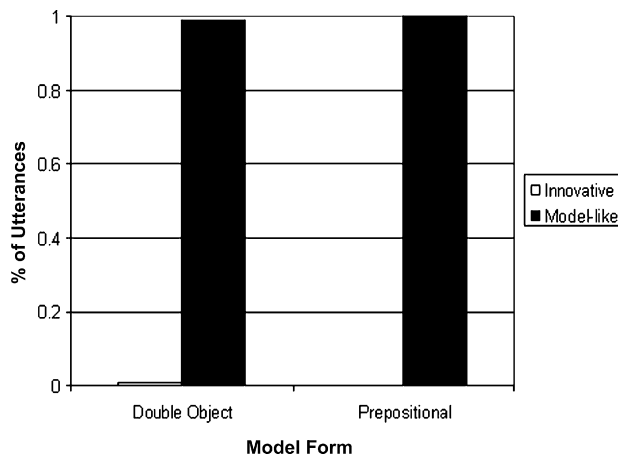


Fig. 1. Results of Experiment 1. Percentages are based on the number of dative sentences containing the novel verb modeled in the noted sentence frame and are collapsed over all participants. In this experiment, children heard both verbs modeled in the same syntactic form.



is significantly greater than expected by chance ( $t(15) > 12$ ;  $p < .001$ ). Thus, the children in this study used the novel verbs they heard only in the form in which these were modeled, providing little evidence of syntactic generalization.

## 2.5. Discussion

At first glance, these data appear to support the Item-Based Hypothesis. Indeed, they are reminiscent of the data reported for three-year-olds in the Akhtar and Tomasello (1997) paper. In that study, children heard one novel verb modeled in each of four sentence structures, including no arguments, agent-only, patient-only and both agent and patient. Three-year-olds were significantly more likely to produce the verbs in sentence structures they had heard before, with only a few instances of extension to new sentence types. Likewise, in the present study, children only use novel verbs in the forms that they were modeled in, suggesting that they do not have full productive knowledge of the English dative alternation, but rather have item-based representations for each verb. However, these children, unlike those in Akhtar and Tomasello's study, heard only one form of the alternation over the course of the experiment. They did not hear any verbs in the alternate form. Perhaps these children are able to productively use novel verbs in the dative alternation, but fail to do so because of the pragmatics of the experimental setting or due to syntactic priming effects.

Syntactic priming has been reported in experiments with adults (e.g., Bock, 1986). This is the phenomenon in which individuals are more likely to use a syntactic form that they have heard or used recently than to use a different syntactic form, even if it is equally appropriate (Bock, 1986). This phenomenon has also been reported in young children (Brooks & Tomasello, 1999; Song & Fisher, 2004). It is possible that the apparent lack of generalization shown by the children in this experiment is due to the overwhelming presence of only one dative form. Participants may have a strong grasp of the English dative alternation, but not produce the alternate form simply because of priming or due to the pragmatics of a situation in which an adult is using only one form. In the next experiment, we removed this possible confound by modeling one of the novel verbs in the prepositional form of the dative, and modeling the other novel verb in the double object form.

## 3. Experiment 2

### 3.1. Participants

The participants in Experiment 2 were 16 children (6 boys and 10 girls), with a mean age of 3;0.14 (years;months.days; range 2;11.21–3;1.8). These participants were recruited from the same database as the participants in Experiment 1. An additional nine children were tested and excluded from analysis due to uncooperativity (5), experimenter error (3), or a preexisting developmental delay (1).

### 3.2. Procedure

The procedure for this experiment was the same as described for Experiment 1, except that each participant heard one verb modeled in the prepositional dative and the other verb modeled in the double object dative. Both the order of presentation of the forms and the verb that occurred in a given form were balanced across participants.

As in Experiment 1, two experimental sessions were completely retranscribed by another experienced coder. The two transcribers agreed on 91% of utterances.

### 3.3. Predictions

Because this experiment reduced the likelihood of priming or pragmatic effects that could bias children against producing any but the modeled form, we predicted that children would use the novel verbs in an unmodeled form. That is, they would sometimes produce double object datives with verbs modeled only in the prepositional dative and vice versa. Such behavior would provide evidence that these children have an abstract understanding of the dative alternation.

### 3.4. Results

The results of the second experiment are presented in Fig. 2. Of the 188 dative uses of the novel verbs (mean 11.75 per participant, range 6–21), 68.6% were produced in the modeled form, while 31.4% were produced in the unmodeled form. While children's preference for using the novel verbs in the modeled form was statistically significant ( $t(15) > 1$ ,  $p < .001$ , two-tailed), the number of novel verbs used in the

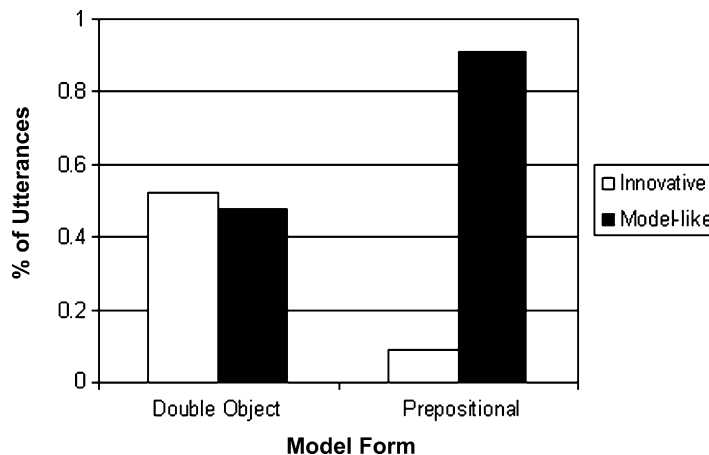


Fig. 2. Results of Experiment 2. Percentages are based on the number of dative sentences containing the novel verb modeled in the noted sentence frame and are collapsed over all participants. In this experiment, participants heard one verb modeled in the double object form and the other verb modeled in the prepositional form.

unmodeled form was statistically greater than 0 ( $t(15) > 1$ ,  $p < .001$ , two-tailed). As predicted, this indicates that the production of the novel verbs in the unmodeled form by the children in this study was not simply due to error, showing evidence of abstract syntactic representations.

Unexpectedly, participants were also much more likely to shift from a double object form of the dative to the prepositional form. Shifts from the prepositional form to the double object form occurred only 8.9% of the time, suggesting that the participants were not very productive in shifting to the double object dative, although the number of productive uses of the novel verbs in the double object form is significantly greater than zero ( $t(15) > 1$ ,  $p < .01$ , two-tailed). Indeed, when one looks at the number of participants who productively used one of the novel verbs in the double object form, only 7 of 16 showed this ability and often did so only once. When children heard a novel verb modeled in the prepositional dative, they used it in that form significantly more often than in the alternate form ( $t(15) > 1$ ,  $p < .001$ , two-tailed). On the other hand, when participants heard a novel verb modeled in the double object form, they produced it in the prepositional form 52.0% of the time and in the double object form 48.0% of the time. There is no significant difference between the number of times a verb modeled in the double object form was produced in the modeled form and the number of times it was produced in the prepositional form ( $t(15) < 1$ ,  $p > .8$ , two-tailed). Furthermore, of 16 participants, 13 used a verb modeled in the double object form as a prepositional dative. This suggests that three-year-olds have productive knowledge of the alternation from the double object dative to the prepositional dative, but show less of a tendency to alternate from prepositional to double object datives. Possible explanations for this asymmetry are discussed in the following section.

#### 4. Discussion

This study set out to determine if three-year-old English-speaking children would exhibit evidence of syntactic generalization of the dative alternation, flexibly using the double object or prepositional dative constructions with novel verbs. Experiment 1 showed that when participants were taught two novel verbs in the same dative form, they demonstrated no productive knowledge of the dative alternation. However, Experiment 2 showed that when one verb was taught in the double object dative and the other verb was modeled in the prepositional dative, three-year-olds did generalize to the other syntactic frame. This demonstrates that three-year-olds have an abstract understanding of the dative alternation and can productively use this understanding under certain experimental conditions.

Abstract understanding of a syntactic alternation suggests that children's grammatical knowledge is not item-based, but rather driven by a general understanding of the syntactic properties of the language (Fisher, 2002; Tomasello, 2000). It could be argued, however, that the children in this study once had item-based syntax and that they very recently advanced to a more general understanding of grammar. While this study does not speak to the nature of children's understanding of the dative

alternation prior to age 3, it does present evidence that this understanding is not item-based at the time of the study. Previous work (e.g. Akhtar & Tomasello, 1997) indicated that children do not have abstract representations of the transitive construction, a much simpler sentence type, until well past the age of 3. Because those studies tested a generalization that is not necessarily robust in English (Fisher, 2002), it was possible that children failed to show evidence of abstract representations because productivity was not clearly warranted. However, the present study used a more robust, if more complex, syntactic alternation and found evidence of abstraction. Furthermore, most children do not spontaneously produce both forms of the dative alternation until around the age of 2; 6 (Campbell & Tomasello, 2001). The participants in this study, therefore, had only been producing dative alternations for a few months prior to showing evidence of abstract representation of this alternation. This is in marked contrast with the three-year-old participants in Akhtar and Tomasello's (1997) study, who had been producing both transitive and intransitive sentences spontaneously for a year or more, but failed to show evidence of abstract representations. While the present study cannot speak to the question of whether children's earliest syntactic representations are item-based, it does provide evidence of abstract syntactic representations at an earlier age than previously demonstrated, following shortly after the appearance of dative alternation in spontaneous speech. Clearly, under the appropriate test conditions, three-year-old children show productive knowledge of certain syntactic generalizations.

The question remains, however, as to why children failed to generalize in Experiment 1, but did so in Experiment 2. These findings are similar to those of Brooks and Tomasello (1999) where three-year-olds only generalized from the active to the passive form of novel verbs, and vice versa, when both constructions were modeled in the same experiment. Those authors attribute their results to a training effect, where the presence of both constructions in the same experiment led the participants to consider using the active/passive alternation. Alternatively, their results could be due to syntactic priming. Bock (1986) and Bock and Loebell (1990) note that adults tend to use syntactic constructions they have heard in the previous discourse, and that the use of passive constructions in the previous discourse generally increases the likelihood that adults will use a passive in later conversation. Likewise, Bock and Loebell found that the use of one dative form in recent discourse increases the probability that the same dative form, rather than the alternate, will be used to describe a similar event. The results of both Experiments 1 and 2 may be partly explained by similar priming effects. In Experiment 1 participants heard novel verbs used only in either the double object or the prepositional dative form. This increased the likelihood that they would continue to produce sentences using only the modeled form. However, in Experiment 2, all participants heard one novel verb modeled in the double object dative, and one novel verb modeled in the prepositional dative, increasing the likelihood that both verbs would be used in both forms. Thus, one might conclude that syntactic priming effects could account for the findings from both experiments.

However, if syntactic priming were the only factor underlying children's performance in Experiment 2, we would have expected generalization to occur equally in

both directions (i.e., from the modeled double object form to the prepositional form, and from the modeled prepositional form to the double object form). The results of Experiment 2 showed that children were much more likely to go from the modeled double object form to the prepositional dative, a result which is not easily explained by priming. This asymmetry also decreases the likelihood that our results are due to training or online learning of the alternation. While it is possible for children to have learned the alternation over the course of the experimental session, as Brooks and Tomasello's (1999) participants did with the passive alternation, it is unlikely that children would learn only one half of the relationship between the two dative forms. Furthermore, the participants in this study most likely had experience with both dative forms prior to their arrival in the lab (Snyder & Stromswold, 1997). This was not the case for the children in Brooks and Tomasello's (1999) study because young English learners have little to no experience with passive sentences (Demuth, 1989). Therefore, while participants in this study would have been able to use their prior experience with dative verbs during the task, the participants in Brooks and Tomasello's study would not have been able to do so. The combination of this fact about experience and the asymmetry in children's responses make an online-learning account of children's performance in this study less viable. We consider several possible explanations for this asymmetry below.

First, there may have been discourse/pragmatic factors that could have influenced children's preference for the prepositional dative. Researchers have long known that there is a tendency to use the double object form of the dative when the recipient is a pronoun (e.g., *I gave him the ball*). There is some debate about why this is the case. Some suggest that this is consistent with general discourse/pragmatic tendencies to place given information before new information (Bresnan & Nikitina, 2003; Fillmore, 1968). Osgood and Zehler (1981) note that young children appear to be sensitive to these types of distributional facts of English, although it is not clear that they understand the pragmatics. Indeed, early pilot work for this study attempted to manipulate the discourse context to encourage the use of a pronoun in place of one of the arguments. However, children in both the pilot studies and in the experiments presented here failed to use pronouns with any consistency. It is, therefore, difficult to determine whether or not the preference for the prepositional dative found in Experiment 2 is due to pragmatic factors. Further research in this area would be necessary to clarify this issue.

Alternatively, other researchers have suggested that length factors, rather than discourse/pragmatic factors, best account for the fact that the double object form of the dative tends to be used when the recipient is a pronoun. In particular, they note that this is consistent with a tendency of languages to place longer, phonologically heavier objects last (e.g., Hawkins, 1994; Wasow, 2002). Thus, speakers are much more likely to say *I sent the boy the dog*, than *I sent the veterinarian the dog*. Rather, there would be a tendency to say *I sent the dog to the veterinarian*. In this study we carefully controlled for the length of the noun phrases, such that all object noun phrases contained two syllables (*the key*, *the cup*, *Toby*, *Petey*). It is therefore unlikely that length factors can account for the results of Experiment 2.

We have argued that we have insufficient evidence to support a role for discourse/pragmatic factors in accounting for three-year-olds' tendency to generalize less to the double object form of the dative. Furthermore, our controls for argument length eliminate the possibility that length effects are driving the asymmetry in children's productions. Alternatively, perhaps frequency plays a role. A number of studies have shown that linguistic elements that are highly frequent in child-directed speech, including phonemes, word and syllable structures and lexical items, tend to appear earlier in children's speech than do their lower frequency counterparts (e.g., Anderson, Morgan, & White, 2003; Beckman & Edwards, 2000; Demuth & Johnson, 2003; Levelt, Schiller, & Levelt, 2000). Similar effects have been shown for higher frequency argument structures (Demuth, Machobane, Moloi, & Odat, 2005). Perhaps children's preference for the prepositional dative stems from its greater frequency in their linguistic experience.

Two corpus studies of the dative alternation that examine child-directed speech show that the most frequent dative verbs (e.g., *give*, *read*) are used more frequently in the double object form (Campbell & Tomasello, 2001; Snyder & Stromswold, 1997). These same studies also report that the double object form of the dative is acquired earlier or at about the same time as the prepositional form of the dative for most children. These facts cast doubt on a frequency-based explanation of the imbalance in our data. However, Gropen et al. (1989), in another corpus study, showed that a greater number of (lower frequency) verb types actually occur in the prepositional form of the dative. The reasons for this distributional fact are unclear, but the type/token imbalance suggests that children may have some evidence that not all verbs can occur in the double object form or that they do so only very rarely. As discussed earlier, children do not learn those verbs which occur strictly in the prepositional form (i.e., *Latin* datives) until a somewhat advanced age. This fact makes it unlikely that the children in this study are aware that any verb is actually prohibited from occurring in the double object form. It is possible, however, that they have noticed that some verbs, particularly those of long-distance transfer (e.g., *throw*), are not commonly used in the double object form. Given that both novel actions in this study involved long-distance transfer, children may have preferred the prepositional form because they know it is more felicitous with this type of verb.

Another possible explanation for this preference may have to do with the children's understanding of the semantics of the verbs being used. Perhaps children in this experiment were not treating *Toby* and *Petey* as recipients, but rather as goals, which can only take the prepositional form. One reason for thinking that this might have been the case is that the objects often landed in the vicinity of the "recipient", rather than being caught. Thus, the "recipient" was not clearly in possession of the object after the activity had been performed. If children are aware of these subtle semantic differences in argument structure by the age of 3, this might provide an explanation for the preference to generalize to the prepositional form. Alternatively, it is also possible that locative verbs may be more frequent than dative verbs, possibly biasing an interpretation in this direction. Future study of children's use of novel verbs with an unambiguous recipient would help resolve this issue.

In summary, the three-year-olds in this study showed evidence of syntactic generalization of the dative alternation when the alternative form was also present in the experimental context. These results therefore support the Generalization Hypothesis, arguing against a strong Item-Based description of early syntactic representations. At the same time, however, there was an asymmetry in children's productivity, with a preference for the prepositional form of the dative. We have considered several possible explanations for this asymmetry. A more comprehensive investigation of children's developing understanding of verb semantics and thematic roles will help determine which of these explanations is most likely.

## 5. Conclusion

The goal of this study was to shed light on an apparent paradox in the data on the nature of early syntactic representations. Young children show evidence of abstract grammar in comprehension tasks, but do not demonstrate knowledge of various syntactic generalizations in production tasks. Using the English dative alternation, a frequent and predictable syntactic rule, this study demonstrated that three-year-old children do show evidence of abstract syntactic representations under certain experimental conditions. The results further suggest that children's more extensive experience with the prepositional form of the English dative construction may allow them to generalize more readily to this form than to the double object form of the alternation. Therefore, it is clear that three-year-old children have abstract syntactic knowledge, but that the demonstration of this knowledge is affected by the interaction of multiple environmental factors, including type frequency, syntactic priming, and the availability of appropriate linguistic evidence.

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