The Role of the Input in the Acquisition of Third Person Singular Verbs in English

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During the early stages of language acquisition, children pass through a stage of development when they produce both finite and nonfinite verb forms in finite contexts (e.g., "it go there," "it goes there"). Theorists who assume that children operate with an abstract understanding of tense and agreement marking from the beginnings of language use tend to explain this phenomenon in terms of either performance limitations in production (e.g., V. Valian, 1991) or the optional use of finite forms in finite contexts due to a lack of knowledge that tense and agreement marking is obligatory (the optional infinitive hypothesis; K. Wexler, 1994, 1996). An alternative explanation, however, is that children's use of nonfinite forms is based on the presence of questions in the input ("Where does it go?") where the grammatical subject is immediately followed by a nonfinite verb form. To compare these explanations, 2 groups of 24 children aged between 2 years 6 months and 3 years were exposed to 6 known and 3 novel verbs produced in either declaratives or questions or in both declaratives and questions. The children were then questioned to elicit use of the verbs in either finite or nonfinite contexts. The results show that for novel verbs, the children's patterns of verb use were closely related to the patterns of verb use modeled in the language to which they were exposed. For known verbs, there were no differences in the children's use of individual verbs, regardless of the specific patterns of verb use modeled in the language they heard. The implications of these findings for theories of early verb use are discussed.

KEY WORDS: **language acquisition, third person singular verbs, input-driven learning**

During the early stages of language acquisition, children pass through a stage of development between approximately 2 and 4 years of age when they produce both finite and nonfinite verb forms in finite contexts (e.g., "he go"/"he goes"). There is, however, little agreement among researchers as to the reasons for this. The current study represents an attempt to evaluate three different explanations for this phenomenon through an experimental investigation of English-speaking children's use of third person singular marking with known and novel verbs.

The first explanation to be considered is the influence of performance limitations in production on children's early use of verb inflections. Some researchers claim that children operate with an abstract knowledge of the systems governing tense and agreement marking from the beginnings of language use. These theorists attribute the early use of nonfinite forms in finite contexts to performance limitations affecting the child's

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ability to overtly produce tensed forms in all obligatory contexts (e.g., Pinker, 1984; Valian, 1991).

The difficulty with most performance-related accounts of early language acquisition is that they typically fail to specify the exact circumstances under which children are likely to be affected by performance limitations, and they therefore lack predictive power. Those accounts that do make more specific predictions, for example with respect to subject omission, usually invoke limitations on the length of children's early utterances as an explanation for the omission of specific sentence constituents (P. Bloom, 1990; Valian, 1991). From this perspective, it might be reasonable to assume that performance-based accounts should predict that children will be more likely to omit third person marking when producing longer utterances than when producing shorter utterances. However, in a detailed study that aimed to determine which particular aspects of syntactic structure result in an increase in performance demands, L. Bloom, Miller, and Hood (1975) reported that the children in their study were just as likely to produce verb inflections with longer utterances (three constituents) as with shorter utterances (two constituents). Their data show that neither two- nor three-constituent utterances are close enough to a performance ceiling to prevent children adding inflections, which suggests that overall utterance length may play only a minor role in determining whether children produce verb inflections in obligatory contexts.[1]

Although verb inflections were supplied in both two- and three-word utterances, more familiar lexical items or items that had just been modeled by the adult were more likely to be supplied in longer utterances than new or unfamiliar lexical items. Therefore, although performance limitations accounts make few specific predictions regarding children's early verb use, these findings suggest that first, children will be more likely to omit third person marking with new or unfamiliar verbs than with known verbs, because remembering and producing an unfamiliar lexical item requires additional processing resources (although producing an inflection in itself does not appear to increase performance demands). Second, children will be more likely to produce third person marking with both known and unfamiliar verbs if they have recently heard an utterance modeling the required inflection.

The second explanation to be considered for the use of finite and nonfinite verb forms in finite contexts is the optional infinitive (OI) hypothesis (Wexler, 1994,

1996). Wexler claimed that even very young children operate with an adult-like understanding of tense and agreement and that, consequently, they possess the knowledge necessary to identify verb forms in the language they hear as finite or nonfinite. However, he suggested that children initially lack the knowledge that tense and agreement marking is obligatory. Thus, they alternate between producing finite and nonfinite forms in finite contexts until such a point in development when the knowledge that tense and agreement marking is obligatory matures.

Researchers working within the OI framework have claimed that the different markers of tense develop in parallel (Rice, Wexler, & Hershberger, 1998). The correct production of finite forms in finite contexts is assumed to increase in a steady manner over time, reflecting the underlying composite measure, tense, that is subject to maturation over the course of development. In its strongest form, this account should therefore predict that children will be equally likely to produce finite verb forms in finite contexts across a range of different verbs at a given stage of development.

Although the OI hypothesis predicts that finite forms will sometimes be omitted in obligatory contexts, in its current form it does not make any clear predictions concerning precisely when, where, or under what circumstances children might be expected to produce finite forms in finite contexts. Thus, it does not make any specific predictions regarding either children's use of known versus unfamiliar verbs or their use of specific lexical items. Taking the OI hypothesis at face value, if children were to show different patterns in their use of finite and nonfinite forms in finite contexts with individual verbs, this would suggest that the OI hypothesis does not provide the best explanation for the early use and non-use of finite verb forms in finite contexts. However, if the OI hypothesis were developed further and, for example, incorporated a performance limitations account of known versus unfamiliar verb use, rather different predictions might emerge with respect to the exact pattern of finite and nonfinite verb use expected in children's early speech.

The third explanation for children's use of finite and nonfinite verb forms in finite contexts is a constructivist, input-based approach. The apparently optional use of finite verb forms in finite contexts in children's early speech may reflect item-based learning and the patterns of verb use in the language to which children are exposed. Thus, constructivist approaches typically predict that children's earliest linguistic representations will be tied to individual lexical items, such as verbs, pronouns, or other high frequency markers (e.g., Braine, 1976; Childers & Tomasello, 2001; Lieven, Pine, & Baldwin, 1997; Pine, Lieven, & Rowland, 1998; Tomasello, 1992;

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[1] Bloom et al. (1975) included the highly frequent progressive inflection *-ing* in their analyses alongside the less frequent tense inflections *-ed* and *-s*. It is therefore possible that the overall length of utterance could affect the likelihood that children will produce the tense inflections *-ed* and *-s* in obligatory contexts, but not the progressive inflection *-ing*.

see also Valian & Coulson, 1988, for suggestions on the role of high frequency markers in early language acquisition). This kind of item-based learning may in part explain children's apparently optional use of finite forms in finite contexts. Children hear finite verb forms modeled in declaratives in the input (e.g., "He jumps") and nonfinite forms modeled in questions in the input (e.g., "Can he jump?"). If children acquire separate item-based constructions from questions and declaratives, (e.g., "He jump"/"He jumps"), this might lead them to produce both finite and nonfinite forms in finite contexts, or it could cause them to be confused about whether or not the third person marker is required

The emphasis on lexically based learning means that from a constructivist perspective, differences in the use of new and familiar lexical items are predicted. For example, Tomasello (1992) suggested that in his daughter's speech at a given stage of development verbs that had previously been acquired were used in more complex sentences than those that were most recently acquired. A number of experimental studies have provided further support for the suggestion that children learn the argument structures associated with individual verbs on a verb-by-verb basis. For example, English-speaking children are more willing to correct ungrammatical non-subject-verb-object (SVO) word orders with known verbs than with novel verbs (Abbot-Smith, Lieven, & Tomasello, 2001; Akhtar, 1999). Although children below 3 years of age are unwilling to generalize argument structure to novel verbs, there appears to be a continuum in terms of levels of productivity, with 2-year-olds showing very little productivity with novel verbs, whereas 3-year-olds are much more likely to generalize their linguistic knowledge to novel verb forms.

Although these findings could be seen to reflect a gradual decrease in performance limitations over the course of development, from a constructivist perspective they are assumed to reflect changes in children's underlying linguistic representations. Exactly what kinds of representations underlie this gradual increase in productivity is unclear. However, the findings suggest that children are gradually building up from linguistic representations that are tied to individual lexical items to more abstract representations that allow greater flexibility in use.

With respect to the use of third person singular marking in finite contexts, a constructivist input-based approach should predict that (a) children's provision of third person marking with novel verbs will be tied to individual verbs and will be dependent on the input modeled for that verb—therefore, children will be more likely to produce finite verb forms in declaratives if they hear those verbs modeled in declaratives ("It jumps") than if they hear them modeled in questions ("Will it

jump?"); and (b) children may show some generalization to unfamiliar verbs in their use of third person marking if they have begun to develop more abstract constructions that support a degree of linguistic productivity. No specific predictions are made regarding children's use of familiar verbs because they are expected to have learned something about the use of these verbs from their prior linguistic experience.

The current study is an investigation of performance limitations, OI, and constructivist accounts of English-speaking children's use of third person singular verb forms (e.g., *goes*, *jumps*) in finite contexts. To avoid confusion, finite /s/ or /z/ forms will be referred to as third person singular /s/ forms (3PS-s), and nonfinite forms will be referred to as "unmarked." These accounts were examined by comparing children's use of known and novel verbs modeled in different sentence contexts. In finite contexts, the children heard known and novel verbs produced in declaratives (e.g., "It jumps"), and thus the relevant third person forms were modeled by the investigator, whereas in nonfinite contexts, the children heard known and novel verbs modeled in questions (e.g., "Will it jump?"), and thus the relevant third person forms were not modeled by the investigator. The children were then questioned to elicit use of the known and novel verbs in finite or nonfinite contexts to determine to what extent their use of 3PS-s or unmarked verb forms was affected by the specific verbs used (known or novel) and the sentence contexts in which the verbs were modeled (declaratives only, questions only, or both declaratives and questions). The hypotheses derived from the performance limitations (PL), optional infinitive (OI), and constructivist (C) accounts of children's use of third person marking in finite contexts are summarized below.

1. The use of 3PS-s verb forms with known verbs will not be affected by input condition (OI & C = yes, PL = no). The OI (in its strongest form) and C accounts should predict that the provision of 3PS-s forms with known verbs will not be affected by input condition (reflecting an underlying knowledge of tense and children's previous linguistic experience, respectively). In contrast, a PL account should predict that unless there is a ceiling effect, children will be more likely to provide third person marking with known verbs if those 3PS-s forms have been modeled in the input (because the recent use of a similar utterance reduces the processing demands in reproducing that utterance).

2. The use of 3PS-s verb forms with novel verbs will be affected by input condition (3PS-s > mixed > unmarked) (PL & C = yes, OI = no). A PL and a C account should predict that children will be more likely to produce 3PS-s marking with novel verbs if a 3PS-s form has been modeled in the input (reflecting

a decrease in processing demands or the acquisition of the relevant lexical form, respectively). In contrast, the OI hypothesis, unless modified to incorporate a role for performance limitations, should predict that there will be no differences between novel verbs in the children's use of 3PS-s marking, irrespective of the particular forms modeled in the input (reflecting an abstract knowledge of tense).

3. The use of 3PS-s verb forms with novel verbs will be (a) higher than with known verbs in the 3PS-s condition (C = yes, PL & OI = no), (b) roughly equal to use with known verbs in the mixed condition (OI & C = yes, PL = no), and (c) lower than use with known verbs in the unmarked condition (PL & C = yes, OI = no). A C account should predict that children will be (a) more likely to produce 3PS-s forms with novel verbs than with known verbs when only 3PS-s forms are modeled in the input (reflecting a lack of knowledge of the unmarked novel verb form), (b) equally likely to produce 3PS-s forms with novel and known verbs modeled in both 3PS-s and unmarked forms (reflecting the acquisition of 3PS-s and unmarked novel verb forms and previous linguistic experience with known verbs), and (c) less likely to produce 3PS-s forms with novel verbs than with known verbs modeled in only unmarked form (reflecting a lack of knowledge of the 3PS-s novel verb form). In contrast, a PL approach should predict that children will be more likely to omit third person marking in finite contexts with novel verbs than with known verbs in all conditions (reflecting increased performance demands), thus only concurring with a C account with respect to Hypothesis 3c, and the OI hypothesis should predict that children's use of known and novel verbs will be similar in all conditions reflecting an underlying knowledge of tense, thus only concurring with a C account with respect to Hypothesis 3b.

Study 1: Children's Production of Finite and Nonfinite Verb Forms in Finite Contexts

Method
Participants

The participants in this study were 24 monolingual English-speaking children aged between 2;6 (years; months) and 3;0 (M = 2;8). There were 13 boys and 11 girls. This age group fits squarely within what is usually regarded as the "optional infinitive" stage in development. Between 3 and 4 years of age, children move from approximately 50% marking of finiteness in obligatory contexts to approximately 90% marking (Rice et al., 1998). Between 2;6 and 3;0, therefore, children are unlikely to have moved out of the OI stage. To ensure that the children had entered the OI stage, children were only included in the study if they produced both 3PS-s and unmarked forms in finite contexts during the study, although in practice it was not necessary to exclude any children on the grounds that they failed to demonstrate some degree of optionality in their use of 3PS-s forms in finite contexts. The children were recruited through the Max Planck Child Study Centre at the University of Manchester, U.K., and visited the Centre with their parents/guardians to take part in the study. Two additional children were tested but were excluded from the study because they failed to produce any exemplars of any of the novel verbs.

Procedure

After an initial warm-up session when children engaged in free play with the investigator, they were invited to take part in three games. The children were told that in each game, the investigator was going to show them what particular objects do, and their task was to try to remember what each object did. Each game consisted of two known verbs (Game 1, *spin* and *swing*; Game 2, *jump* and *roll*; and Game 3, *rock* and *squeak*) and one novel verb (*tam*, *mib*, or *keef* in Games 1, 2, and 3, respectively), accompanied by an appropriate action for known verbs, and a novel action for which children were unlikely to have a name. The games were presented to each child in the same order and with the same accompanying verbs and actions. The known verbs were selected on the basis that they (a) were monosyllabic and could be used intransitively to ensure that length effects did not differentially influence the children's verb use, (b) denoted actions that were identifiable and could easily be modeled by the investigator, and (c) were likely to be familiar to young English-speaking children. To determine whether the verbs were likely to be familiar, we searched the Manchester corpus of 12 children's speech between 2;0 and 3;0 and their mothers' speech (Theakston, Lieven, Pine, & Rowland, 2001, available on the CHILDES system, MacWhinney, 2000) and a dense database consisting of 5 hours of data from a single mother and child every week for a year between 2;0 and 3;0 for the six known verbs. The verbs were all used by the mother and child in the dense database, and by a mean of 7.7 children, range = 5–12, and a mean of 9.7 mothers, range = 8–12, in the less dense Manchester corpus. We therefore concluded that the verbs were likely to be familiar to the children.

In each of the three games, the relevant verbs (as listed above) were presented in four blocks. In each of

the four blocks the children heard the two known verbs for that game used once each and the novel verb for that game used three times (to ensure that they were able to learn the novel verb). Thus, the children heard a total of 4 models for each of the two known verbs and 12 models for the novel verb in each game.

The verbs used in each game were modeled by the investigator in one of three conditions: 3PS-s forms only, unmarked forms only, and mixed forms (both 3PS-s and unmarked forms). 3PS-s forms were modeled in declaratives. A block of 3PS-s verb uses consisted of "This one VERBs (known verb 1), This one VERBs (known verb 2), This one VERBS, Look, it VERBs, it VERBs (novel verb)." Unmarked forms were modeled in questions. A block of unmarked verb uses consisted of "Will this one VERB (known verb 1)? Will this one VERB (known verb 2)? Will this one VERB? Should it VERB? Will it VERB (novel verb)?" Mixed verb forms were modeled in alternating blocks of 3PS-s and unmarked forms; thus, children heard two blocks of 3PS-s verb forms, and two blocks of unmarked verb forms. The ordering of the conditions was counterbalanced across children such that in each game with its specified verbs and actions, some children heard the verbs in 3PS-s form only, some children heard the verbs in unmarked form only, and some children heard the verbs in both 3PS-s and unmarked forms. Each child played one game in each condition (3PS-s only, mixed 3PS-s and unmarked, unmarked only), allowing a within-subjects comparison of the influence of the input on the children's verb use in finite contexts.

After the second, third, and fourth blocks of verb uses, the children were asked questions of the form "What does this one do? What does it do? It___" to elicit use of the two known verbs and the novel verb in finite contexts. The children were questioned to elicit use of each verb three times in total. Once they had produced a particular verb, they were not questioned about that verb again until after the next block of verb models. The investigator responded to the children as neutrally as possible, and in the same way regardless of whether they produced a 3PS-s or unmarked verb form, to avoid reinforcing any particular type of response. All of the children's elicited and spontaneous uses of the verbs modeled in each game were coded as 3PS-s or unmarked and the proportional use of each verb in 3PS-s form as a function of their total number of uses of that verb in finite contexts was calculated. The scores ranged from 0 to 100% for 3PS-s verb use.[2] Spontaneous uses accounted for a mean of 7.5% of the children's data, range = 0–47.1%.

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[2] All but 4 of the children who responded produced between one and four responses with novel verbs and between one and eight responses with the two known verbs combined.

Results and Discussion (Study 1)

To determine whether the data from the two known verbs in each experimental condition could be combined, the children's proportional use of 3PS-s verb forms in finite contexts with each of the known verbs was compared. As the data were in percentages, arcsine and square root transformations were applied. A two (verb: 1, 2) by three (condition: 3PS-s, mixed, unmarked) analysis of variance (ANOVA) revealed that there were no significant main effects of verb, $F(1, 12) = 1.05$, $p > .05$, or condition, $F(2, 24) = 0.10$, $p > .05$, nor a significant interaction between the variables, $F(2, 24) = 1.24$, $p > .05$. This shows that there were no differences between known verb 1 and known verb 2 across conditions in the likelihood that children would provide a 3PS-s verb form in finite contexts. Thus, the data for the two known verbs in each condition were combined.

The Mean Proportional Use of 3PS-s Forms Across Children

Figure 1 shows the mean proportional use of 3PS-s verb forms in finite contexts with known verbs and novel verbs across children for the three experimental conditions (3PS-s only, mixed, unmarked only). The reader is reminded that in all cases, the correct answer in terms of the adult grammar would be a marked 3PS-s form.

For known verbs, the children appear relatively consistent in their proportional use of 3PS-s forms and provide 3PS-s forms around 70% of the time, regardless of the specific type of input they received. These data show that the children are within the OI stage as a group. With novel verbs, in contrast, there are clear differences in the children's use of 3PS-s forms in finite contexts according to the specific nature of the input they received, with the proportional use of 3PS-s forms ranging from 100% in the 3PS-s condition to 48% in the mixed condition and 36% in the unmarked condition.

As there was no variance in the children's scores with novel verbs in the 3PS-s condition (the children never produced unmarked forms of novel verbs modeled in the 3PS-s condition), a Friedman test was carried out to establish whether there were significant differences between conditions in the children's use of 3PS-s forms dependent on either verb type (known vs. novel) or input type (3PS-s only, 3PS-s and unmarked, unmarked only). Six of the children failed to produce all of the known and novel verbs in each condition, resulting in empty cells in their data sets, and as a result their data were excluded from the overall analysis. However, the distribution of missing values was judged to be random. Some children failed to produce some novel verbs, others failed to produce some known verbs, and there was

Figure 1. Proportional use of 3PS-s verb forms in finite contexts with known and novel verbs (Study 1).
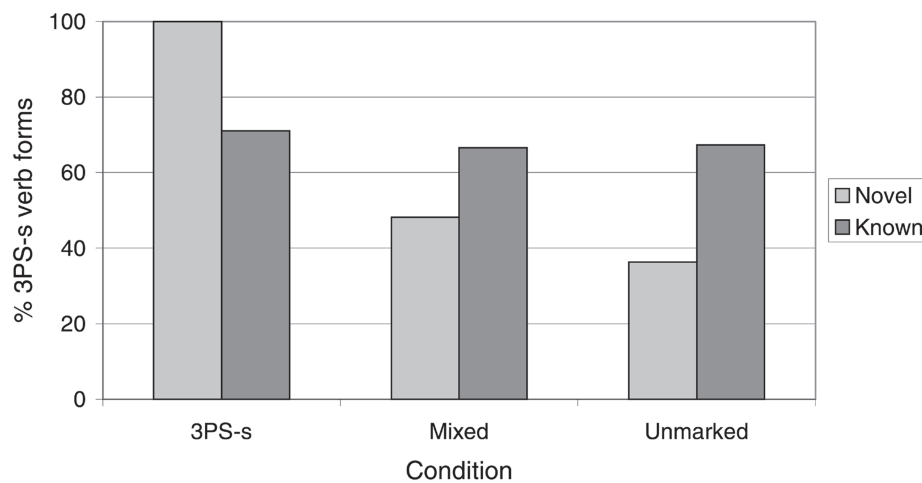
at least one missing value with both novel and known verbs in each condition (3PS-s only, 3PS-s and unmarked, unmarked only). Although 5 of the 6 children who failed to produce a full set of responses were younger than the mean age for the study, there were no significant correlations between the children's age in months and their production of 3PS-s verb forms with either known or novel verbs in any of the three conditions (nonsignificant σ values ranged from .13 to .37, $p > .05$). Thus, although excluding a number of children results in a loss of statistical power, the reduced sample is representative of the pattern of verb use observed in all the children's data. Children who did not produce all the verbs were excluded from the overall analyses, but they were excluded from subsequent pairwise comparisons on a test-by-test basis (rather than listwise) to ensure that all possible data were included in each analysis. Figure 1 represents the proportional use of 3PS-s forms for all children who produced the relevant verb(s). The Friedman test was significant, $\chi^2(5) = 34.89$, $p < .001$, showing that there were differences between conditions in the children's use of 3PS-s forms.

Post hoc comparisons were then carried out to test the predictions derived from the performance limitations, OI, and constructivist accounts. In all of the following pairwise analyses, a Bonferroni adjustment allowing for nine comparisons was made to the significance values accepted in these tests. First, to determine whether there were differences in the proportional use of 3PS-s forms with known verbs according to input type (3PS-s only, 3PS-s and unmarked, unmarked only), three pairwise comparisons using Wilcoxon signed rank tests were carried out. The data show that the children's use of known verbs remained consistent across conditions (3PS-s condition, $M = 71.09$, $SD = 32.33$; mixed condition, $M =$

66.64, $SD = 35.83$; unmarked condition, $M = 67.29$, $SD = 40.48$; nonsignificant Z values ranged from -0.51 to -0.88, $p > .05$). This provides support for the OI and constructivist accounts that predict consistent use of 3PS-s forms in finite contexts regardless of the specific input condition, but it counts against a performance limitations account that predicts that the proportional use of 3PS-s forms in finite contexts will be higher when 3PS-s forms are modeled in the input than when only unmarked forms are modeled.

Second, to determine whether there were differences in the proportional use of 3PS-s forms with novel verbs according to input type (3PS-s only, 3PS-s and unmarked, unmarked only), three pairwise comparisons using Wilcoxon signed rank tests were carried out. The analyses revealed that input type affected the children's production of 3PS-s verb forms with novel verbs such that they showed a significantly greater use of 3PS-s forms with novel verbs in the 3PS-s condition ($M = 100.00$, $SD = 0.00$), than in the mixed condition ($M = 48.17$, $SD = 37.03$; $Z = -3.43$, $N = 19$, $p < .001$), and in the unmarked condition ($M = 36.23$, $SD = 40.71$; $Z = -3.48$, $N = 19$, $p < .001$), although there was no difference in the proportional use of 3PS-s forms between the unmarked and mixed conditions ($Z = -1.42$, $N = 22$, $p > .05$). These data provide support for the performance limitations and constructivist accounts that predict that children will be more likely to provide a 3PS-s verb form with novel verbs when that form has been modeled in the input (reflecting a decrease in processing demands or lexically based knowledge, respectively), but count against an OI account that predicts consistent use of 3PS-s forms across verbs. However, performance limitations and constructivist accounts also predict that children will provide a higher proportion of 3PS-s forms in the mixed condition

than in the unmarked condition because the 3PS-s verb form is modeled in the mixed condition, but not in the unmarked condition. Although the mean values suggest a tendency towards producing a greater proportion of 3PS-s forms in the mixed condition than in the unmarked condition, the difference was not significant. This finding could be seen to count against performance limitations and constructivist accounts but may provide partial support for the OI hypothesis that predicts consistent use of 3PS-s forms in finite contexts regardless of input condition.

Finally, to determine whether there were differences in the proportional use of 3PS-s forms with novel and known verbs in each condition (3PS-s only, 3PS-s and unmarked, unmarked only), three pairwise comparisons using Wilcoxon signed rank tests were carried out. The analyses show that in the 3PS-s condition, the children produced a significantly higher proportion of 3PS-s forms with novel verbs than with known verbs ($Z = -2.95$, $N = 19$, $p < .005$), whereas in the unmarked condition, they produced a significantly higher proportion of 3PS-s forms with known verbs than with novel verbs ($Z = -2.85$, $N = 22$, $p < .005$). There was no difference in the children's use of 3PS-s forms with known and novel verbs in the mixed condition ($Z = -1.67$, $N = 22$, $p > .05$). These data provide support for the constructivist account, which predicts that in finite contexts children will produce a higher proportion of 3PS-s forms with novel verbs than with known verbs in the 3PS-s condition, a roughly equal proportion of 3PS-s forms with known and novel verbs in the mixed condition, and a higher proportion of 3PS-s forms with known verbs than with novel verbs in the unmarked condition. These findings also provide partial support for a performance limitations account in that the children were more likely to produce 3PS-s forms with known verbs than with novel verbs in the unmarked condition, but count against this account in that the children were not consistently more likely to produce 3PS-s forms with known verbs than with novel verbs across conditions. In fact, the children showed an advantage for novel verbs over known verbs in the 3PS-s condition. These findings also count against the OI account that, in its strongest form, predicts a similar level of 3PS-s verb use in finite contexts across verbs.

The Number of Children Following Individual Response Patterns

The previous analyses are based on the mean proportional use of 3PS-s forms with known and novel verbs in each condition across children. We then investigated the patterns of responses in each condition for individual children to determine how many of the children followed the patterns of verb use suggested by the results of the above analyses. Table 1 shows the number of children in each condition who produced 3PS-s forms only, 3PS-s and unmarked forms, unmarked forms only, or no verb use with known and novel verbs.

First, it is clear that the pattern of verb use in the input influences the children's use of novel verbs more than their use of known verbs. For novel verbs, the modal response in all conditions follows the pattern(s) modeled in the input such that 20 children produced only 3PS-s forms in the 3PS-s condition, 12 children produced both 3PS-s and unmarked forms in the mixed condition, and 11 children produced only unmarked forms in the unmarked condition. Moreover, none of the children produced an unmarked novel verb in the 3PS-s condition when the unmarked form was not modeled in the input, whereas 18 children in the mixed and unmarked conditions produced some unmarked novel verb forms. For known verbs, in contrast, the modal response pattern only matches the input in the mixed condition with 12 children having produced both 3PS-s and unmarked forms. In fact, in the unmarked condition, the modal response for known verbs is to produce 3PS-s forms only. McNemar chi-square tests show that in the 3PS-s and unmarked conditions, the number of children who provided particular kinds of responses with known and novel verbs differs significantly, 3PS-s condition $\chi^2(1) = 9.09$, $p < .01$, unmarked condition $\chi^2(1) = 4.17$, $p < .05$, whereas in the mixed condition there was no difference between known and novel verbs in the children's response pattern, $\chi^2(1) = 0.00$, $p > .05$.

Table 1. Number of children producing 3PS-s forms only, 3PS-s and unmarked forms, and unmarked forms only with known and novel verbs in finite contexts in each condition (Study 1).

Children's response pattern	Input condition					
	3PS-s		3PS-s and unmarked		Unmarked	
	Known	Novel	Known	Novel	Known	Novel
3PS-s only	9	20	8	5	12	5
3PS-s and unmarked	12	0	12	12	6	7
Unmarked only	2	0	3	6	4	11
No use	1	4	1	1	2	1

These data show clearly that for a large number of children, the verb forms modeled in the input influence the likelihood that they will produce 3PS-s forms in finite contexts with novel verbs, and provide further support for a constructivist, input-based account of early verb use in finite contexts. Contrary to the predictions of an OI account, none of the children produced an unmarked novel verb form unless that form was modeled in the input. However, these data also show evidence of linguistic productivity among the children. Although children were only included in the study if they showed some degree of optionality in their use of 3PS-s forms in finite contexts, for known verbs, in each condition, between 8 and 12 of the children produced only 3PS-s forms. This shows that for some verbs, at least, they may have mastered the use of 3PS-s marking. For novel verbs, although the numbers are smaller, in the unmarked condition 5 children produced only 3PS-s forms, and a further 7 children produced some 3PS-s forms alongside unmarked forms. This suggests that half of the children were able to go beyond the input and produce 3PS-s forms for novel verbs that had only been modeled in unmarked form in the input. A central question concerns the degree of abstractness underlying this kind of linguistic productivity, from a fully abstract, rule-based system to a system based on item-based constructions that are gradually becoming more abstract.

The children's data were examined further to investigate whether there seemed to be any relation between children's production of 3PS-s forms with individual verbs that might reflect both the level of abstractness present in the child's linguistic system and the specific input children hear. To determine whether any patterns could be detected in the children's verb use, each child's overall pattern of responses with known and novel verbs was categorized as follows. Each child's known verb use was categorized as (a) 3PS-s only (the child produces 3PS-s forms with all known verbs in all conditions), (b) optional (the child produces 3PS-s and unmarked verb forms, including either/both 3PS-s or unmarked forms not modeled in the input), or (c) input-driven (the child provides 3PS-s forms only in the 3PS-s condition, 3PS-s and unmarked forms in the mixed condition, and unmarked forms in the unmarked condition). Each child's novel verb use was categorized in the same way, although in practice optional use refers to the use of 3PS-s forms when only unmarked forms were modeled in the input as none of the children produced an unmarked novel verb form unless that form was modeled in the input. Table 2 shows a two-way matrix for known and novel verbs indicating the number of children who fell into each category. For example, the top left-hand cell indicates that none of the children produced 3PS-s forms only with both known and novel verbs.

Table 2. Individual children's patterns of verb use in finite contexts (Study 1).

Known verb use	Novel verb use			
	3PS-s only	Optional ± 3PS-s	Input driven	Total
3PS-s only	0	5	0	5
Optional ± 3PS-s	3	4	11	18
Input driven	0	0	1	1
Total	3	9	12	24

The figures show that none of the children had fully mastered use of the 3PS-s inflection with both known and novel verbs. However, trends can be observed in the data. Looking at the row totals in Table 2, the 5 children who produced only 3PS-s forms with known verbs always showed some productivity with novel verbs; the 18 children who showed some productivity with known verbs and used 3PS-s and unmarked forms not modeled in the input are split between those who showed some productivity with novel verbs (7 children) and those who followed the input with novel verbs (11 children); the 1 child who strictly followed the input with known verbs also did so with novel verbs. These data show that although children who produce 3PS-s forms with known verbs in finite contexts can, to some extent, generalize their knowledge to novel verbs, many children who are still firmly within the OI stage in their use of known verbs are unable to generalize use of the 3PS-s inflection for use with novel verbs modeled in unmarked form. Looking at the column totals, it is clear that 12 of the children (3PS-s and optional production children) saw some similarity between the novel verbs and verbs they already knew, and generated a 3PS-s form for novel verbs they had heard modeled in only unmarked form, whereas the other 12 children (input-driven children) relied solely on the input in their use of novel verbs. These findings count against an OI account in its strongest form that would predict similar use of 3PS-s forms across verbs, but are consistent with performance limitations and constructivist accounts. In particular, they are compatible with a constructivist approach that predicts that children will initially depend on item-based constructions attested in the input, and only gradually move towards more abstract constructions to support productive use of the 3PS-s inflection. This interpretation of the data will be explored further in the final *Discussion* section.

All of the analyses presented above suggest that the way in which verbs are used in the input influences children's use of 3PS-s forms with novel verbs. However, one possibility is that the children's reliance on the input with novel verbs may reflect a greater tendency to repeat the form produced by the investigator, simply

because the children heard the investigator use each novel verb three times more often than each known verb (12 models for each novel verb compared to 3 models for each known verb). If the number of verb models heard by the children influenced the likelihood that they would produce the verb form modeled by the investigator, we would expect to find that as the children were exposed to an increasing number of verb models (a total of 6 novel verb models before the first elicitation test, 9 models before the second elicitation test, and 12 models before the third elicitation test), they would become more likely to produce the verb form modeled in the input in their own speech. To determine whether the children showed a tendency to move toward input-driven responses after they had heard a larger number of verb models in the input, we compared the children's responses at the first, second, and third elicitation prompts. The children's responses at each prompt were categorized as either matched (the form modeled in the input) or mismatched (a form not modeled in the input) for novel and known verbs modeled in the 3PS-s and unmarked conditions.[3] Cochran's Q tests revealed that there were no differences in the children's use of matched versus mismatched verb forms at each elicitation prompt with either novel or known verbs in the unmarked condition or with known verbs in the 3PS-s condition, nonsignificant $Q(2)$ values ranged from 0.33 to 3.71, $p > .05$. For novel verbs modeled in the 3PS-s condition, there was no variation in the children's responses because none of the children ever produced a mismatched form; thus, Cochran's Q could not be calculated because the variable was not dichotomous. However, the stable response pattern observed in this condition across elicitation prompts indicates that the children were equally likely to provide a matched response, regardless of the number of verb models they had heard. It is also worth noting that in previous studies comparing English-speaking children's use of known and novel verbs modeled in non-SVO sentence structures, (a) the children heard an equal number of models with both known and novel verbs but still demonstrated a greater tendency to follow the forms modeled in the input with novel verbs; (b) there was no increase in the children's tendency to follow the non-SVO word orders modeled in the input over time, showing that simply hearing more verb models did not lead to following them more; and (c) the children heard more than 50 models of each verb in non-SVO word order, but still showed a greater tendency to correct non-SVO word orders with known verbs than with novel verbs (Abbot-Smith et al., 2001; Akhtar, 1999). These findings suggest that the children's greater tendency to produce the verb form(s) modeled in the input with novel verbs than

with known verbs in the present study is unlikely to reflect differences in the degree to which they follow verb models they hear.

In summary, the evidence is only partly consistent with the performance limitations and OI accounts of early 3PS-s verb use but is broadly consistent with a constructivist input-based explanation of early verb use in finite contexts. However, one possible explanation for the lack of use of unmarked forms with novel verbs modeled in 3PS-s form (*tams*, *mibs*, *keefs*) is that the children had learned these forms as uninflected wholes similar in type to verbs such as *bounce* and *dance*. One argument against this suggestion is based on the fact that none of the children attempted to add additional inflections to novel verbs they heard produced in only the 3PS-s form, for example *tamses*, despite the fact that a number of the children added the required inflection to novel verbs modeled in only the unmarked form. It is possible, however, that the lack of overmarking reflects the fact that a different allomorph of the third person marker, /iz/, is required in these contexts, similar in type to verbs such as *bounces*. Therefore, the possibility that children learned 3PS-s verb forms as unmarked wholes was examined further in Study 2.

Study 2: Children's Knowledge of the Third Person Verb Inflection (/s/, /z/)

Method
Participants

The participants in this study were a second group of 24 monolingual English-speaking children aged between 2;6 and 3;0 ($M = 2;7$). There were 12 boys and 12 girls. The children were recruited through the Max Planck Child Study Centre and visited the Centre with their parents/guardians to take part in the study. A further 2 children were tested but were excluded from the study because they failed to produce any exemplars of any of the novel verbs.

Procedure

The procedure was identical to that of Study 1, except that the children were asked questions designed to elicit use of the unmarked form to determine whether children who had only heard the 3PS-s form of novel verbs were able to produce the unmarked form (i.e., remove the /s/ inflection) in grammatical contexts where the 3PS-s form never occurs in adult English. Two

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[3] It was not possible to categorize the children's responses in the mixed condition because they heard both 3PS-s and unmarked verb forms modeled in the input.

different prompts were used to elicit verb use: (1) "What can this one do? What can it do? It can ___," and (2) "What's this one gonna do? What's it gonna do? It is gonna ___." These two prompt types were chosen because there is some debate in the literature concerning whether children recognize that modals carry tense (e.g., Van Valin, 2002), and some theorists might argue that unless children recognize that a given auxiliary or modal form marks tense, their grammar might license the use of 3PS-s verb forms in these contexts to mark tense in the sentence in question. The prompt "It is gonna" was always produced with a full rather than contracted auxiliary to guard against the possibility that contracted forms may not be analyzed as auxiliaries and therefore as carriers of tense. To ensure that each child received each prompt an equal number of times, children were questioned after each block of verb models, making a total of four elicitation contexts for each verb. The investigator alternated between the two prompts such that for the first and third blocks children received one prompt, and for the second and fourth blocks they received the alternative prompt. The order in which the prompts were used was counterbalanced across children and across conditions. All of the children's elicited and spontaneous uses of the verbs modeled in each game were coded as 3PS-s or unmarked and the proportional use of each verb in unmarked form as a function of their total number of uses of that verb in nonfinite contexts was calculated. The scores ranged from 0 to 100% for unmarked verb use.[4] Spontaneous uses accounted for a mean of 2.3% of the children's data, range = 0 to 17.4%.

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[4] All but 6 of the children who responded produced between one and four responses with novel verbs and between one and eight responses with the two known verbs combined.

Results and Discussion (Study 2)

To determine whether the data from the two known verbs in each experimental condition could be combined, the children's proportional use of unmarked verb forms in nonfinite contexts with each of the known verbs was compared. As the data were in percentages, arcsine and square root transformations were applied. A two (verb: 1, 2) by three (condition: 3PS-s, mixed, unmarked) ANOVA revealed that there were no significant main effects of verb, $F(1, 9) = 1.00, p > .05$, or condition, $F(2, 18) = 1.00, p > .05$, nor a significant interaction between the variables, $F(2, 18) = 1.00, p > .05$. This shows that there were no differences between known verb 1 and known verb 2 across conditions in the likelihood that children would provide an unmarked verb form in nonfinite contexts; thus, the data for the two known verbs in each condition were combined. In addition, to investigate whether the children's production of unmarked forms was affected by the particular elicitation prompt used ("It can ____" vs. "It is gonna ___"), a 2 × 3 ANOVA investigating the effects of prompt type in the different conditions was carried out. As the data were measured in percentages, square root and arcsine transformations were applied to the data. The ANOVA revealed a main effect of condition, $F(2, 38) = 11.49, p < .001$, but no effect of prompt type and no interaction between condition and prompt type, and therefore the data from both prompt types were combined for individual verbs.

Figure 2 shows the proportional use of unmarked verb forms in nonfinite contexts with known and novel verbs for the three input conditions (3PS-s only, mixed, unmarked only).

Figure 2. Proportional use of unmarked verb forms produced in nonfinite contexts with known and novel verbs (Study 2).
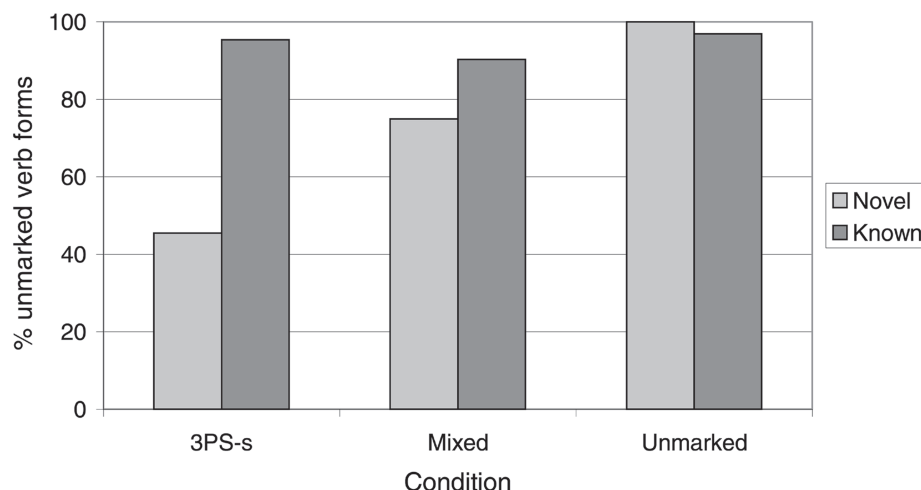
Although for known verbs, the children appeared relatively consistent in their proportional use of unmarked forms and provided unmarked forms over 90% of the time in nonfinite contexts regardless of the specific type of input they received, with novel verbs there were some differences in the children's use of unmarked forms according to the specific nature of the input they received, ranging from 45% in the 3PS-s condition to 75% in the mixed condition to 100% in the unmarked condition. As there was no variance in the children's scores with novel verbs in the unmarked condition (the children never produced 3PS-s forms with novel verbs modeled in the unmarked condition), a Friedman test was carried out to establish whether there were significant differences between conditions in the children's use of unmarked forms dependent on either verb type (known vs. novel) or input type (3PS-s only, 3PS-s and unmarked, unmarked only).[5] The Friedman test was significant, $\chi^2(5) = 49.57$, $p < .001$, showing that there were differences between conditions in the children's use of unmarked forms.

Pairwise comparisons using Wilcoxon signed rank tests were carried out to determine whether there were differences in the proportional use of unmarked forms (a) with known verbs according to input type (3PS-s only, 3PS-s and unmarked, unmarked only), (b) with novel verbs according to input type (as above), and (c) between novel and known verbs in a given input condition (as above). A Bonferroni adjustment allowing for nine comparisons was made to the significance values accepted in these tests. The analyses revealed that the children's use of known verbs remained consistent across

conditions (3PS-s condition, $M = 95.39$, $SD = 11.98$; unmarked condition, $M = 96.92$, $SD = 10.22$; mixed condition, $M = 90.28$, $SD = 28.62$; nonsignificant Z values ranged from 0.00 to -1.46, $p > .05$). In contrast, their production of unmarked verb forms with novel verbs was affected by input condition such that they showed a significantly greater use of unmarked forms with novel verbs in the unmarked condition ($M = 100.00$, $SD = 0.00$), than in the 3PS-s condition ($M = 45.45$, $SD = 41.61$; $Z = -3.33$, $N = 20$, $p < .001$), and in the mixed condition ($M = 75.00$, $SD = 25.69$; $Z = -2.96$, $N = 19$, $p < .005$), and a significantly greater use of unmarked forms in the mixed condition than in the 3PS-s condition ($Z = 3.08$, $N = 19$, $p < .005$). Moreover, there were differences between the children's use of known and novel verbs according to input type. In the 3PS-s and mixed conditions, the children produced a significantly higher proportion of unmarked forms with known verbs than with novel verbs (3PS-s condition, $Z = -3.54$, $N = 21$, $p < .001$; mixed condition, $Z = -2.33$, $N = 21$, $p < .05$), although there was no difference in the children's use of unmarked forms with known and novel verbs in the unmarked condition ($Z = -1.34$, $N = 22$, $p > .05$).

We then investigated the patterns of responses in each condition for individual children to determine to what extent the verb use of individual children followed the overall patterns indicated by the above analyses. Table 3 shows that (a) for known verbs modeled in 3PS-s form only, 23 of the children produced the unmarked form in nonfinite contexts, and (b) although 8 children consistently produced the incorrect 3PS-s verb form in nonfinite contexts with novel verbs that they have only ever heard in the 3PS-s form, 14 of the children showed evidence that they were able to extract the correct unmarked verb form from the modeled 3PS-s form by removing the /s/ or /z/ inflection.

This suggests that these children are unlikely to assume that novel forms that end with /s/ or /z/ are unmarked verbs similar to *dance* and *bounce*, because if this was the case, they would not be expected to remove the /s/ in a nonfinite context. This raises the question of why children of the same age failed to produce

[5] Eight of the children failed to produce both known and novel verbs in each condition, resulting in empty cells in their data sets, and as a result their data were excluded from the overall analysis. However, the distribution of missing values was judged to be random. Only 3 of the 8 children who failed to produce a full set of responses were younger than the mean age for the study; some children failed to produce some novel verbs, others failed to produce some known verbs, and there was at least one missing value with both novel and known verbs in each condition with the exception of known verbs in the mixed condition. Thus, although excluding a number of children results in a loss of statistical power, the reduced sample is representative of the pattern of verb use observed in all the children's data.

Table 3. Number of children producing 3PS-s forms only, 3PS-s and unmarked forms, and unmarked forms only with known and novel verbs in nonfinite contexts in each condition (Study 2).

| Children's response pattern | Input condition | | | | | |
| | 3PS-s | | 3PS-s and unmarked | | Unmarked | |
	Known	Novel	Known	Novel	Known	Novel
3PS-s only	0	8	2	0	0	0
3PS-s and unmarked	4	6	1	8	21	22
Unmarked only	19	8	21	13	2	0
No use	1	2	0	1	1	2

the unmarked forms of verbs they had only ever heard in 3PS-s form and provides further evidence that children's use of 3PS-s and unmarked verb forms in finite contexts may be determined by the use of these verbs in the language children hear.

General Discussion

This study investigated children's early production of finite (3PS-s) and nonfinite (unmarked) verb forms to determine whether performance limitations in production, the optional infinitive hypothesis, or a constructivist, input-based approach could best account for early verb use during the prolonged stage in development when children produce both finite and nonfinite forms in finite contexts. Three specific hypotheses were tested.

The first hypothesis was that there would be no differences in the children's proportional use of 3PS-s marking with known verbs across input conditions. The data show that with known verbs, the children exhibited "optional" but similar levels of use of 3PS-s verb forms in finite contexts, irrespective of the input they received for those verbs. This finding is consistent with the OI hypothesis and a constructivist input-based account, and is taken to reflect either the workings of a single underlying abstract system or children's previous experience with these verbs. In contrast, a performance limitations account that claims that the recent use of specific lexical items reduces their associated processing load should predict that unless the children's performance is at ceiling, their use of 3PS-s forms with known verbs will be lower when they have only heard the unmarked forms of these verbs modeled in the input. This hypothesis was not supported by the data.

The second hypothesis was that the children's use of 3PS-s forms with novel verbs in finite contexts would be affected by the specific input they received for that verb. Provision of 3PS-s forms should be highest for verbs modeled in 3PS-s form, lower for verbs modeled in 3PS-s and unmarked form, and lowest for verbs modeled in only unmarked form. With novel verbs, the children showed neither similar levels of use of 3PS-s verb forms across verbs, nor an "optional" pattern of use of 3PS-s verb forms in finite contexts. Instead, there were differences in the use of 3PS-s forms with novel verbs depending on the specific forms modeled in the input. The children were significantly more likely to produce 3PS-s forms with novel verbs modeled in 3PS-s form only than with verbs modeled in either unmarked form only or in both unmarked and 3PS-s forms. This finding is broadly consistent with a performance limitations account and a constructivist input-based account, reflecting a reduction in performance demands for recently

modeled forms or differences in the level of linguistic knowledge associated with each novel verb, respectively. These findings are not, however, consistent with the OI hypothesis that in its strongest form predicts that children will show similar levels of tense and agreement marking across individual lexical items. Moreover, although none of the children in Study 1 showed "optional" use of 3PS-s forms with verbs they only heard modeled in 3PS-s form, in Study 2, in nonfinite contexts 64% of children who responded were able to produce the unmarked form of novel verbs they had only heard in 3PS-s form. This suggests that the lack of "optionality" in finite contexts in children's use of novel verbs modeled in 3PS-s form is unlikely to reflect their belief that these 3PS-s novel verb forms are unmarked verbs similar to *bounce*.

The third hypothesis was that the children's proportional use of 3PS-s marking in finite contexts should be higher for novel verbs than for known verbs in the 3PS-s condition, approximately equal for novel and known verbs in the mixed condition, and lower for novel verbs than for known verbs in the unmarked condition. The children produced a significantly higher proportion of 3PS-s forms with novel verbs than with known verbs in the 3PS-s condition, a similar proportion of 3PS-s forms with known and novel verbs in the mixed condition, and a significantly higher proportion of 3PS-s forms with known verbs than with novel verbs in the unmarked condition. These findings (a) provide support for a constructivist input-based approach; (b) provide some support for the OI hypothesis in that the children showed similar levels of 3PS-s use with known and novel verbs in the mixed condition, but count against this account in its strongest form because it predicts similar levels of 3PS-s provision across verbs regardless of input condition; and (c) provide some support for a performance limitations account that predicts that the children's use of 3PS-s forms will be higher for known than for novel verbs in the unmarked condition, but count against this account because it predicts that 3PS-s provision will be higher for known verbs than for novel verbs in all conditions.

Overall, these results are most consistent with a constructivist input-based account of early verb use, which explicitly predicts that there will be differences between verbs in the children's use of 3PS-s forms and that these differences will reflect the use of these verb forms in the language children hear. The OI hypothesis in its current form does not explicitly address the question of why there might be differences between verbs in the children's use of 3PS-s forms in finite contexts. Although a performance limitations account might predict that there will be differences in the proportional use of 3PS-s forms between known and novel verbs based

on differences in their levels of familiarity, and between individual novel verbs dependent on the specific forms modeled in the input, these predictions are not fully supported by the data. The current findings suggest that, initially at least, children learn to produce 3PS-s and unmarked verb forms on a verb-by-verb basis, a suggestion that is supported by other work on the development of verb inflections (L. Bloom, Lifter, & Hafitz, 1980; Clark, 1996).

Note that although the constructivist input-based account is broadly consistent with the current data, these children were not simply imitating the language that they heard. The children's tendency to produce 3PS-s forms in finite contexts and unmarked forms in nonfinite contexts suggests that they knew something about the linguistic contexts in which these verb forms should appear. Moreover, half of the children productively generalized their knowledge of the 3PS-s verb inflection from known verbs to novel verbs that they only heard modeled in unmarked form. These children seemed to be moving closer to the adult system. Thus, what differentiates theoretical accounts is not the issue of whether children generalize grammatical knowledge, but rather how such generalizations are interpreted and when they are expected to occur.

Although many researchers claim that the earliest use of 3PS-s forms reflects an abstract knowledge of tense and agreement, one suggestion that is compatible with previous work from a constructivist perspective is that lexically based constructions may provide the basis for generalization of 3PS-s marking to novel verbs. A recent experimental study showed that when trained on the transitive construction, children were more able to produce a novel verb in that construction if the training sentences modeled a specific pronominal subject and the progressive inflection (e.g., He's VERB-ing) than if there was less lexical overlap through the use of a number of different noun phrase (NP) subjects (e.g., NP's VERB-ing) (Childers & Tomasello, 2001; see also Abbot-Smith et al., 2001; Akhtar, 1999). These kinds of lexically based slot-and-frame constructions are seen as an intermediate step between fully lexically specified constructions and more abstract, adult-like constructions. When eliciting verb use in the present study, the investigator provided the children with the pronominal subject *it*. It is therefore possible that the children were using a lexically based construction "It __s/z" to support generalization of the third person inflection to novel verbs that they only heard used in unmarked form. Reliance on such a construction of this type might also account for the similarity between known verbs in the children's proportional use of 3PS-s forms. However, further studies are required to determine whether partially lexically specified constructions of this kind might

lead to improved performance on 3PS-s marking in comparison with elicitation contexts with less lexical consistency in the construction.

If a constructivist, input-driven account can in part account for the apparently optional use of 3PS-s forms in finite contexts, this could have important implications for the treatment of children with specific language impairment (SLI). SLI children go through an extended period of development relative to normal language control children, when they produce 3PS-s and unmarked forms in finite contexts (Rice et al., 1998). If, as some researchers have suggested (e.g., Leonard, 1989; Leonard, McGregor, & Allen, 1992), SLI children encounter difficulties in processing the language they hear, the presence of questions in the input where the grammatical subject appears adjacent to a nonfinite verb could provide an additional source of confusion for these children. It may therefore take them a considerable time to establish the correct positioning of finite and nonfinite verbs leading to an extended period of apparently optional use of finite forms in finite contexts. Interventions that highlight the difference between declaratives and questions, or that provide additional input for 3PS-s forms may turn out to be beneficial, but we currently have very little understanding of how children process the input at this level.

It is clear that there are many important questions that have yet to be answered. First, although the suggestion that children acquire item-based constructions from both declaratives and questions in the input that underpin the use of 3PS-s and unmarked verb forms in finite contexts is supported in part by the current data, it is not clear what factors determine the specific constructions acquired by young children. For example, how might children acquire unmarked forms for use in finite contexts from the use of questions in the input? Why did some children generalize use of 3PS-s marking for use with novel verbs modeled in unmarked form when they did not generalize use of unmarked forms to novel verbs modeled only in 3PS-s form (although this would result in the production of ungrammatical utterances)? How frequently must children hear specific lexical combinations to acquire them? And how many different exemplars of a construction are needed before children begin to develop more abstract representations? Second, at some stage in development children must abandon ungrammatical "constructions" to move toward adult language use. What are the processes that underlie the strengthening of adult-like grammatical representations and the concurrent weakening of earlier, more primitive representations? Third, 3 of the children in the current study showed optional use of 3PS-s marking in finite contexts with known verbs but obligatory use of 3PS-s marking with novel verbs. Why was this pattern

of verb use observed when the use of 3PS-s marking with novel verbs is thought to depend on the abstraction of constructions from the use of known verbs? We can only speculate that there is a complex interaction between the development of abstract constructions that support generalization to novel linguistic items and the lexically based representations acquired at earlier stages in development. This might mean that for well known verbs, lexically based constructions may continue to determine the child's use of that verb, even beyond the stage in development when they have extracted a more abstract construction (see Bybee & Scheibman, 1999, for similar suggestions with respect to adult language use). In other words, children may be moving away from apparently optional behavior with most verbs while maintaining early established patterns of use with some highly frequent verbs for longer. The answers to these questions are likely to require a detailed understanding of the complex interactions between the distributional properties of the input and the nature of children's linguistic representations at any given point in development.

To conclude, the present study adds to a growing body of evidence that suggests, first, that children's early knowledge of grammar is tied to specific lexical items and that the development of more abstract linguistic constructions occurs only gradually over the course of development (Akhtar, 1999; Akhtar & Tomasello, 1997; Bloom et al., 1980; Childers & Tomasello, 2001; Lieven et al., 1997; Pine et al., 1998; Theakston et al., 2001; Tomasello, 1992, 2000). Second, the language that children hear plays an important and ongoing role in determining the specific nature of their early linguistic knowledge (Lieven, Theakston, Pine, & Rowland, 2000; Naigles & Hoff-Ginsberg, 1998; Rowland & Pine, 2000; Theakston et al., 2001; Wijnen, Kempen, & Gillis, 2001). Children's early use of tense and agreement is often taken as central evidence in support of the argument that children operate with abstract grammatical knowledge. However, the current study suggests that even apparently advanced aspects of language development, such as the development of tense marking, may be subject to the same general learning principles as other aspects of language, namely initially lexically specific learning, followed by the gradual development of more abstract knowledge. For those theories that would claim that these results can be accounted for by children's early abstract knowledge of tense and agreement and assuming either performance limitations or optionality, there is a clear need to develop these theories in much more detail so that they can be adequately tested against the results of experiments such as those presented here. From a constructivist perspective, much more empirical research investigating the processes by which children develop more abstract constructions, especially with respect to complex grammatical functions such as tense and agreement marking, is needed, but we suggest that working within a constructivist framework provides a useful starting point for further investigation.

Acknowledgments

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