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ANNA L. THEAKSTON and ELENA V. M. LIEVEN

Journal of Child Language / Volume 32 / Issue 03 / August 2005, pp 587 - 616
DOI: 10.1017/S0305000905006872, Published online: 06 September 2005

Link to this article: http://journals.cambridge.org/abstract_S0305000905006872

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The acquisition of auxiliaries BE and HAVE: an elicitation study*

ANNA L. THEAKSTON
University of Manchester

AND

ELENA V. M. LIEVEN
Max Planck Institute for Evolutionary Anthropology, Leipzig

(Received 13 March 2003. Revised 3 September 2004)

ABSTRACT

Auxiliary syntax is recognized to be one of the more complex aspects of language that children must acquire. However, there is much disagreement among researchers concerning children's early understanding of auxiliaries, with some researchers advocating a relatively abstract grammar as the basis for auxiliary syntax, while others view the acquisition of auxiliary syntax as the gradual accumulation of linguistic knowledge, initially tied to individual lexical items. To investigate the status of children's early knowledge of auxiliary syntax, two studies were carried out. In study 1, 28 children (M = 3;1) were tested for their use of the auxiliaries BE and HAVE in declaratives, while in study 2, 19 children (M = 3;3) were tested for their use of these auxiliaries in questions. Although overall error rates were low, there were differences between BE and HAVE in the proportion and types of errors observed in declaratives and questions, and some individual children showed very high error rates. The implications of these findings for different models of auxiliary syntax in children’s early utterances are discussed.

INTRODUCTION

The acquisition of auxiliary syntax is recognized to be one of the more complex aspects of the language acquisition process. Both researchers

[*] We would like to thank Vivien Lee for help with the data collection, and the nurseries, parents and children who took part in these studies. This research was funded by the Economic and Social Research Council, Grant Number R000237911. Address for correspondence: Anna L. Theakston, Department of Psychology, University of Manchester, Oxford Rd., Manchester, M13 9PL, UK. tel: +44 (161) 275 2600. fax: +44 (161) 275 2588. e-mail: anna.theakston@manchester.ac.uk
who assume that children have access to an innately given abstract grammar, and those who argue that children have to learn the complexities of language, agree that many aspects of the auxiliary system must be learned through linguistic experience (Pinker, 1984; Wexler, 1994; Pine, Lieven & Rowland, 1998). For example, Pinker (1984) posits innate mechanisms that allow children to identify auxiliaries as carriers of tense and agreement marking, but he suggests that children must learn the privileges of occurrence of each auxiliary separately on the basis of direct positive evidence.

From a generativist perspective, although many researchers acknowledge that children must learn the properties of individual auxiliaries from the language they hear, once children begin to produce auxiliaries, many take this as evidence that they are operating with relatively abstract grammatical representations. For example, Wexler’s OPTIONAL INFINITIVE (OI) HYPOTHESIS (1994) claims that from the very beginnings of language use, children possess the necessary knowledge to identify finite verb forms, including auxiliaries, and to identify the person marking for individual auxiliary forms necessary for correct use of subject–verb agreement. Thus, although children fail to mark tense in all obligatory contexts until relatively late in development, the OI Hypothesis predicts that when children produce finite verbs or auxiliaries, they will show correct use of subject–verb agreement. This means that although the OI account allows for differences in rates of provision vs. omission for different markers of tense (e.g. auxiliary BE vs. auxiliary DO—see Rice, Wexler & Hershberger, 1998), it does not allow for different rates of agreement marking if an auxiliary carrying tense is provided, either between different auxiliaries or between sub-forms of an auxiliary (e.g. is and are as sub-forms of BE), as children are expected to provide correct agreement marking. Similarly, other researchers working within the generativist framework allow for differences in patterns of use between auxiliaries. For example, Stromswold (1990) and Santelmann, Berk, Austin, Somashekar & Lust (2002) predict higher error rates with auxiliary DO and copula BE than with other auxiliaries. However, these researchers also suggest either explicitly (Stromswold, 1990: 20) or implicitly (Santelmann et al., 2002) that children understand the relation between sub-forms of auxiliaries that are marked for person and number (BE, DO, and HAVE), and should therefore predict very low rates of agreement error.

In contrast, researchers working within a constructivist framework typically assume that children begin the language acquisition process with a lexically-specific knowledge of syntax that is tied to individual verbs (Tomasello, 1992), pronouns (Childers & Tomasello, 2001) and other high frequency markers (Pine et al., 1998). Children’s early grammars are assumed to reflect low-scope frames that appear with high frequency in the
language to which they are exposed (e.g. Rowland & Pine, 2000; Theakston, Lieven, Pine & Rowland, 2001, 2002). Only as children acquire an increasing number of lexically-based frames will they begin to develop the more abstract schemas thought to underpin adult language use (Langacker, 1987; Bybee & Scheibman, 1999; Croft, 2001; see for example Tomasello, 2000 for a summary of experimental studies on the acquisition of the transitive frame). Consequently, constructivist theorists are reluctant to accept claims that children operate with an abstract understanding of the auxiliary system from early in development, and prefer to conceptualize the acquisition of auxiliary syntax as the gradual development of low-scope frames tied to individual auxiliary sub-forms (Richards, 1990; Lieven, Theakston, Pine & Rowland, 2000, Wilson, 2003; Theakston, Lieven, Pine & Rowland, 2005). This might mean that children begin with a series of independent frames, for example I’m V-ing, He’s V-ing, and only gradually develop the more abstract schema X’Aux V-ing. Interestingly, constructivist approaches might also predict that auxiliary omission in declaratives will occur if children learn low-scope S-V frames (e.g. He V-ing) from questions in the input where the auxiliary appears in fronted position rather than between the subject and verb, for example Is he jumping? (see Theakston, Lieven & Tomasello, 2003 for similar work on the omission of third person singular marking on verbs in English, and Fey & Loeb, 2002 for related suggestions on the role of adult recast questions in children’s early auxiliary use). Children’s early use and non-use of auxiliaries might therefore reflect their knowledge of a small number of low-scope formulae based around specific pN-Aux and pN-V combinations, rather than an understanding of the abstract systems of tense and agreement marking that operate in the adult grammar.

Of particular interest to many researchers is the acquisition of auxiliary BE. This auxiliary carries both tense (They are singing vs. They were singing) and agreement (They are singing vs. She is singing), and thus provides a useful testing ground to investigate children’s knowledge of these abstract systems. For example, Rice, Wexler & Cleave (1995) collected spontaneous and elicited data for auxiliary and copula BE in questions and statements from a group of 20 children aged between 2;6–3;4 (M=2;11). They report that the level of S–Aux/V agreement in elicited utterances for a combined measure of auxiliary and copula BE was 93%, and in spontaneous speech levels of S–Aux agreement for individual sub-forms of auxiliary BE (am, are, is) were 98% or above. The only significant error reported in the children’s use of auxiliary BE is omission (see also Cleave & Rice, 1997). They conclude that the data support the OI hypothesis that suggests that from very early in language development, children possess all the grammatical knowledge necessary to provide agreeing forms but lack the knowledge that tense marking is obligatory in finite contexts.
However, when approaching these data from a constructivist perspective, it is unclear how they should be interpreted. In both spontaneous and elicited statements, it is impossible to determine how many of the children’s auxiliaries were contracted and how many were full forms. This means that the high rates of S–Aux agreement could reflect rote-learned pronominal+contracted auxiliary forms, for example it’s, he’s, I’m (some researchers, e.g. Pinker, 1984, exclude contracted auxiliary forms from their analyses arguing that these are unanalysed forms). Indeed, an analysis of the use of auxiliary BE in declaratives in the Manchester corpus (Theakston et al., 2001, available on CHILDES, MacWhinney, 2000) suggests that lexically-specific learning tied to individual pronominal subjects accounts for a large proportion of children’s spontaneous auxiliary use between two to three years of age. First, a mean of 94% of the children’s uses of the auxiliary sub-forms is and am were contracted. Second, the proportion of declaratives with which children provided specific sub-forms of auxiliary BE differed according to the specific lexical subject produced (Theakston et al., 2005, see also Wilson, 2003 for similar analyses of other CHILDES corpora). Moreover, there was a relation between the order in which children acquire specific S–Aux combinations, and their frequency of use in the input (Theakston et al., 2005). Interestingly, Cleave & Rice (1997) report higher rates of accuracy in three-year-olds use of BE in contractible contexts than in uncontractible contexts. Whilst they claim this does not reflect the use of unanalysed forms because the children produce a variety of different lexical subjects, this does not preclude the use of more complex frames such as NP’s V. Moreover, the observed difference in use between contractible and uncontractible contexts is not predicted by the OI theory as it currently stands.

These findings suggest that researchers must be cautious in attributing an abstract knowledge of auxiliary syntax to children on the basis of their production of pronominal subjects with contracted auxiliary forms, as it is possible that they have learned these forms as lexical wholes from the language to which they are exposed. A similar argument can be made with respect to children’s use of questions with auxiliary BE. If early questions are based around pronominal subjects (e.g. Is he jumping) rather than full NP subjects, these utterances could also reflect the use of lexically-specific frames, for example Is he V-ing? (Pine et al., 1998, see also Rowland & Pine, 2000 for the role of lexical learning in Wh–Aux question combinations). Studies that differentiate between the use of auxiliaries with pronominal subjects and use with full NP subjects are therefore needed to determine the level at which children are operating. It should be noted, however, that of course children must eventually attain adultlike language proficiency. Therefore, although at some stage in development children will demonstrate correct S–Aux agreement with full NP subjects, it is still possible that
this knowledge of auxiliary syntax has developed from earlier acquired lexically-specific frames based around pronominal subjects.

One grammatical form that is closely related to auxiliary BE is auxiliary HAVE. Like BE, HAVE can be inflected for tense (She has stopped vs. She had stopped) and has different person-marked sub-forms in the present tense (She has stopped vs. They have stopped). However, the use of auxiliary HAVE is somewhat more complex than auxiliary BE. Whereas in the present progressive, BE always appears with a progressive ing verb form (e.g. She is running), in the present perfect HAVE appears with the past participle which takes a range of forms, some with regular ed inflection (e.g. She has stopped), some with semi-regular en inflection (e.g. He has eaten) and some irregular (e.g. She has gone). In addition, there is considerable cognitive complexity associated with the present perfect because this form contrasts in subtle ways with the past tense form that does not require an auxiliary (e.g. She has stopped vs. She stopped). To further complicate matters, some verbs (e.g. stop) appear in the same form in both past tense and present perfect (stopped), whereas others have unique forms for each sentence type (e.g. She has gone vs. She went). Previous studies documenting children’s acquisition of the present perfect suggest that they have considerable difficulty mastering these complexities of use (Fletcher, 1985; Johnson, 1985; Gathercole, 1986). In particular, children are reported to have difficulty with producing the correct verb form, with many producing overregularizations (have dranked), and overmarking irregular forms (have dranken) (Johnson, 1985). Although there is some disagreement concerning when children begin to acquire the present perfect, the evidence suggests that British-English speaking children are able to produce some types of present perfects in their speech by around age 3;0 (Fletcher, 1985; Gathercole, 1986).

As far as we are aware, there are no studies to date that explicitly compare children’s ability to use auxiliaries BE and HAVE. However, a comparison of children’s use of these two auxiliaries would be interesting for a number of reasons:

- BE and HAVE both carry agreement. Therefore, we would expect to find similarly low levels of S–Aux agreement errors across BE and HAVE if children understand the relation between different forms marked for person and number because, given this knowledge, agreement errors are not predicted to occur with any frequency under generativist accounts. If, however, children’s knowledge of individual auxiliaries is tied to lexical frames acquired separately and at different stages of development, we might expect to see differences in children’s early use of BE and HAVE that reflect the level of abstractness present in their linguistic systems associated with individual lexical
forms. In particular, HAVE is typically acquired later than BE and may therefore attract more errors.

- Children should show similar levels of correct auxiliary use in utterances where auxiliaries are provided for both is and are, and for has and have, if they recognize the different sub-forms of BE and the different sub-forms of HAVE as exemplars of single auxiliaries that differ only with respect to the person encoded. This assumption is either explicit or implicit in a number of generativist theories (e.g. Stromswold, 1990; Santelmann et al., 2002). Differences between individual sub-forms of either BE or HAVE would suggest that the children’s knowledge of individual forms of these auxiliaries is developing separately and at different rates. In particular, as HAVE is acquired later than BE, differences between has and have may occur.

- Some present perfect verb forms (e.g. The cup has broken) can also be used as predicates with copula BE (The cup is broken), and in passives with forms of BE (The cup was broken by the man). If children analyse sentences in terms of their underlying abstract grammatical properties, these similarities in lexical form would not be expected to cause any great confusion. On the other hand, if children’s early knowledge of syntax is tied to individual lexical items and attaining adultlike linguistic knowledge involves the development of schemas from concrete exemplars, such patterns of overlap may affect children’s developing representations of auxiliary HAVE that has limited consistency in terms of the verb forms with which it appears.

Johnson (1985) suggests that we can learn a great deal about children’s verb representations by examining the non-adultlike verb forms they produce, and claims that many incorrect forms are generated by analogy to other, previously acquired forms. Although Johnson refers to the use of the en and ed inflections, it is possible that children may also use analogy based on phonological similarity to determine the argument structures in which specific verb forms might be produced.

The current study is an investigation into, and comparison of, children’s knowledge of auxiliaries BE and HAVE in declaratives and questions. The study was designed to encourage children to produce full rather than contracted auxiliaries in an attempt to test their knowledge of auxiliary syntax with forms that are unlikely to be learned as lexically-specific formulae. The aim was to determine whether children demonstrated (1) similar levels of correct use with different auxiliaries and different sub-forms of those auxiliaries, (2) high levels of S–Aux agreement when producing non-contracted auxiliaries, and (3) to compare the types of errors occurring with BE and HAVE.
STUDY 1: CHILDREN’S USE OF AUXILIARIES BE AND HAVE IN DECLARATIVES

METHOD

Participants

The participants in this study were 28 monolingual English-speaking children aged 2;8 to 3;7 (M = 3;1). There were 16 males and 12 females. The children were recruited from and tested in local nurseries in the Manchester area with the exception of two children who were recruited through the Max Planck Child Study Centre and visited the Centre with their parents to take part in the study.

Stimuli

Ten prime-target sentence pairs, each including a different main verb, were created to elicit use of auxiliary BE, and ten prime-target sentence pairs were created to elicit use of auxiliary HAVE (see Appendix 1). The present perfect verbs used with HAVE referred to recently completed events, and in some cases could also refer to the resulting outcome of a recently completed event. These are the earliest acquired meanings of the present perfect so should represent a use of the present perfect that is relatively familiar to young children (Johnson, 1985; Gathercole, 1986). All the sentences were intransitive and were designed to encourage use of full rather than contracted auxiliaries by using sentence subjects that are difficult to combine phonologically with the contracted auxiliary (e.g. The horse is jumping). Two sub-forms of BE (is, are) and two sub-forms of HAVE (has, have) were included in the sentences to encode third person singular and third person plural subjects. In each sentence pair, the prime modelled one form of the auxiliary in question, and the target was designed to elicit use of the second auxiliary form, for example, the prime sentence The horse is jumping was paired with the target sentence The pigs are jumping. The form of the auxiliary presented in the prime sentence alternated for each pair to encourage the children to use both third person singular and third person plural forms in imitated and elicited declaratives. The order in which children heard primes with each auxiliary form was counterbalanced across children.

Procedure

After an initial warm-up session when the children were familiarized with the investigator, they were invited to take part in two games, one to elicit auxiliary BE and one to elicit auxiliary HAVE. They were told that in each game, she was going to show them some toys and describe their actions. She explained that the children’s task would be sometimes to copy what she said and at other times to tell her what was happening. Before modelling each
action, the children were shown the relevant toys and asked if they knew the name for each toy. Most of the objects were well known to the children (e.g. horse, cars, bus) although some were less familiar (e.g. cabbage). If the children did not know the names of the objects, the investigator provided them. The procedure was as follows for each prime-target pair.

- Prime sentence modelled twice with accompanying action (e.g. *The horse is jumping*).
- Child asked to repeat prime sentence.
- Prime sentence modelled twice more with accompanying action.
- Child asked to repeat prime sentence.
- Action modelled with new toys and child questioned three times to elicit use of alternative auxiliary form (e.g. the singular subject *horse* replaced with a plural subject *pigs* or vice versa).

Children were asked *Now what's happening?* to elicit BE, and *What's happened?* to elicit HAVE. The investigator provided the relevant sentence subject, for example *The pigs* to provide a context that required use of either a third person singular or plural auxiliary form.

When the first game had been completed, there was a break of approximately 30 minutes while the children played with toys that were not connected to the study or returned to their nursery class. Three of the children completed the second game on a different day to fit around the activities of the nursery. After the break, the investigator told the children that they would be playing another game with some different toys. The procedure was identical to the first game except that the auxiliary changed from BE to HAVE or vice versa.

**Coding**

The children’s imitated and elicited/spontaneous declaratives were coded separately for the provision or omission of an auxiliary form (e.g. *The cows are eating*, *The marbles have rolled* vs. *The horse jumping*, *The man fallen*), and for whether the auxiliary was correct or incorrect. The auxiliary form omitted was determined by the lexical verb form produced and whether the subject was singular or plural. Incorrect declaratives containing errors of commission were categorized according to the type of error observed. Three types of error were coded:

1. **Agreement errors** (e.g. *The man are jumping*, *The giraffes has fallen*) where a third person singular auxiliary form was used with a third person plural subject, or a third person plural auxiliary form was used with a third person singular subject. The required auxiliary was determined by the lexical verb form produced. Note that for HAVE, the third person plural auxiliary form is identical to the unmarked
form, thus errors where *have* is used with a third person singular subject could be viewed as Optional Infinitive errors rather than agreement errors. Nevertheless, these errors differ from other OI errors where the auxiliary form is omitted completely.

(2) *Use of an incorrect auxiliary* (e.g. *The man has jumping, The cows are fallen*) where the lexical verb form produced is consistent with the elicitation context, but the auxiliary produced is not consistent with the lexical verb form.

(3) *Use of an incorrect verb form* (e.g. *The dog is jump, The dogs have fallened*), where the auxiliary is consistent with the elicitation context, but the lexical verb form is incorrect.

In all of the following analyses, *is, are, has,* and *have* are used to refer to declaratives where the form in question was required, according to the elicitation context, singular or plural subject, auxiliary form, and lexical verb form as described above. For example, omission errors with *is* refer to utterances where *is* has been omitted, agreement errors with *is* refer to utterances where *are* is used in place of *is,* incorrect auxiliary errors with *is* refer to utterances where an auxiliary other than a form of BE is used in place of *is,* and verb form errors with *is* refer to utterances where a lexical verb form other than the progressive is used with *is.*

**RESULTS**

In all of the following analyses, non-parametric statistical analysis was carried out using Friedman tests to detect any overall differences in use between the auxiliary forms *is, are, has,* and *have.* Where overall differences were found, two post hoc comparisons were made using Wilcoxon tests to compare the children’s use of (1) the third person plural auxiliary forms *are* and *have,* and (2) the two forms of HAVE, *has* and *have.* Hochberg’s method for two comparisons was used to adjust the significance values accepted in these tests (Shaffer, 1995). Comparison 1 was carried out because third person plural auxiliary forms appear to be acquired later and attract more errors than third person singular forms (Theakston et al., 2005), and this will allow us to detect specific differences between BE and HAVE. Comparison 2 was carried out because HAVE is thought to cause children more problems than BE, and therefore there are more likely to be differences between the two forms *has* and *have* than between the earlier acquired forms of BE.

*The proportional use of grammatically correct declaratives*

Figure 1 shows the percentage of the children’s imitated and elicited declaratives that were grammatically correct for each of the four auxiliary
forms where required. Although the children produce a high proportion of correct imitated declaratives for all auxiliary forms (over 70%), there are marked differences between forms in their proportional correct use in elicited declaratives. In particular, the children produce few correct declaratives with HAVE, most notably where the form have is required.

Friedman tests were carried out to determine whether there were significant differences between auxiliary forms in the proportional use of correct imitated and elicited declaratives in the children’s speech. The results show that there were differences in the proportional use of correct imitated declaratives between auxiliary forms ($X^2 = 26.76$, $df = 3$, $p < 0.001$). Wilcoxon tests revealed that the children produced a significantly higher proportion of correct declaratives where are was required than where have was required ($Z = -3.06$, $N = 22$, $p < 0.05$), and where has was required than where have was required ($Z = -2.31$, $N = 24$, $p < 0.01$). Similarly, there were significant differences between auxiliary forms in the proportional use of correct elicited declaratives ($X^2 = 46.58$, $df = 3$, $p < 0.001$). Wilcoxon tests revealed that the children produced a significantly higher proportion of correct declaratives where are was required than where have was required ($Z = -4.19$, $N = 24$, $p < 0.001$), and where has was required than where have was required ($Z = -3.29$, $N = 24$, $p < 0.01$).

We then examined the children’s data individually to determine whether the general patterns of auxiliary use observed were typical of auxiliary use in the speech of individual children. Figure 2 shows the number of children who produced different proportions of correct imitated and elicited declaratives with each auxiliary form.

Although most of the children produced a high proportion of correct imitated declaratives across auxiliary forms, there is a steady decline such that increasing numbers of children made errors in their imitation of
declaratives where the forms *has* and *have* were required. For elicited declaratives, for each auxiliary form there were some children who produced errors. While most of the children were able to produce over 50% correct declaratives where *is* and *are* were required, this was not the case for *has* and *have*. For these forms, only nine and five children respectively achieved greater than 50% accuracy, while many children produced less than 25% grammatically correct declaratives (13 children for *has*, and 20 children for *have*).

As there were differences between auxiliary forms in the proportion of correct declaratives produced by the children, further analyses were carried out to determine whether there were differences in the proportion of errors of omission and/or errors of commission between auxiliary forms. Figure 3
shows the error types produced in imitated and elicited declaratives with each auxiliary form.

**Errors of omission**
To determine whether there were differences in the rates of auxiliary omission in imitated and elicited declaratives across auxiliary forms, two Friedman tests were carried out. The results show that there were no differences between auxiliary forms in the rates of auxiliary omission in declaratives for either imitated or elicited utterances. However, the children were more likely to omit auxiliaries in elicited utterances in comparison with imitated utterances across auxiliary forms, ($M$ omission rates in imitated declaratives ranged from 3.0 to 11.3%, in elicited declaratives from 25.6 to 34.4%).

**Errors of commission**

*Agreement errors.* The mean proportion of agreement errors in imitated and elicited declaratives is relatively low for all auxiliary forms. Moreover, these data are based on declaratives produced with full NP subjects and full auxiliary forms rather than pronominal subjects combined with contracted auxiliaries. Thus, these data appear to be compatible with the suggestion that from the beginnings of auxiliary use, children understand the complexities of agreement marking. However, a more detailed examination of the children’s errors suggests that this might not be the case.

First, Friedman tests show that there were significant differences in the proportion of imitated and elicited declaratives containing agreement errors between auxiliary forms (imitated $X^2=8.60$, df = 3, $p < 0.05$; elicited $X^2=10.70$, df = 3, $p = 0.01$). Wilcoxon tests revealed no significant differences between *are* and *have*, or *has* and *have* for imitated declaratives, whereas for elicited declaratives, the children were slightly more likely to make agreement errors where *have* was required than where *are* was required ($Z = -2.13$, $N = 24$, $p = 0.066$). Second, with the exception of *is* and *are* in imitated declaratives where all the children performed well, for all auxiliary forms the low mean levels of agreement errors mask error rates of over 30% for some children rising to over 50% for elicited declaratives where *has* and *have* were required (six different children showed over 30% agreement errors with at least one auxiliary form). These data show that although the children were generally able to differentiate between third person singular and third person plural auxiliary sub-forms for BE, for HAVE they showed a tendency to produce the singular form *has* with plural subjects where the form *have* was required.

*Incorrect auxiliary errors.* The data were examined to determine whether there were differences between auxiliary forms in the proportion of utterances
that were produced with an incorrect auxiliary. All of the errors of this type consisted of children using forms of BE in place of forms of HAVE or vice versa. Friedman tests showed that there were significant differences between auxiliary forms in the proportional use of an incorrect auxiliary in imitated ($X^2 = 19.71, df = 3, p < 0.001$) and elicited ($X^2 = 26.73, df = 3, p < 0.001$) declaratives. For imitated declaratives, Wilcoxon tests revealed that the children were more likely to produce incorrect auxiliary forms in place of have than in place of are ($Z = -2.67, N = 22, p < 0.01$) and has ($Z = -2.09, N = 24, p < 0.05$). For elicited declaratives the children were more likely to produce incorrect auxiliary forms in place of have than in place of are ($Z = -3.52, N = 24, p < 0.001$). These findings show that the children were more likely to use forms of BE where forms of HAVE were required than vice versa, and that this error was more common with plural subjects where have was required than with singular subjects where has was required.

To determine whether the tendency to replace auxiliary HAVE with forms of auxiliary BE reflected order effects, such that there was some carry-over from the BE condition to the HAVE condition for those children who heard auxiliary BE first, Kruskall-Wallace tests were conducted comparing the proportional use of different auxiliaries in place of has and have in both imitated and elicited declaratives across conditions. The results were not significant (non-significant $X^2$ values ranged from 0.25 to 5.32, $df = 3$) revealing that the use of BE in place of HAVE is not a result of carry-over effects due to the order in which the children heard the auxiliary forms.

Earlier, we raised the possibility that children’s use of present perfect verb forms could be affected by the use of similar forms in predicate constructions with the copula, if they base their use of individual lexical forms in specific constructions on the use of other phonologically similar forms that are acceptable in these constructions. To test this prediction, we needed to determine which present perfect forms are acceptable in the adult grammar as part of a copula construction, and heard sufficiently frequently in a copula construction to suggest that children might have learned that these forms can be used in copula constructions from the input. The data from the 12 mothers in the Manchester corpus (Theakston et al., 2001) were searched for any exemplars of the 10 present perfect verb forms used in this study that appeared with a full form of either BE or HAVE (the third person singular contracted forms of BE and HAVE are the same (‘s), and therefore cannot be differentiated). For each verb, the percentage of utterances where the verb appeared with a form of BE in predicates (e.g. *It is ripped*) compared with its use as a present perfect verb form (e.g. *It has ripped*) was calculated. Those verbs where predicates accounted for over 10% of the uses in the language children heard were assumed to be acceptable in this form in the adult grammar and heard sufficiently frequently for children to have acquired these forms.
These analyses show that in imitated declaratives, a total of 37.0% of the children's errors of using an incorrect auxiliary included verbs that were acceptable as predicates with the copula in the adult grammar (e.g. *The bus is parked*), thus 63.0% of these errors appeared to be productive errors in the sense that the children produced utterances that are not acceptable in the adult grammar. Similarly, in elicited declaratives, 63.2% of the children's errors were apparently productive (e.g. *The hedgehogs are tumbled*, *The fox is rolled it*). These errors suggest that the children knew that something should be produced between the subject and the verb in declaratives, but that for HAVE, they were often unsure what this form should be and may have resorted to using a form with which they were more familiar (i.e. forms of BE). It is also possible that the children were aware that some of the present perfect verb forms modelled were also acceptable in the copula construction, and by a process of analogy produced other verbs in this construction that are not acceptable in the adult grammar.

**Verb form errors.** The children’s data were examined to determine whether there were differences between auxiliary forms in the proportional use of verb form errors. Friedman tests showed that there were no significant differences between auxiliary forms in the proportion of imitated declaratives that contained verb form errors ($X^2=4.8$, $df=3$, $p>0.05$), but in elicited declaratives, there were significant differences in the proportional use of verb form errors between auxiliary forms ($X^2=18.90$, $df=3$, $p<0.001$). Wilcoxon tests revealed that the children were more likely to produce verb form errors with have than with are ($Z=-2.95$, $N=24$, $p<0.01$), but there was no difference in error rates between has and have. These findings replicate previous studies (Fletcher, 1985; Johnson, 1985; Gathercole, 1986), and show that the children in this study had particular difficulty in producing the correct verb form in present perfect constructions. They produced a range of errors (the use of a stem form of the verb (*The bus has park*), the use of a progressive form of the verb (*The elephants have jumping*), the addition of an *ed* inflection to irregular verb forms (*Mouse has fallened*), the addition of an *en* inflection to stem forms (*The fox has rollen*), and on occasions the addition of the combined *en*+*ed* inflections (*Hoops have rollened*). Overregularization of the *ed* and *en* inflections accounted for 75.3% of verb form errors. Overall, these errors are consistent with the suggestion that children are gradually working out the function of the *en* and *ed* inflections.

**Summary**

The children’s use of auxiliaries BE and HAVE in declaratives confirms the findings of previous studies that children have more difficulty establishing
the correct verb forms for use with HAVE than with BE, and overall levels of S–Aux agreement errors are low. However, more detailed analysis suggests that the children may be acquiring knowledge of the different auxiliary forms separately. First, there are differences both between BE and HAVE, and between sub-forms of HAVE (has, have) in the proportional use of correct declaratives when auxiliaries are produced. Second, for some individual children, levels of agreement errors are somewhat higher than would be expected if they had a complete understanding of the systems governing tense and agreement. Moreover, there is a higher proportion of agreement errors with HAVE than with BE in the use of the third person singular auxiliary form has where the third person plural form have is required. Third, the pattern of BE for HAVE substitution errors observed is consistent with the suggestion that the children’s knowledge of auxiliary syntax may be tied to individual lexical forms, and that the constructions acquired earliest by children will be those that have a significant amount of consistency across exemplars, as is the case in the present progressive construction. Children may rely on familiar constructions that have a stronger representation in their linguistic systems during the early stages of acquisition, resulting in the substitution of BE for HAVE, a form that appears to be less strongly represented in the children’s linguistic systems at this stage in development.

To investigate children’s early representations of auxiliary syntax further, a second study was carried out to evaluate children’s use of BE and HAVE in questions. Many theories of acquisition (and the adult grammar) assume that questions are derived from declarative sentences via projections that leave traces marked for grammatical properties such as tense or agreement. Therefore, if children operate with an abstract understanding of auxiliary syntax, they are expected to show a full understanding of S–Aux agreement, even though in questions the auxiliary appears in fronted position before the sentence subject.

STUDY 2: CHILDREN’S USE OF AUXILIARIES BE AND HAVE IN QUESTIONS

METHOD

Participants

The participants in this study were 19 monolingual English-speaking children aged 3;1 to 3;11 (M = 3;3). These were different children to those who participated in Study 1. There were nine males and ten females. 13 of the children were recruited and tested in local nurseries in the Manchester area, and six were recruited through the Max Planck Child Study Centre and visited the Centre with their parents to take part in the study. Ideally,
we wanted to collect data from 28 children as in the previous study. However, it proved extremely difficult to elicit questions from the children. A further 30 children were tested but were excluded from the study because they failed to produce any questions (either imitated or elicited), and were generally non-compliant. We observed that the children fell into two groups, those who very quickly understood that they were expected to ask questions and did so throughout the study, and those who failed to understand this requirement, despite the presence of questions they were asked to imitate, and produced no questions at all. Four further children were excluded, two due to the failure of technical equipment, and two because they failed to complete the study.

**Stimuli**

The stimuli were similar to those used in Study 1, except that the prime-target sentences were questions rather than declaratives, and there were six pairs of sentences rather than ten (see Appendix 2). All sentences began with an auxiliary verb, for example *Is the duck hopping?*. Consequently, it was not possible to provide a singular or plural context for the children by producing the sentence subject as in Study 1. The order in which the children completed the two games (*BE/HAVE*) and the order in which children heard primes with each auxiliary form within games (*is, are/has, have*) was counterbalanced across children.

**Procedure**

The children were invited to play two games that involved asking a puppet lots of questions. As in Study 1, they watched various toys taking part in activities. They were told that the puppet knew what the toys were doing, and their task was to ask him what was happening. The investigator explained that when they asked a question that was correct, the puppet (a frog) would croak and nod his head, and when they got one wrong he would shake his head and they had to try again. Before the games started, the children were shown the toys that would be involved and asked if they knew the name for each toy. If they did not know the names of the objects, the investigator provided them. The procedure was as follows for each prime-target pair.

- Prime question modelled with accompanying action (e.g. *Are the giraffes falling?*)
- Child asked to repeat prime.
- Action modelled with new toys and child questioned a maximum of three times to elicit use of alternative auxiliary form
To encourage the children to ask questions, the investigator asked *Can you ask Mr Frog what the X is/are doing? or Mr Frog knows what the X is/are doing, can you ask him?* enabling her to remind them of the name of the toy(s). If the children attempted to ask the puppet a question and used the correct verb for the action modelled, they received a positive response from the puppet. If they were unsure or gave the incorrect main verb, they were provided with a prompt (e.g. *How about swinging?*). To introduce the children to the puppet and familiarize them with the game, for the first question, the investigator deliberately produced an incorrect question by choosing an action that was incorrect (e.g. *What are the giraffes doing Mr Frog? Are the giraffes falling?* – when the giraffes are swinging) to show the children the puppet’s response (shakes head) to an incorrect question. She continued by acknowledging the puppet’s response and asking another question that was correct (e.g. *No? Ok, are the giraffes swinging?*).

In response to the correct question, the puppet croaked and nodded its head.

**Coding**

The children’s imitated and elicited/spontaneous questions were coded as correct or incorrect, and the nature of the error in incorrect questions was recorded. Four types of error were coded: (1) agreement errors (e.g. *Is the cows jumping?, Have the man fallen?*), (2) use of an incorrect auxiliary (e.g. *Has the cows jumping?, Is the man fallen?*), (3) use of an incorrect verb form (e.g. *Is the man jump?, Has the man flyen?*), and (4) double marking errors (e.g. *Are the men are flying?, Has the man has fallen?*). The children made no errors of omission, nor any uninversion errors (e.g. *The men are flying?)*. Double marking errors were included because this is a possible error type in questions that require subject–auxiliary inversion, but not in declaratives, and children are known to produce these errors in questions (e.g. Hurford, 1975; Maratsos & Kuczaj, 1978). The type of error was determined using the same criteria as for declaratives, except for double marking errors that were defined by the presence of two auxiliary forms, one preceding the subject and one preceding the verb.

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[1] A number of the children who were excluded from the study on the grounds that they failed to produce any questions may have produced some uninversion errors. However, it was impossible to determine whether these children were describing the action using a declarative, or asking a question using declarative word order as their intonation was unclear. The children who were included in the study all produced inverted questions throughout.
RESULTS

Proportional use of correct questions

Figure 4 shows the percentage of the children’s imitated and elicited questions that were grammatically correct for each of the four auxiliary forms. It is clear that as with declaratives, the children’s performance was more accurate for auxiliary BE than for auxiliary HAVE, especially on elicited questions.

To determine whether there were significant differences between auxiliary forms in the proportion of correct imitated and elicited questions, Friedman tests were carried out. The results show that there was a significant difference between auxiliary forms in the proportion of correct imitated ($X^2 = 18.23$, $df = 3$, $p < 0.001$) and elicited ($X^2 = 11.61$, $df = 3$, $p < 0.01$) questions produced. For imitated questions, Wilcoxon tests revealed no significant differences between *are* and *have*, or between *has* and *have*. For elicited questions, the children were more likely to produce correct questions where *are* was required than where *have* was required ($Z = -2.23$, $N = 15$, $p = 0.05$). These data show that the children were more likely to produce correct questions with forms of BE than with forms of HAVE.

We then examined the children’s data individually to determine whether the general patterns of auxiliary use observed were typical of auxiliary use in the speech of individual children. Figure 5 shows the number of children who produced different proportions of correct imitated and elicited questions with each auxiliary form.

Although over half of the children produced over 50% correctly imitated questions across auxiliary forms, there was a steady decline as increasing
numbers of children made errors in their imitation of questions where the forms *has* and *have* were required. For elicited questions, although the majority of the children produced a high proportion of correct questions where *is* and *are* were required, six and seven of the children for *has* and *have* respectively produced fewer than 50% correct questions (fewer than 25% correct where *have* was required). Thus, it appears that although many of the children have acquired question syntax with forms of BE, they are not able to transfer this knowledge to forms of HAVE.

**Errors of commission**

A second analysis was carried out to determine whether there were differences between auxiliary forms in the kinds of errors that were produced, to determine whether the higher proportion of errors found with HAVE reflected an increase in verb form or incorrect auxiliary errors, as with declaratives. Figure 6 shows the types of errors that occurred with each auxiliary form.

*Agreement errors.* Figure 6 shows the proportion of the children's questions that contained agreement errors. It is immediately clear that the mean levels of agreement errors were high (17.5%) where *have* was required in imitated questions, and high (between 11.0–18.5%) where *are*, *has*, and *have* were required in elicited questions. These figures suggest that the children’s grasp of S–Aux agreement in questions is much less well developed than their knowledge of these systems in declaratives, contrary to the predictions of the various generativist accounts outlined earlier, and raising the question of what form children’s early knowledge of these systems takes. To determine whether there were differences between auxiliary forms in the proportion of questions that contained agreement errors, Friedman tests were carried out. The results showed that there were differences between auxiliary forms in the proportion of agreement errors produced in imitated questions (*X^2*= 8.32, *df* = 3, *p* < 0.05), although
Wilcoxon tests revealed no differences between *are* and *have*, or between *has* and *have*. However, there was no difference between auxiliary forms in the proportion of agreement errors produced in elicited questions \( (X^2 = 3.09, df = 3, p > 0.05) \). An examination of the data from individual children shows that with the exception of imitated questions where *is* was required, for all auxiliary forms in imitated and elicited questions some children made agreement errors over 30% of the time, rising to 100% agreement errors with elicited questions where *are* and *has* were required for some children (13 different children showed over 30% agreement errors with at least one auxiliary form).

**Incorrect auxiliary errors.** The data show that the children produced higher levels of incorrect auxiliary errors where *has* and *have* were required than where *is* and *are* were required in imitated and elicited questions, although these errors were much rarer in questions than in declaratives. In questions, none of the children replaced auxiliary BE with forms of auxiliary HAVE, although two children replaced auxiliary HAVE with forms of BE. In addition, one child replaced both BE and HAVE with the auxiliary form *did* resulting in errors of the type *Did the bear sliding?* and *Did the ducks fallen?*. Friedman tests showed that there were no differences between auxiliary forms in the proportion of incorrect auxiliary errors in imitated \( (X^2 = 3.67, df = 3, p > 0.05) \) or elicited \( (X^2 = 6.00, df = 3, p > 0.05) \) questions, reflecting the fact that few of the children produced any of these errors with any auxiliary form.

The possibility that the children’s use of present perfect verb forms with forms of auxiliary BE could be affected by the use of similar verb forms in predicate constructions with the copula was then examined, again by
determining the proportion of errors of this type that are acceptable in the adult grammar as predicates with a copula verb. For each verb, the percentage of utterances where the verb appeared with a form of BE in predicates (e.g. *Is it hidden?*) compared with its use as a present perfect verb form (e.g. *Has it hidden?*) was calculated. Those verbs where predicates accounted for over 10% of the uses in the language children heard were assumed to be acceptable in this form in the adult grammar, and heard sufficiently frequently for children to have acquired these forms.

These analyses show that for the two children who made incorrect auxiliary errors in imitated and elicited questions, only 22% of their errors included verbs that were acceptable as predicates with the copula in the adult grammar (e.g. *Is the cow hidden?*), thus 78% of these errors appeared to be productive errors (e.g. *Is the rabbit clapped?*). These errors suggest that these two children knew something about question syntax, but they were either unsure how to construct questions using forms of HAVE and relied instead on a more familiar question construction with forms of BE, and/or they recognized a relation between the copula and present perfect constructions based on the fact that some verb forms can be used in questions with both BE and HAVE.

**Verb form errors.** The data show that the children made more verb form errors with auxiliary HAVE than with auxiliary BE. Friedman tests show that there were differences between auxiliary forms in the proportion of verb form errors produced in imitated ($X^2 = 11.00, df = 3, p = 0.01$) and elicited ($X^2 = 11.09, df = 3, p = 0.01$) questions. Wilcoxon tests show that in imitated questions, there were no differences in verb form errors between *are* and *have*, or between *has* and *have*, whereas in elicited questions the children were more likely to make verb form errors with *have* than with *are* ($Z = -2.46, N = 15, p < 0.05$) but there were no differences between *has* and *have*. These findings show that, in line with the findings of previous studies with declaratives (Fletcher, 1985; Johnson, 1985; Gathercole, 1986), the children in this study had some difficulty in producing the correct verb form in the present perfect question construction. They produced a range of errors (the use of a stem form of the verb *Has the mouse dance?*, the use of a progressive or third person form of the verb *Has the chickens dancing?*, *Have they claps?*, the addition of an *ed* inflection to irregular and regular verb forms *Has the cow hiddened?*, *Has the tiger falled?*, and the addition of an *en* inflection to stem forms *Have the hedgehogs rollen?*). The use of a stem form of the verb accounted for 65.4% of verb form errors in questions compared with 19.2% in declaratives, while just 23.1% of verb form errors in questions represented overregularisations of the *ed* and *en* inflections compared with 75.3% in declaratives.

**Double auxiliary marking.** Overall, the children made very few double marking errors, for example, *Has the bus has parked?*, *Are the giraffes
are swinging? To determine whether there were differences in the proportional use of double marking between auxiliary forms in imitated questions, a Friedman test was carried out. The results showed that there were no differences between auxiliary forms in the proportional use of double marking in imitated ($X^2 = 2.00$, $df = 3$, $p > 0.05$) questions. There was no variance in the proportional use of double marking in elicited questions between auxiliary forms so a Friedman test could not be carried out.

Overall summary
The pattern of results detailed above shows that the errors children produced varied according to both the specific auxiliary form, and whether that form was produced in declaratives or in questions. In particular, there was a higher proportion of agreement errors in questions than in declaratives, but there were differences in the relative proportions of agreement errors between auxiliary forms in elicited declaratives but not in elicited questions. These data suggest that agreement marking may develop separately in these two utterance types. However, due to the frequent errors of omission in declaratives, overall, children were more likely to produce correct elicited utterances in questions rather than in declaratives. These two findings suggest that the low rates of agreement errors in declaratives might be due to the fact that the children could avoid producing an auxiliary in these contexts by omitting the auxiliary, whereas the higher proportion of agreement errors in questions may reflect the fact that the children were unable to coordinate S–Aux agreement in contexts where they were under increased pressure to produce an auxiliary. Another interesting finding is that the children were much more likely to produce overgeneralizations of the present perfect *ed* and *en* inflections in declaratives than in questions. This suggests that the children’s understanding of the relation between auxiliary HAVE and its associated verb forms may differ for declaratives and questions.

discussion
This study examined children’s understanding of auxiliary syntax by comparing their use of the auxiliaries BE and HAVE in imitated and elicited declaratives and questions. The elicitation contexts were designed to promote the use of full NP subjects rather than pronouns to determine whether children understand S–Aux agreement at an abstract level, or whether the apparently high levels of S–Aux agreement reported in other studies might reflect the acquisition of high frequency pronominal subjects in combination with contracted auxiliaries. The auxiliaries BE
and HAVE share similarities because both are marked for tense and agreement, but differ in the complexity of the verb forms with which they appear.

The main findings are as follows. There were differences in the proportional correct use of the four auxiliary forms in declaratives and questions, with BE attracting fewer errors than HAVE, and with sub-forms of HAVE (has and have) attracting different error rates in declaratives. These differences in use reflect errors of commission rather than errors of omission. Agreement errors were frequent in questions but somewhat rarer in declaratives. Substitution errors where the children used forms of BE in place of HAVE were more common in declaratives than in questions. Lexical verb form errors were common with HAVE but took a different form in the two constructions, with overgeneralizations of the en and ed inflections occurring in declaratives compared with the use of stem forms in questions.

Overall, the data are consistent with those reported in other studies of auxiliary syntax. First, in declaratives the dominant error pattern observed with all auxiliary forms was omission. Auxiliary omission is predicted by a number of theories of the acquisition of auxiliary syntax, including those assuming early abstract grammatical knowledge (e.g. Wexler, 1994; Rice et al., 1995), and those that assume children gradually learn auxiliary syntax on the basis of the distributional relationships available in the language they hear (e.g. Lieven et al., 2000; Theakston, Theakston et al., 2003; 2005). Second, although the children produced a higher proportion of errors with HAVE than with BE, this can largely be explained by the higher proportion of verb form errors with HAVE, as suggested by previous studies. This provides further support for the suggestion that children experience considerable difficulties establishing the correct use and form of present perfect verbs.

However, there are a number of additional findings that may cast light on the processes underlying the acquisition of auxiliary syntax. First, the differences observed between BE and HAVE are not restricted to verb form errors. Differences in the rates of agreement errors and incorrect auxiliary errors suggest that the children’s understanding of auxiliaries BE and HAVE differs in a number of respects. There were also differences in the children’s levels of correct auxiliary use between sub-forms of BE (e.g. is and are in the proportion of correct use in questions – see Figure 4), and sub-forms of HAVE (e.g. has and have in the proportion of correct declaratives and incorrect auxiliary errors in declaratives), that again suggest differences in the children’s levels of knowledge regarding the use of each sub-form. These differences are not predicted by accounts that credit children with an abstract understanding of the person marking of each sub-form of a given auxiliary.
Second, the pattern of errors observed in children's production of declaratives vs. questions suggests that the two grammatical systems may initially develop independently. The children produced a higher rate of agreement errors in questions than in declaratives. This finding is incompatible with current generativist accounts that assume that children understand the relation between different lexical forms marked for person and number from the earliest stages of acquisition (e.g. Stromswold, 1990; Wexler, 1994; Rice et al., 1995). The children also produced a higher rate of overregularisation of the *en* and *ed* inflections with HAVE in declaratives than in questions. It is unclear how these differences can be accounted for by theories of acquisition that assume that a single abstract grammatical system underlies children's early use of auxiliary forms. One possibility is that these findings reflect differences in the performance demands in producing questions and declaratives. The higher rate of agreement errors in questions could reflect performance limitations that affect the children's ability to coordinate knowledge of the relevant auxiliary form with knowledge of the grammatical subject that appears later in the utterance (e.g. Pinker, 1984). Similarly, in questions the decreased rate of verb form errors with the *ed* and *en* inflections and increased use of stem forms might reflect greater performance demands. In questions, the auxiliary and verb are separated by the sentence subject whereas in declaratives, the auxiliary and verb are adjacent to each other. However, a performance-based approach cannot easily explain why there were differences between auxiliary forms in the rates of agreement errors observed in declaratives. Nor is it clear why the use of stem verb forms was not observed in the children's use of questions with BE if the performance demands in questions make it difficult to produce inflected forms. These problems highlight the need for performance-based theories to make specific predictions about how performance limitations might be expected to operate in children's early speech.

Third, although in declaratives the overall proportion of agreement errors observed was low, there was a marginally significant difference between BE and HAVE in the use of third person singular auxiliary forms with third person plural subjects, and some individual children exhibited very high levels of agreement errors. The variation in error rates across children was also observed in their production of questions, but in questions the overall levels of agreement error were also relatively high. This suggests that there may be a developmental progression in the acquisition of agreement marking, rather than children having a full understanding of the complexities of agreement marking from very early in the acquisition process. In the case of questions, it may be that children master the complexities of agreement marking relatively late in development, thus explaining the increased occurrence of these errors in questions,
although high rates of auxiliary omission may in fact mask problems with agreement marking in declaratives as well. Interestingly, although Rice et al. (1995) claim that their elicitation and spontaneous data reveal that children have an abstract understanding of the systems governing tense and agreement marking, the mean values for correct use of auxiliary and copula BE conceal considerable variation between children as evidenced by the large standard deviations found in their data (Rice et al., 1995: 857, Tables 6 and 7). Moreover, they choose to dismiss patterns of variation between children, stating that ‘One of the SLI children was excluded from these (agreement marking) analyses because this was the only child who demonstrated agreement errors ... this child’s grammar seems to be not quite the same as that of the other children’ (Rice et al., 1995: 859). It is not clear what this might mean, nor is it clear why the data from this child should be dismissed because they differ from those produced by other children. The present study shows that variations in levels of agreement marking between children are not unusual (six children show high levels of agreement errors in declaratives with at least one auxiliary form, and 13 children show high levels of agreement errors in questions with at least one auxiliary form) and as such should be accounted for by any theory of auxiliary acquisition.

Finally, the pattern of observed errors in the current study where the children produced forms of BE in place of HAVE is interesting. Although some of these apparent errors reflected the correct use of a copula construction with BE, the majority did not and were genuine errors where, in the adult grammar, BE cannot be used in place of HAVE. The presence of these errors in declaratives and questions suggests that (1) although the children had some knowledge of auxiliary syntax, and perhaps recognized the need to produce a lexical item in a predetermined ‘slot’, they were unsure of the correct form required and tended to use forms that are generally early acquired (Lieven et al., 2000), and/or (2) the children may recognize a relation between the present perfect construction with HAVE, and the copula construction with BE, based on an understanding that some verb forms can appear in both constructions. If children recognize the relation between the two constructions, it is possible (although speculative) that they will produce a copula construction with verb forms that are phonologically similar to others they have heard used in that construction. Alternatively, they might assume that all verb forms that can be used in one construction can also be used in the other, in a similar developmental progression to the overgeneralization of argument structure alternation rules. Whether the use of BE in place of HAVE reflects a reliance on a relatively well known auxiliary form or the generalization of constructions based on the knowledge that groups of verbs can appear in multiple constructions is unknown. However, either possibility is consistent with
constructivist approaches to the acquisition of syntax that assume that an adultlike grammar develops from constructions that are initially based around individual lexical items (e.g. individual auxiliary forms), and that whole constructions can be stored as lexical items as well as individual words, allowing associations between constructions used with the same lexical items to develop.

One aspect of the current study that is worth considering in more detail is the use of both imitation and elicitation tasks. It is clear from the data that (1) the children performed more accurately in the imitation task than in the elicitation task for both declaratives and questions, and (2) the deficit in performance in the elicitation task in comparison with the imitation task was more pronounced for declaratives than for questions. The first of these findings seems to reflect the task demands – it was apparently easier for the children to reproduce an utterance correctly than to generate one from scratch. Some researchers, mainly working within a generativist framework, argue that the ability to imitate sentences correctly provides a true measure of children’s underlying grammatical knowledge (e.g. Santelmann et al., 2002). However, from a constructivist perspective the two tasks are assumed to tap into different levels of children's knowledge. Within this theory, although children may be able to correctly imitate a sentence of which they have partial knowledge, they may not have a sufficiently well represented knowledge of that sentence to allow correct production in the absence of prior linguistic support (see Tomasello & Abbot-Smith, 2002 for a discussion of task demands and the relative strength of cognitive representations). The second of these findings reflects the high rate of auxiliary omission in elicited declaratives, whereas auxiliary omission in questions did not occur. This is assumed to reflect the nature of the children's knowledge. For declaratives, children appear to operate both with frames that contain auxiliaries (e.g. He’s V-ing) and frames where the auxiliary is omitted, perhaps derived in part from questions in the input (e.g. Is He V-ing) (Lieven et al., 2000; Theakston et al., 2003; 2005). In contrast, question frames seem to be based around the wh-word or fronted auxiliary, for example Is he V-ing? (Dabrowska, 2000; Rowland & Pine, 2000). If children are using these types of frames to produce their utterances in the elicitation task, it is perhaps not surprising that they are able to correctly produce an auxiliary form more often in questions than in declaratives.

One difficulty lies in determining how to reconcile the findings of the current study with previous findings that suggest that by approximately age 3;0 either (1) children have very little understanding of auxiliary syntax and their early use of auxiliaries is dependent on lexically-specific combinations of pronouns and contracted auxiliaries (Wilson, 2003; Theakston et al., 2005), or (2) children possess a fully abstract knowledge of auxiliary syntax.
(Rice et al., 1995). One possibility is that children possess an abstract understanding of auxiliary syntax from the earliest stages of language use, but tend to produce pronominal subjects in combination with contracted auxiliaries because these forms are the preferred forms of expression in English. An alternative suggestion is that the period of development from approximately 2;11 to 3;1, is crucial in children’s developing understanding of auxiliary syntax. During this time, children might begin to build the more abstract representations necessary to use auxiliaries correctly in all obligatory contexts.

We favour the latter interpretation and suggest that the development of previously acquired lexically-specific knowledge of auxiliary syntax provides a more accurate fit to the data. The differences observed in the current study between individual sub-forms of BE and HAVE, and between the two auxiliaries when produced in questions vs. declaratives are more consistent with the suggestion that children begin with lexically-specific knowledge tied to individual forms used in specific constructions, and only gradually are links between lexical forms and the use of individual forms in multiple constructions built up (Theakston et al., 2002). It is more difficult to account for the differences observed in the children’s use of individual auxiliary forms if one assumes that they operate with an abstract, system-wide grammar that underlies all auxiliary use. However, it is clear that further research is necessary to determine how children’s knowledge of auxiliary syntax develops prior to three years of age, and that future research must probe children’s early knowledge of auxiliary syntax in contexts where full NP subjects are required to avoid the possibility that early but correct use of auxiliary syntax reflects the acquisition of S–Aux combinations learned directly from the input. Only with further research will we begin to understand how children might learn the complex system of auxiliary syntax.

REFERENCES


APPENDIX 1

SENTENCES USED IN STUDY 1

The horse is jumping  The pigs are jumping
The orange is rolling  The marbles are rolling
The goose is hopping  The dolls are hopping
The cabbage is spinning The apples are spinning
The octopus is waving  The men are waving
The princess is dancing The chickens are dancing
The mouse is eating  The cows are eating
The sponge is sliding  The hippos are sliding
The tortoise is swinging The giraffes are swinging
The fish is swimming  The sharks are swimming
The dress has ripped  The shirts have ripped
The peach has stopped The hoops have stopped
  (action = rolling)

The ambulance has gone  The tractors have gone
The moose has fallen  The elephants have fallen
The starfish has hidden The ducks have hidden
The witch has flown  The aeroplanes have flown
The fox has tumbled  The hedgehogs have tumbled

The box has opened  The doors have opened
The glass has toppled  The men have toppled
  (action = topple off a table)
**APPENDIX 2**

**SENTENCES USED IN STUDY 2**

<table>
<thead>
<tr>
<th>English</th>
<th>German</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the fox cooking?</td>
<td>Are the bear and seal cooking?*</td>
</tr>
<tr>
<td>Is the tortoise swinging?</td>
<td>Are the giraffes swinging?</td>
</tr>
<tr>
<td>Is the duck hopping?</td>
<td>Are the dolls hopping?</td>
</tr>
<tr>
<td>Is the bear sliding?</td>
<td>Are the hippos sliding?</td>
</tr>
<tr>
<td>Is the fish swimming?</td>
<td>Are the sharks swimming?</td>
</tr>
<tr>
<td>Is the horse jumping?</td>
<td>Are the elephants jumping?</td>
</tr>
<tr>
<td>Has the tiger fallen?</td>
<td>Have the ducks fallen?</td>
</tr>
<tr>
<td>Has the rabbit clapped?</td>
<td>Have the bear and seal clapped?*</td>
</tr>
<tr>
<td>Has the mouse danced?</td>
<td>Have the chickens danced?</td>
</tr>
<tr>
<td>Has the bus parked?</td>
<td>Have the cars parked?</td>
</tr>
<tr>
<td>Has the man rolled?</td>
<td>Have the hedgehogs rolled?</td>
</tr>
<tr>
<td>Has the cow hidden?</td>
<td>Have the pigs hidden?</td>
</tr>
</tbody>
</table>

*The data were examined to determine whether the two sentences containing compound NP subjects attracted higher levels of error than other sentences. However, the children were no more likely to produce errors with these sentences than with any others, and therefore the sentences were grouped together for the analyses.