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NOTE

Testing the Agreement/Tense Omission Model using an elicited imitation paradigm*

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ABSTRACT

The present study used an elicited imitation paradigm to test the prediction of Schutze & Wexler's (1996) AGREEMENT/TENSE OMISSION MODEL (ATOM) that the rate of non-nominative subjects with agreement-marked verb forms will be sufficiently low that such errors can reasonably be disregarded as noise in the data. A screening procedure identified five children who produced non-nominative subject errors (all *her* for *she*) who were then asked to repeat 24 sentences with 3sg feminine pronoun subjects (*she*) and agreeing main verbs or auxiliaries. All five children produced at least one non-nominative subject (*her*) with an agreement-marked verb form, and for none of these five children was the non-NOM+AGR rate significantly different to the rate that would be expected by chance, given the independent frequencies of non-nominative subjects and agreement-marked verb forms in their data. The three children for whom this expected (by chance) error rate was significantly greater than 10% (representing an acceptable level of noise in the data) produced non-NOM+AGR errors at a rate significantly greater than 10%, counter to the prediction of the ATOM. These results replicate and extend the naturalistic-data findings of Pine *et al.* using a different method. They also provide support for the use of elicited imitation as a methodology for assessing children's early grammatical knowledge.

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INTRODUCTION

It has long been observed that some English-speaking children pass through a period of development in which they use non-nominative pronouns in subject position, producing utterances such as, for example 'Me want it', 'My want it' or 'Her playing football' (see Pine, Rowland, Lieven & Theakston, 2005, for a list of references). Schutze and Wexler (1996; Wexler, 1998) seek to account for this phenomenon by means of a formal, generativist analysis known as the Agreement/Tense Omission Model (ATOM). Under this view, children have correctly set ALL the relevant grammatical parameters of their language 'from the earliest observations that we can make' (Wexler, 1998: 79). The 'one UG difference' (Wexler, 1998: 43) between adults and children is that in the child grammar 'either tense or agreement may be independently missing ... in finite environments' (Schutze & Wexler, 1996). When tense is missing, a non-finite form (e.g. *play* for *plays* or *playing* for *is playing*) surfaces. When agreement is missing the 'default case' – in English, the accusative – surfaces (with one exception, discussed shortly). Accusative is taken to be the default case in English, as it is the case used for utterances that are not marked for tense (e.g. 'Me.', as a response to a question such as 'Who wants a drink?').

According to the model, pronoun case marking errors such as *me want it* or *her playing football* occur when tense is present but agreement is absent. The absence of agreement results in the appearance of the default, accusative form (*me* or *her*). Tense, although present in the underlying representation of the utterance, is invisible for present tense utterances as the necessary tense-bearing morphemes (e.g. *-s*) or auxiliary (e.g. *is*) also bear agreement, which is not present, and so cannot surface. Note that the past tense *–ed* morpheme can surface in such cases (e.g. *her played football*) as it does not encode agreement. Errors in which the genitive pronoun is used (e.g. *My* want it) occur when both agreement and tense are absent. According to Wexler (1998) the genitive case is appropriate for utterances lacking both tense and agreement (e.g. gerund forms such as *his playing football* [*upset me*]) in both the child and adult grammar. When agreement is present but tense is absent, forms such as *She crying* or *He play* will surface. Of course, when tense and agreement are both present, an adult-like utterance results.

Importantly, no pattern of omission of tense or agreement can generate utterances such as *Her plays* or *My am playing* in which a non-nominative subject pronoun is used with a verb form marked for agreement, a point to which we return shortly.

Because the ATOM predicts that children will not use non-nominative subject pronouns with agreement-marked verb forms, some researchers have interpreted the model as predicting a positive relationship between

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children's correct use of nominative subjects and verb-agreement marking, or that for utterances with non-nominative subjects, there will be significantly fewer agreeing than non-agreeing verb forms. For example, Schutze & Wexler (1996: 674) in an analysis of data from Nina, Peter and Sarah from the CHILDES database, report that 'virtually all non-NOM subjects occur with non-finite verbs [i.e. verbs not marked for agreement], significantly different from NOM subjects'. Associations between nominative subject provision and verb agreement are also reported by Loeb & Leonard (1991) and Wexler, Schutze & Rice (1998) with the latter study using both naturalistic data and data from a 'probe test' (p. 329), designed to encourage the use of 3sg pronoun subjects.

Not all studies, however, find such an association. Rispoli (1999) reports data from 29 children aged between 2;6 and 4;0 who participated in two quasi-experimental, two-hour sessions (free play with toys and pictures designed to encouraged the use of 3sg pronouns), conducted within a fortnight. Of these, seven children produced sufficient numbers of nominative and non-nominative pronouns and agreement-marked and non-marked verbs to allow inferential statistics to be calculated. Although 'nominative case subject pronouns were usually produced at a higher rate in sentences with agreement than in sentences lacking agreement' (p. 367), this difference did not reach statistical significance for any individual child.

In fact, as argued by Pine *et al*. (2005), any association between the provision of nominative subjects and agreement-marked verb forms is orthogonal to the central prediction of the ATOM; that non-nominative subjects will not occur with agreement-marked verb forms.

To see why findings such as those reported by Schutze & Wexler (1996) do not provide an appropriate test of the model, consider a hypothetical child who exhibits a quite different pattern. Suppose that, for this child (as for Nina, Peter and Sarah) virtually all non-nominative subjects occur with non-agreeing verbs. Suppose further, that (unlike these children) virtually all nominative subjects also occur with non-agreeing verbs. This pattern would not be inconsistent with the predictions of the ATOM, as the model makes no claim with regard to the frequency with which children will produce agreeing versus non-agreeing verb forms for nominative subjects. Consider now a second hypothetical child who, in violation of the ATOM, produces a substantial number of non-nominative subjects with agreeing verbs (i.e. at a rate well above that attributable to 'noise') but produces nominative subjects with agreeing verbs at a significantly higher rate. Although such a child would provide evidence against the ATOM, they would, nevertheless, exhibit the same pattern shown by Nina, Peter and Sarah (agreement being much more frequent with nominative that non-nominative subjects), that Schutze & Wexler (1996) take as support for their model.

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In fact, the critical prediction of the ATOM is that non-nominative subjects will not occur with agreement-marked verbs. Schutze (2001) explicitly acknowledges that the ATOM predicts that the rate of such combinations will be 'essentially zero, modulo noise in the data' (p. 508). Following the logic of Schutze and Wexler's (1996) account, the presence of morphemes that bear both tense and agreement (e.g. 3sg *−s* or auxiliary *is*) demonstrates that agreement is present in the child's representation of an utterance. When agreement is present, the grammar cannot fail to assign nominative case to the subject pronoun (though, hypothetically other forms of the pronoun could surface if the appropriate form were not present in the child's lexicon).

As Pine *et al.* (2005) note, the prediction that non-nominative subjects will not occur with agreement-marked verb forms can be tested only on children who produce a reasonable number of non-nominative pronouns in subject position, and a reasonably high rate of verb agreement in general. Although it is indeed the case that children very rarely produce non-nominative subjects with agreement-marked verb forms, for most children this is a simple consequence of the scarcity of both items independently in the data. To test the prediction of the ATOM, it is necessary to identify children who would be expected to produce non-nominative subjects with agreement-marked verb forms at a reasonable rate if this were licensed by their grammar, given the frequency with which they use non-nominative subjects and verbs marked for agreement independently.

Using a chi-squared statistic, and focusing on 3sg pronouns (*He/Him, She/Her*) Pine *et al.* (2005) calculated this *expected* [*by chance*] *error rate* (i.e. the rate of non-NOM+AGR sentences that would be expected to occur by chance if the two features were independent) for the 12 children of the Manchester corpus (Theakston, Lieven, Pine & Rowland, 2001). For only three of these children (Anne, Becky and Gail) and for only the feminine 3sg pronoun paradigm was the expected error rate greater than or close to 10%; an arbitrary figure representing 'the upper limit on the rate of agreeing verbs with non-nominative subjects that one would be prepared to disregard as noise' (Pine *et al.*, 2005: 272–273). For both Anne and Becky, the observed rates of *her*+AGR were 33·3%, significantly greater than the respective expected rates of 26·9% and 21·3%, and the 10% 'noise' level. For Gail, the observed rate of 39·1% was significantly lower than the expected rate of 52·8%, but still significantly greater than the acceptable 'noise' level.

Whilst Pine *et al.*'s (2005) results clearly count against the ATOM, they are also open to a number of possible objections. The first is that the results are based on data from only a handful of children. This is at least in part because the majority of children in the literature do not produce enough non-nominative subjects and agreement-marked verb forms independently

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such that the expected error rate is greater than a 'permissible noise' level. Nevertheless, it is possible that the children studied by Pine *et al*. (2005) are unusual in some way, and that, if the relevant data were available for more children, they would support the predictions of the ATOM.

The second is that, for Becky and Gail, the majority of purported counter-examples to the predictions of the ATOM, are of the form *non-nominative subject + contracted agreeing copula/auxiliary BE* (i.e. *her's + ADJ/NOUN/VERB*) as opposed to *non-nominative subject + agreeing lexical main verb*. This is potentially problematic as the form *her's* is homophonous with the genitive pronoun *hers*, meaning that some apparent *her's* for *she's* errors may have, in fact, been *hers* for *she* errors. Of course, this finding could, in principle, be a consequence of a general tendency for these children to use more agreement-marked auxiliaries than agreement-marked lexical main verbs (or simply more auxiliaries than lexical main verbs). To investigate this possibility further it would be advantageous to have data from more children, particularly data in which lexical main verbs and auxiliary + main verb combinations are used with approximately equal frequency.

The third possible objection is that, strictly speaking, the central prediction of the ATOM can be tested only on data collected at a single point in developmental time, whereas the data used in Pine *et al*. (2005) were collected over a period of approximately 12 months. Although this period was chosen such that each child produced both non-nominative subjects, and nominative subjects with agreeing verb forms throughout the study, it is still possible that these figures could have been distorted by developmental change. The rate of non-nominative subject error is likely to be highest during the earliest stages of development and then gradually decline (as older children and adults do not make such errors). Conversely, the rate of provision of verb-agreement marking is likely to be lowest early in development and then gradually increase (as older children and adults use verb-agreement marking in virtually 100% of obligatory contexts).

A related objection is that the study of Pine *et al*. (2005) focused on relatively young children (the oldest was 2;0 at the beginning of the study). Since many children aged 2;0 produce very little verb agreement overall, the focus on such young children means that it is possible that this study underestimated the expected error rate, and/or missed the period in developmental time when non-NOM + AGR errors are most frequent. Such errors are likely to be most common relatively late in development, when children are using a good deal of verb agreement, but may still sometimes make non-nominative subject errors (and indeed have been observed in children as old as 4;0; Rispoli, 1999).

The goal of the present study was to address some of the possible objections to the study of Pine *et al*. (2005) and to obtain converging data

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using a different experimental paradigm, that of elicited imitation. This method allows us to elicit 3sg pronoun subjects and verb forms at a single point in developmental time, thus avoiding the potentially confounding effect of developmental change. In order to avoid the possibility of missing some of the relevant errors due to children producing low overall rates of agreement-marked verbs, we chose to study older children who were producing reasonably high rates of such forms.

An obvious disadvantage of the elicited-imitation paradigm (particularly when used with relatively old children) is that, since the child is, for each trial, attempting to imitate a well-formed utterance, the method might be expected to artificially increase rates of verb agreement and decrease rates of non-nominative subject provision as compared with spontaneous production data.

On the other hand, the fact that this method would seem to reduce the likelihood of the commission of non-NOM+AGR errors can also be seen as a strength. Since any non-NOM+AGR error observed will have been produced immediately after (indeed, as an attempted imitation of) a correctly-formed model sentence, it is difficult to dismiss such errors as ''noise''.

A further advantage of the elicited imitation paradigm is that it allows for auxiliary+main verb combinations and lexical main verbs to be elicited in equal numbers, and thus to investigate whether rates of non-NOM+AGR error really are higher for auxiliary+main verb combinations than for lexical main verbs (e.g. Pine *et al.*, 2005), or whether this is simply an artefact of naturalistic data sampling.

SCREENING PROCEDURE

A screening procedure was used to identify participants and pronoun paradigms for which non-nominative subject errors would be observed.

METHOD

Participants

Participants were 24 monolingual English-speaking children (13 boys and 11 girls) aged between 3;5 and 4;3 (M=3;11), recruited from a single nursery school class in Manchester, England.

Procedure

The study used an elicited imitation (sentence repetition) paradigm, which allows for precise control of the target utterance with respect to the pronoun subject. The study was presented to the child as a repetition game in which

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her task was to repeat the experimenter's utterances into a (Shure SM58) microphone (connected to a Sony mindisc recorder). The minidisc recorder to which the microphone was connected was also connected to a loudspeaker, to allow children to hear their own voice. This proved a considerable incentive when encouraging children to copy the experimenter, and to speak directly into the microphone.

The instructions given to each child were simply 'You have to copy me, and say exactly what I say'. Each child was first given six practice trials using full NP subjects (*Mickey* or *Mickey and Minnie*) and intransitive verbs (*run, swim, sleep, sing, walk, jump*), half used as lexical main verbs (e.g. *Every day Mickey sings a song*) and half with a form of auxiliary BE (e.g. *Today Mickey is running*). Every child displayed perfect performance for all six practice trials.

Immediately after the six practice trials, 18 test trials were presented in random order. Twelve trials (three each using the pronoun subjects *he*, *she*, *we*, and *they*) were of the form *Today* [NP_{SUBJ}] [*AUX BE*] [*VERB-ing*] [NP_{OBJ}] (e.g. *Today they are kicking the ball*) to ensure that the use of AUX BE + 3sg progressive *-ing* was natural. The verbs used for these trials were *touch, bite, read, hide, move, pull, push, draw, kick, hold, eat* and *drink*. Although each verb always occurred with the same object NP, the pronoun subject was varied systematically from verb to verb in a predetermined random order for each child. The remaining six trials (three each using the pronoun subjects *he* and *she*) were of the form *Every day* [NP_{SUBJ}] [*VERB-s*] [NP_{OBJ}] (e.g. *Every day he reads a book*) to ensure that the use of a lexical main verb was natural. Six of the 12 verb + direct object combinations used for the trials with AUX BE, selected at random, were used for these trials.

Transcription and scoring

All child utterances (repetitions of the experimenter and spontaneous utterances) were transcribed offline by the first author according to CHAT conventions (MacWhinney, 2000). The data were also transcribed by a research assistant blind to the hypothesis under investigation. For utterances with the pronominal subjects *he*, *we*, and *they*, agreement between the two transcribers was 100%. Utterances with *she/her* are considered separately in the relevant section of the main study.

Utterances were scored for the identity of the subject pronoun (nominative or non-nominative), and as to whether or not verb-agreement marking was unambiguously present on either the main verb (*-s*) or auxiliary (*is*/-'*s*/*are*/'*re*….*ing*). Forms for which agreement marking is ambiguous (e.g. past tense forms) were scored as non-agreeing. Responses for which the transcribers could not reach agreement as to the form of the

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TABLE 1. *Screening procedure: percentage of non-nominative subjects for each pronoun paradigm*

	She/Her %Her	He/Him %Him	We/Us %Us	They/Them %Them
Alan	60	0	0	0
Bob	100	0	0	0
Chris	100	0	0	0
Dave	100	0	0	0
Emma	60	0	0	0
Felicity	0	0	0	0
Georgia	0	0	0	0
Harry	0	0	0	0
Iona	0	0	0	0
Jane	0	0	0	0
Karl	0	0	0	0
Liam	0	0	0	0
Mary	0	0	0	0
Neil	0	0	0	0
Olivia	0	0	0	0
Paul	0	0	0	0
Quentin	0	0	0	0
Rachel	0	0	0	0
Steven	0	0	0	0
Tom	0	0	0	0
Uri	0	0	0	0
Vikki	0	0	0	0
Will	0	0	0	0
Xavier	0	0	0	0
Mean	18	0	0	0

subject, or as to whether or not verb-agreement marking was present were excluded, as were responses that did not contain a subject or verb, or were unclear. A further seven utterances were excluded due to problems with the recording equipment.

RESULTS

Table 1 shows the proportion of utterances for each pronoun paradigm which had non-nominative subjects (data on verb agreement marking are not reported here as these data are irrelevant for the pronouns *he*, *we* and *they*, as they did not occur in non-nominative form. Rates of verb-agreement marking for utterances with *her/she* are discussed in the relevant section of the main study).

Perhaps surprisingly, the elicited imitation paradigm was successful in eliciting non-nominative subjects, despite the fact that children were attempting to imitate the experimenter's utterances, which used exclusively

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nominative subjects. Overall error rates were low, with 19 of the 24 children studied making no non-nominative subject errors (though this was perhaps, in part, a result of using an elicited imitation paradigm with relatively old children). The remaining five children all made non-nominative subject (*her* for *she*) errors solely with the 3sg feminine pronoun paradigm at rates of 60% (two children) and 100% (three children).

These findings are remarkably consistent with those of studies that have used spontaneous production data. Our finding that only around 20% of children make non-nominative subject errors is consistent with Rispoli's (2005) observation of considerable variation across children with respect to the commission of non-nominative subject errors. Rispoli (2005) argues that whether or not children make pronoun case-marking errors is largely determined by individual differences between children, with some building pronoun paradigms conservatively, and others ''reach[ing] beyond their grasp'' (p. 93) and hence committing such errors.

Our finding that children make non-nominative subject errors only for the 3sg feminine pronoun paradigm is consistent with the findings of many previous studies that rates of non-nominative subject error are much higher for this than for any other pronoun paradigm (e.g, Rispoli, 1994; 1998; 1999; Vainikka, 1994; Moore, 1995; Schutze, 1997; Pine *et al*., 2005). Rispoli (1994; 1998; 1999) suggests that non-nominative subject errors might be highest for *she/her* because the lexical item *her* (unlike other non-nominative pronouns such as *me*, *him, us* or *them*) does ''double duty'' (1998: 550) as the objective and possessive pronoun for the 3sg feminine paradigm. Consequently, *her* has a higher retrieval strength than other non-nominative pronoun forms, and is therefore more likely to be recalled in error for use in subject position.

Recall that the central prediction of the ATOM is that children will not use agreement-marked verb forms with non-nominative subjects. It clearly follows, then, that this prediction can be tested only on children and pronoun paradigms for which non-nominative subjects have been observed. Therefore for the main study we elicited sentences with 3sg feminine pronoun subjects from the five children observed to make non-nominative subject errors.

MAIN STUDY

METHOD

Participants

Participants were the five children identified as making non-nominative subject errors for the 3sg feminine pronoun paradigm: Alan (4;2), Bob (3;6), Chris (4;4), Dave (4;3) and Emma (4;0).

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TABLE 2. *Sentences used in the main study, and the frequency of each verb in the mother's data of the Manchester corpus* (*Theakston* et al., 2001)

Two children received Presentation A first, three Presentation B.
Verb frequencies refer to all main verb forms (for lexical main verbs), and all progressive forms (for compounds with AUX BE).

Story presentation A	Verb frequency	Story presentation B	Verb frequency
She comes downstairs	1569	She is coming downstairs	725
She is making the tea	419	She makes the tea	1465
She has breakfast	2234	She is having breakfast	283
She is getting ready	352	She gets ready	3630
She looks pretty	3009	She is looking pretty	172
She is going to school	2317	She goes to school	6438
She opens the door	501	She is opening the door	4
She is sitting on the carpet quietly	185	She sits on the carpet quietly	1139
		She is drawing a picture	55
She draws a picture	429	She plays with the other children	1039
She is playing with the other children	189	She is putting all the toys away	174
		She eats lunch	881
She puts all the toys away	2973		
She is eating lunch	232		

Procedure

Sentences were presented using an illustrated story about an unnamed girl's daily routine. This ensured that it was natural to use only pronouns (as neither child nor experimenter knew the girl's name), and to use both simple (lexical main verb) and compound (auxiliary + main verb) forms (to describe habitual daily actions, and actions conducted on the particular day of the story respectively). For each of 12 pictures, the experimenter produced a (well-formed) sentence, then elicited a repetition from the child. The experimenter used 12 predetermined verbs (presented in the same order for each child), alternating between simple and compound forms from sentence to sentence (beginning with a simple form for two children, and a compound form for three children). The verbs were chosen as the 12 most frequent in the mothers' data from the Manchester Corpus (Theakston *et al.*, 2001) that were deemed amenable to the story context. After reading through the story once, the experimenter then repeated the procedure, using compound verb forms where he had previously used simple forms and vice versa. Thus for each picture, the child was asked to copy one sentence using a simple verb form and one using a compound form of the same verb plus auxiliary *is* (e.g. *She makes the tea*/*She is making the tea*). The 24 sentences used in the study are shown in Table 2, along with the frequency of each verb in the maternal data from the Manchester corpus.

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Transcription and scoring

All child utterances (repetitions of the experimenter and spontaneous utterances) were again transcribed offline by the first author, and also by a research assistant blind to the hypothesis under investigation. Only utterances that both transcribers agreed contained a 3sg feminine pronoun subject (*her* or *she*) were included in further analyses. This resulted in the exclusion of 13 utterances with no subject, eight with *he* as subject, and three with *they* as subject. In order to maximize the amount of data available, all sentences produced during the screening procedure that had *her* or *she* as subject were also included.

The two transcripts differed crucially (i.e. with regard to the form of the pronoun used, and the presence or absence of agreement) for 17 out of 126 utterances. After subsequent re-listening, the transcribers were able to reach agreement for all but three of these 17 utterances, which were excluded from the analysis.

The remaining 123 utterances were scored for the identity of the subject pronoun (*she* or *her*), and as to whether or not verb agreement was unambiguously present on either the main verb (*-s*) or auxiliary (*is*/-'*s*….*ing*). Forms for which agreement marking is ambiguous (e.g. *Her played* [Alan]) were scored as non-agreeing. To allow us to investigate whether children show a different pattern of subject case and agreement marking for lexical main verbs and auxiliaries, utterances were also classified according to whether the target utterance (defined as the utterance that the child was attempting to imitate) included agreement marking on a lexical main verb or an auxiliary. The target was defined relative to the experimenter's utterance because it is not always possible to determine from an isolated child utterance whether a lexical main verb or auxiliary + present progressive form was intended.

Following the procedures outlined in Pine *et al*. (2005) we then calculated for each child (collapsing across main verb and auxiliary agreement):

1. The expected frequencies of nominative (*she*) and non-nominative (*her*) subjects with agreeing and non-agreeing verb forms. Expected frequency = Row Total × Column Total/Grand Total. This provides an estimate of the number of nominative and non-nominative subjects with and without agreement-marked verbs that would be expected to occur by chance (i.e. if the two were not related in the data).
2. The observed rate of agreeing verb forms with a non-nominative subject (*her*) = Observed frequency of agreeing verb forms with a non-nominative subject (*her*)/Observed frequency of agreeing verb forms in total (with either *her* or *she* as subject).
3. The expected rate of agreeing verb forms with a non-nominative subject (*her*). This is calculated in the same way as 2, except that the

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expected frequency (from 1), rounded up to the nearest integer, rather than the observed frequency is used as the numerator.

RESULTS

Table 3 shows the observed and expected frequencies for nominative (*she*) and non-nominative (*her*) subjects with and without unambiguous verb agreement, whether marked on the main verb or auxiliary (data broken down by main/auxiliary verb marking are shown in Table 4). The observed and expected rates at which the non-nominative subject (*her*) was used with an agreement-marked verb form are also shown.

It is immediately striking that all five children produced at least one non-nominative (*her*) subject with an agreement-marked verb form (all such utterances are shown in the Appendix). Recall however, that the central prediction of the ATOM is that children will not produce such utterances at a rate of above 10% (representing 'noise' in the data). Binomial tests were calculated to determine which children, if any, would be expected to produce *her* subjects with an agreement-marked verb form at a rate significantly higher than 10%, given the independent frequencies of *her* subjects and verbs marked for agreement in the data (i.e. if such forms were permitted by the child's grammar). As the final column of Table 3 shows, three children, Bob, Chris and Dave, meet this criterion. Further binomial tests were conducted to determine whether, for these three children, the observed rate of *her*+AGR was significantly greater than 10%. As Table 3 shows, this test reached significance at $p = 0{\cdot}01$ or better for all three children. The results of this analysis show, then, that every child who produced enough utterances with *her* in subject position and (independently) with verbs marked for agreement to allow a test of the ATOM to be made produced non-nominative (*her*) subjects with an agreement-marked verb form at a rate significantly greater than can be dismissed as noise in the data.

For the remaining two children, Alan and Emma, the rate of non-NOM+AGR expected by chance if this combination were permitted is not significantly greater than the 10% noise level. In any case, Alan's data could not be expected to provide any support for the ATOM, as the only utterance which displays verb-agreement marking has a non-nominative (*her*) subject. The data for Emma pattern in such a way as to potentially suggest support for the ATOM, as only one of her 11 agreement-marked verb forms has *her* as subject. In fact, this rate (0·09) is not significantly lower than the expected rate (0·26, $p = 0{\cdot}07$) by Fisher's exact test (a test equivalent to a standard Chi square, for use on datasets with low expected cell frequencies). Indeed, for no child was the observed rate of

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TABLE 3. *Observed and expected frequencies for nominative (she) and non–nominative (her) subjects with (+) and without (–) unambiguously agreement-marked verb forms, observed and expected rates of her + agreement-marked verb form, and p values of the binomial tests conducted to compare each of these values to 10%*

		She		Her		Her+ AGR			
	AGR	Observed frequency	Expected frequency	Observed frequency	Expected frequency	Observed rate	Binomial >10%?	Expected rate*	Binomial >10%?
Alan (4;2)	+	0	0·05	**1**	0·95	1/1 (1·00)	$p=0·1$ n.s.	1/1 (1·00)	$p=0·1$ n.s.
	–	1	0·95	20	20·05				
Bob (3;6)	+	2	1·46	**3**	3·54	**3/5 (0·60)**	**$p=0·008$****	**4/5 (0·71)**	**$p=0·0004$*****
	–	5	5·54	14	13·46				
Chris (4;4)	+	0	0	**9**	9·00	**9/9 (1·00)**	**$p<0·0001$*****	**9/9 (1·00)**	**$p<0·0001$*****
	–	0	0	19	19·00				
Dave (4;3)	+	0	0	**2**	2·00	**2/2 (1·00)**	**$p=0·01$****	**2/2 (1·00)**	**$p=0·01$****
	–	0	0	28	28·00				
Emma (4;0)	+	10	8·11	**1**	2·89	1/11 (0·09)	<10%	3/11 (0·26)	$p=0·09$ n.s.
	–	4	5·89	4	2·11				

* The common fraction denotes the expected frequency of *her*+AGR, rounded up to the nearest integer, divided by the total number of utterances containing a verb marked for agreement (the numbers used in the binomial test). The decimal fraction (in parentheses) is calculated in the same way using the non-rounded expected frequency of *her*+AGR.

TABLE 4. *Agreeing and non-agreeing auxiliaries and lexical main verbs by pronominal subject case*

		AGR on AUX		AGR on main verb		Total	
		She	Her	She	Her	She	Her
Alan	AGR+	0	0	0	1	0	1
	AGR−	1	11	0	9	1	20
Bob	AGR+	1	0	1	3	2	3
	AGR−	5	8	0	6	5	14
Chris	AGR+	0	0	0	9	0	9
	AGR−	0	14	0	5	0	19
Dave	AGR+	0	0	0	2	0	2
	AGR−	0	15	0	13	0	28
Emma	AGR+	4	1	6	0	10	1
	AGR−	3	2	1	2	4	4

non-NOM+AGR significantly different (by Fisher's exact test) to that expected by chance if such forms were permitted by the child's grammar.

Table 4 shows the results broken down by main and auxiliary verb marking. It is notable that, displaying the opposite pattern to Becky and Gail (Pine *et al.*, 2005), 15 of the 16 agreement-marked verbs which occurred with non-nominative subjects in the present study were lexical main verbs. Thus it cannot be the case that the apparent non-NOM+AGR errors observed were in fact *hers* (genitive pronoun) for *she* errors (a possibility for sentences such as *Her-'is playing*).

DISCUSSION

Under the agreement/tense omission model, when a child produces an utterance containing a verb form unambiguously marked for both tense and agreement (e.g. *play-s*), this demonstrates that agreement is present in the child's representation of the utterance. This being the case, it is simply not possible for the grammar to fail to assign nominative case to the subject (e.g. *she*). The model therefore predicts that non-nominative subjects with agreement-marked verb forms will occur at a rate of 'essentially zero, modulo noise in the data' (Schutze, 2001: 508).

Whilst, at first glance, this prediction would seem to be borne out by the available naturalistic data, closer inspection reveals that the majority of children for whom data is available do not independently produce non-nominative subjects or agreement-marked verb forms with sufficient frequency that the non-predicted forms would be observed even if they were permitted by the child's grammar. As Pine *et al.* (2005) demonstrate,

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when statistical analysis is used to isolate those children for whom non-nominative subjects and agreement-marked verb forms are independently sufficiently frequent that they would be expected, by chance, to occur together in significantly more than 10% of relevant contexts (an arbitrary level of acceptable 'noise' in the data), we find that children, almost without exception, do produce non-NOM+AGR forms at rates significantly higher than 10%.

Mirroring the results of Pine *et al*. (2005), the present study found that children who make both sufficient use of verb-agreement marking and produce a sufficient number of non-nominative subjects to allow a test of the ATOM to be made do not support the predictions of the model. For each of these children (three of the five tested) the rate of non-nominative subjects with agreement-marked verb forms was significantly greater than could reasonably be dismissed as noise. Furthermore, for no child was the rate of non-NOM+AGR significantly different to the rate that would be expected by chance, given the independent frequencies of non-nominative subjects and agreement-marked verb forms.

One possible objection to the interpretation of the results presented here is that since neither Chris nor Dave produced a single nominative subject (*she*) over the course of the study, these children might have yet to acquire this lexical form. Schutze (2001) argues that the ATOM cannot be tested a child who has not acquired the relevant nominative form (in this case *she*) since, for such a child, '*her* would effectively be the child's NOM form … because she knows it is a 3sg feminine pronoun and she has not yet learned any other forms that express that meaning' Schutze (2001: 509).

This issue is easily resolved for Dave, who produced the utterance 'She [/] her getting her clothes' (for 'She is getting ready'). Whilst this utterance was clearly a re-tracing, and so was scored as *her+non-agreeing verb*, it demonstrates that this child has at least some knowledge of the lexical item *she*, and is capable of producing it in a relevant context.[1] Chris did not produce the form *she* over the course of the study. Whilst it may seem unlikely that a child aged 4;4 would have yet to acquire so frequent a lexical item as *she*, since we cannot rule out this possibility, Chris's data remain equivocal.

One could also argue that the results of the present study are not meaningful because they are based on data from only a handful of children

[1] Since Schutze (2001) offers no criterion for acquisition of a particular pronoun form (or definition of ''productive inventory'', p. 507) it is not possible to say whether or not this single use of *she* constitutes evidence that Dave had ''acquired the relevant nominative form'' (Schutze, 2001: 509). This issue is complicated by the fact that some children have been observed to produce the form *she* prior to a stage in which *her* is used exclusively in all 3sg feminine pronoun contexts (Rispoli, 2002). Our thanks are due to an anonymous reviewer for helping to clarify this point.

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who are relatively old (indeed well beyond the upper age limit of virtually all other studies that have investigated this phenomenon). Although, of course, a larger sample size is always desirable, the fact remains that, from an original cohort of 24 participants, the data from every child who produced a sufficient number of non-nominative subjects, and made sufficient use of verb-agreement marking to allow a test of the ATOM to be made failed to support the model. As argued in Pine *et al*. (2005), it is actually rather difficult to find children who independently produce enough agreement-marked verbs and non-nominative subjects to allow the model to be tested (i.e. to give an expected error rate significantly greater than a level that could be dismissed as noise in the data). This implies that the model derives much of its credibility from the fact that there exist few children whose data could disconfirm the model, even if it were incorrect.

A similar point can be made with respect to the age of our participants. If we had used younger participants, we would presumably have found more non-nominative subject errors (only two children used *her* exclusively throughout the study), but fewer verb forms correctly marked for agreement. If we had used older participants, we would presumably have found fewer non-nominative subject errors, but more verb forms correctly marked for agreement (no child displayed 100% agreement). Again, the implication is that the ATOM derives much of its credibility from the likelihood that non-nominative subject errors, and correct verb marking show different, if overlapping, developmental time-courses. If, as in the present study, and that of Rispoli (1999), we 'catch' children in the period in which they are still making non-nominative subject errors but have begun to use a good deal of verb agreement, we find that they combine the two in a single utterance about as often as one would expect given their independent frequencies.

A final potential criticism is that the method of elicited imitation is not a good measure of children's grammatical competence, at least in the area of case assignment or tense/agreement marking. It could be, for example, that non-NOM+AGR errors were a consequence of children simply repeating the experimenter's utterances verbatim, replacing the item *she* with *her*; the item which they ''prefer'' to use to refer to a female subject (perhaps because it has greater representational strength, having been used by children frequently in their own productions, and ''doing double duty'' (Rispoli, 1998: 550) as a possessive pronoun). Whilst, of course, it is not possible to rule out this objection entirely, two observations do not sit comfortably with this view. The first is that non-agreeing verb forms were still produced with much greater frequency than agreeing verb forms throughout, even for those children whose results are inconsistent with the predictions of the ATOM (Bob, 19 non-agreeing vs. 5 agreeing; Chris, 19 vs. 9, Dave 28 vs. 2). If children were simply repeating the experimenter's

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utterances verbatim and sometimes substituting *her* for *she*, it is difficult to see why they would mostly omit verb agreement. There would not seem to be anything about the elicited imitation paradigm that makes the omission of verb-agreement marking more likely, as similar levels of agreement (non-)marking are observed in naturalistic data (e.g. Pine *et al*., 2005).

Perhaps more importantly, our findings are entirely consistent with those of previous studies that have used naturalistic or quasi-experimental methods. The naturalistic data from Pine *et al*. (2005) and, when they are appropriately analysed, from Schutze & Wexler (1996; see reanalysis in Pine *et al*., 2005) demonstrate that non-NOM+AGR errors are produced too often to be reasonably disregarded as noise in the data. Both studies also report that non-nominative subject errors are more frequent for *she/her* than any other pronoun paradigm, consistent with the findings of our screening procedure. Our findings are also similar to those of Rispoli (1999), who observed 37 non-NOM+AGR errors, all but one with *her*, in a quasi-experimental study.

It does not seem, then, that there is anything about the method of elicited imitation that particularly encourages the production of non-NOM+AGR errors. Indeed, it could be argued that, since the experimenter supplied the correct form of the pronoun and agreeing auxiliary or main verb in each case, the method used in the present study might actually be expected to reduce the rate of such errors by comparison with more naturalistic investigations. Furthermore, if it were the case that the *her*+AGR errors observed in the present study were caused by children simply substituting the lexical item *her* for *she*, with no higher-level syntactic processes involved, then this explanation could, in principle, be applied to all non-nominative subject errors, undermining the need for formal models such as the ATOM.

On the other hand, one specific advantage of the elicited production paradigm is that it allows us to rule out a potential objection to the study of Pine *et al*. (2005). Recall that a potential objection to this study was that, for Becky and Gail, the majority of non-NOM+AGR errors were of the form *her+contracted copula/auxiliary is* (as opposed to a lexical main verb), raising the possibility that such utterances were, in fact *hers* (genitive pronoun) for *she* errors. The same objection cannot be applied to the results of the present study, which exhibit the converse pattern (see Table 4). With the exception of a single utterance produced by Emma, all non-NOM+AGR utterances featured agreement on the lexical main verb. Why should this be? Wilson (2003) argues that children acquire lexically specific subject+auxiliary chunks (e.g. *she+is*) directly from their input. If this is the case, then knowledge of these chunks might be expected to protect auxiliary verbs from non-nominative subject errors, especially for

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the relatively old children in the present study, who would have had plenty of opportunity to acquire a *she+is* chunk (but presumably not a *her+is* chunk, since this combination will be extremely infrequent in the input). Lexical main verbs, under such an account, would not be protected from non-nominative subject errors, as, since there are many more different lexical main verbs than auxiliaries, any particular subject+lexical main verb combination will be likely to be far less frequent in the input than common subject+auxiliary combinations, and hence will be less likely to be acquired as a chunk.

The present study then provides support not only for the analysis of Pine *et al*. (2005) but also for the technique of elicited imitation as a tool for assessing children's grammars. This study has demonstrated that elicited imitation can be used to assess children's knowledge of structures that may appear only infrequently in naturalistic corpora (e.g. agreeing 3sg present tense lexical main verbs), and produces results that are consistent with those obtained using different paradigms. Lust and colleagues (Lust, Flynn & Foley, 1996; Lust, Flynn, Foley & Chien, 1999; Santelmann, Berk, Austin, Somashekar & Lust, 2002) have argued that 'in order for a child to 'imitate' a sentence, the child must analyse and reconstruct the grammatical structure of the sentence' and that imitation 'reflects the linguistic (syntactic and semantic) analysis of the model the child is reconstructing (Santelmann *et al*., 2002: 822). The (perhaps surprising) finding of the present study that some children were not able to successfully imitate such simple sentences as *She draws a picture* or *She has breakfast* provides strong support for the view that the elicited imitation task does not draw on a simple passive copying mechanism. Utterances such as *Her draws a picture* or *Her has breakfast* presumably occur when the child forgets (or fails to register) the actual words used by the experimenter but recalls the meaning of the utterance that is to be repeated, and constructs her own utterance in the same way as if she was producing an entirely novel utterance. The implication is that the elicited imitation paradigm provides a sensitive measure of children's grammatical knowledge, and has the advantage that it can be used to investigate errors (such as non-NOM+AGR) that have low expected frequencies in naturalistic or even elicited production data (one example might be raising errors with negative questions, e.g. *What doesn't he likes?*).

In conclusion, the present study has shown that an experimental paradigm that has not been previously used to investigate the relationship between agreement and case marking – that of elicited imitation – produces results that, when the data are appropriately analysed, corroborate the findings of quasi-experimental (Rispoli, 1999) and naturalistic studies (Schutze & Wexler, 1996; Pine *et al*., 2005). These data show that when the agreement/tense omission model is tested against data from children

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who independently produce sufficiently high rates of verb-agreement marking and of non-nominative subjects to allow a test of the model to be made, there is not one child whose data support the prediction of the ATOM that agreement-marked verbs will not occur with non-nominative subjects.

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APPENDIX

UTTERANCES IN WHICH CHILDREN USED A NON-NOMINATIVE (HER) SUBJECT WITH AN AUXILIARY OR MAIN VERB FORM BEARING TENSE/AGREEMENT

Child	Non-NOM subject + AGR marked verb
Alan	Her draws a picture
Bob	Every day her draws a picture (screening procedure)
Bob	Every day her hits a ball (screening procedure)
Bob	Her draws a picture
Chris	Her comes downstairs
Chris	Her has breakfast
Chris	Her looks pretty
Chris	Her opens the door
Chris	Her draws a picture
Chris	Her makes the tea
Chris	Her sits on the carpet quietly
Chris	Her plays with another children
Chris	Her eats lunch
Dave	Her comes downstairs
Dave	Her looks happy
Emma	Her's drawing a picture

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