

Tense over time: testing the Agreement/Tense Omission Model as an account of the pattern of tense-marking provision in early child English*

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ABSTRACT

The Agreement/Tense Omission Model (ATOM) predicts that English-speaking children will show similar patterns of provision across different tense-marking morphemes (Rice, Wexler & Hershberger, 1998). The aim of the present study was to test this prediction by examining provision rates for third person singular present tense and first and third person singular forms of copula BE and auxiliary BE in longitudinal data from eleven English-speaking children between the ages of 1;10 and 3;0. The results show, first, that there were systematic differences in the provision rates of the different morphemes; second, that there were systematic differences in the rate at which all of the three morphemes were provided with pronominal and lexical subjects; and, third, that there were systematic differences in the rate at which

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copula BE and auxiliary BE were provided with the third person singular pronominal subjects *It* and *He* and the first person singular subject pronoun *I*. These results replicate those of Wilson (2003), while controlling for some possible objections to Wilson's analysis. They thus provide further evidence against the generativist view that children's rates of provision of different tense-marking morphemes are determined by a single underlying factor, and are consistent with the constructivist view that children's rates of provision reflect the gradual accumulation of knowledge about tense marking, with much of children's early knowledge being embedded in lexically specific constructions.

INTRODUCTION

It is a well-established fact that children learning English often fail to produce tense-marking morphemes in contexts in which they are obligatory in adult speech (Cazden, 1968; Brown, 1973). Thus, there is a stage of development during which English-speaking children produce correct utterances such as those in (1a), (1b) and (1c) (which include appropriately realized contexts for third person singular copula BE, third person singular auxiliary BE and third person singular present tense respectively) alongside incorrect utterances such as those in (2a), (2b) and (2c) (in which the same morphemes appear to have been omitted).

- | | |
|-----------------------------|-------------------------|
| (1a) She <u>is</u> naughty | (2a) He a good boy |
| (1b) He <u>is</u> coming | (2b) She <u>jumping</u> |
| (1c) He <u>likes</u> apples | (2c) That go there |

Traditionally, this phenomenon has been interpreted in terms of the gradual acquisition of the relevant morphemes. For example, Brown (1973) assumed that the children in his study had not achieved full mastery of a particular morpheme until they met the criterion of producing it in 90% of obligatory contexts in three successive transcripts. However, more recent generativist accounts assume that children's knowledge of tense-marking morphemes is essentially adult-like from the earliest observable stages and that children's failure to produce such morphemes in obligatory contexts can be explained in terms of the way that this knowledge interacts with other aspects of the child's grammatical system.

Perhaps the most influential account of this kind is Wexler's (1994) Optional Infinitive Hypothesis, which has since been developed into the Agreement/Tense Omission Model (ATOM) (Schütze & Wexler, 1996; Wexler, 1998). According to this model, by the time children begin to produce multiword utterances, they already know how to mark tense and agreement in their speech. However, they are governed by a Unique Checking Constraint (UCC) that is 'genetically specified (and withering

away in time)' (Wexler, 1998: 27). The Unique Checking Constraint impacts on the child's ability to check the subject of the sentence against the abstract features of Tense and Agreement so that these features can be optionally under-specified in the underlying representation of the sentence. The result is that the child sometimes produces non-finite verb forms (forms that are not marked for tense or agreement) in contexts in which tensed verb forms are required, and hence fails to provide tense-marking morphemes in contexts where they would be obligatory in adult speech.

One of the strengths of the ATOM is that it can be used to explain data not only from typically developing children, but also from children with Specific Language Impairment (SLI). Children with SLI have been found to mark tense inconsistently for longer than language-matched controls (Johnston & Schery, 1976; Rice, Wexler & Cleave, 1995; see Leonard (1998) for a review). Rice *et al.* (1995) argue that the pattern of tense-marking error in children with SLI reflects the fact that they are caught in an Extended Optional Infinitive (EOI) stage that is hypothesized to differ from the Optional Infinitive (OI) stage in typically developing children only in that it extends over a more protracted period of development. However, as Rice, Wexler & Hershberger (1998) point out, a central prediction of the ATOM is that, since the failure to provide different tense-marking morphemes is assumed to reflect a single underlying factor, children should show similar patterns of provision across different tense-marking morphemes – and hence that 'growth curves for individual morphemes should be highly similar to each other and to a composite measure' (Rice *et al.*, 1998: 1417). Rice *et al.* (1998) present group data from both typically developing children and children with SLI that appear to be consistent with this prediction. However, in a more recent study, Wilson (2003) reports data from five of the most extensive individual datasets for typically developing children in the Child Language Data Exchange System (MacWhinney, 2000) that seem to undermine this claim.

Wilson (2003) reports a number of effects that seem to count against the ATOM. First, he reports significant within-subject differences in the rate at which the children in his study provided copula BE, auxiliary BE and third person singular present tense. Thus, all five of the children showed significant differences in provision rates for at least two of the three possible comparisons, though the pattern of effects was different in the speech of different children. For example, for Adam the pattern of effects was copula BE > third person singular present tense > auxiliary BE, for Eve the pattern of effects was third person singular present tense > copula BE > auxiliary BE, and for Nina the pattern of effects was copula BE > auxiliary BE > third person singular present tense. These differences are taken by Wilson as evidence against the claim that children show similar patterns of provision across different tense-marking morphemes and hence against

the view that the failure to provide different tense-marking morphemes reflects a single underlying factor such as the Unique Checking Constraint.

Second, Wilson reports significant within-subject differences in the rate at which children provided third person forms of copula BE and auxiliary BE with pronominal and lexical subjects. Thus, four of the five children provided third person forms of copula BE at significantly higher rates with pronominal subjects (e.g. *He's asleep*) than with lexical subjects (e.g. *Baby asleep*), and three of the five children provided third person forms of auxiliary BE at significantly higher rates with pronominal subjects (e.g. *He's coming*) than with lexical subjects (e.g. *Daddy coming*). These effects are interpreted by Wilson as evidence against the view that young children have adult-like knowledge of the relevant tense-markers, and in favour of the view that children's early use of copula BE and auxiliary BE reflects partial knowledge of the relevant tense-marking morphemes embedded in lexically specific constructions such as 'That's + NP' or 'He's + V-ing' (e.g. Peters, 1997; Pine, Lieven & Rowland, 1998; Tomasello, 2000*a, b*). Third, Wilson reports significant within-subject differences in the rate at which children provided copula BE and auxiliary BE with different pronominal subjects. Thus, all of the children showed significantly higher rates of provision of copula BE and/or auxiliary BE for some pronouns than for others. For example, Adam provided copula BE at a rate of 92% when the subject was *It* (e.g. *It's a dog*), and at a rate of only 20% when the subject was *I* (e.g. *I'm a good boy*), and Nina provided auxiliary BE at a rate of 82% when the subject was *He* (e.g. *He's coming*) and at a rate of only 9% when the subject was *I* (e.g. *I'm coming*). Since these effects cannot be explained in terms of a general advantage for pronominal over lexical subjects, they are taken by Wilson as providing particularly strong support for the view that children's knowledge of copula BE and auxiliary BE is embedded in lexically specific constructions.

On the face of it, Wilson's results seem to provide strong evidence against the ATOM, and in favour of a constructivist model of the development of inflection. However, there are a number of possible objections to this interpretation of the data. First, although the differences in levels of morpheme provision reported by Wilson seem to count against the view that the failure to provide different tense-marking morphemes reflects a single underlying factor, this interpretation appears to reflect a much stronger reading of the prediction that 'growth curves for individual morphemes should be highly similar to each other and to a composite measure' than Rice *et al.* actually intend. Indeed, in a later section of their paper, Rice *et al.* (1998) explicitly reject the idea that the OI and EOI hypotheses predict that children will provide different tense-marking morphemes at the same rate at particular points in development on the grounds that children's actual levels of provision are likely to reflect a

complex interaction between the under-specification of tense and/or agreement and differences in the properties of the morphemes that express these grammatical features (e.g. whether they occur as affixes or as free-standing morphemes, whether or not they are contractible and whether or not they move in question formation). The implication is that, contrary to Wilson's claims, the within-subject differences in the rate at which subjects provided different tense-marking morphemes do not count directly against the ATOM (see also Hadley & Rice, 1996; Cleave & Rice, 1997; Rice, Wexler, Marquis & Hershberger, 2000).

Second, although the lexical/pronominal and between-pronoun effects reported by Wilson appear to suggest that children's early use of copula BE and auxiliary BE is embedded in lexically specific constructions, there are alternative possible explanations for both types of effect that reflect potential problems with the way in which the data were coded in Wilson's study. On the one hand, an obvious problem with the pronominal/lexical effects reported by Wilson is that they are based on measures from which utterances with non-nominative subjects (e.g. *Him naughty* and *Her jumping*) were systematically excluded. According to the ATOM, non-nominative subject pronouns (e.g. *Him* and *Her*) are produced in place of nominative subject pronouns (e.g. *He* and *She*) when Agreement (AGR) is under-specified in the underlying representation of the sentence. This means that, according to the ATOM, utterances with non-nominative subjects constitute a particular subset of utterances with pronominal subjects from which the agreeing verb forms examined by Wilson are necessarily absent (though see Pine, Rowland, Lieven & Theakson (2005) for some counter-evidence to this claim). This raises the possibility that the exclusion of such utterances may have artificially inflated provision rates for pronominal versus lexical subjects by removing utterances in which AGR was under-specified from the pronominal measures (because they had non-nominative subjects), but not from the lexical measures (where under-specification of AGR would not have any observable effect on the children's choice of subject). If this turned out to be the case, it could, in principle, explain the pronominal/lexical effects reported by Wilson in a way that is consistent with the ATOM.

On the other hand, an obvious problem with the between-pronoun effects reported by Wilson is that they were based on measures that did not control for lexical knowledge of the relevant morphemes. Thus, it is important to realize that, since under any theory of inflectional development, individual tense-marking morphemes have to be learned, the ATOM only makes predictions about children's use of tense-marking morphemes that are already present in the children's productive lexical inventories. However, when computing provision rates for utterances with different pronominal subjects, Wilson did not control for possible differences in the point at

which children began to use different forms of copula BE and auxiliary BE. It is therefore possible that the between-pronoun effects reported by Wilson might reflect early differences in children's knowledge of these different lexical forms. For example, it could be that Adam's significantly higher rates of provision for copula BE with *It* subjects than with *I* subjects reflected the fact that there was an early stage during which he knew the third person singular form *is* but did not know the first person singular form *am*. If this turned out to be the case, it could, in principle, explain the between-pronoun effects reported by Wilson in a way that is consistent with the ATOM.

In fact, Wilson (2003) explicitly discusses both of these potential problems and concludes that they are unlikely to be responsible for the pattern of effects observed. However, given the difficulty of anticipating how potential confounds might interact with each other in the course of development, it is difficult to evaluate this conclusion without controlling more directly for the relevant factors. The present study therefore represents an attempt to replicate Wilson's analysis on a different group of English-speaking children, while explicitly controlling for the possible objections identified above. This will be done, first, by comparing children's provision rates for third person singular present tense and third person singular forms of copula BE and auxiliary BE during three developmental periods, starting at the point at which each child had produced at least two correct instances of each of these forms; second, by comparing children's provision rates for third person singular copula BE and third person singular auxiliary BE in contexts with lexical and pronominal subjects (including non-nominative subjects); and third, by comparing children's provision rates for copula BE and auxiliary BE with the third person singular pronominal subjects *It* and *He* and the first person singular subject *I* during a period starting at the point at which each child had produced at least two correct instances of each of the relevant forms of copula BE and auxiliary BE. In line with Wilson's conclusions, it is predicted that, even after these stringent controls have been applied, it will not only be possible to find systematic differences in the provision rates of the different morphemes, but also significant pronominal/lexical effects and significant differences in the provision rates for utterances with *It*, *He* and *I* as subject.

METHOD

Participants

Participants in the study were 12 typically developing English-speaking children (6 boys and 6 girls). These children were recruited through advertisements in local newspapers, nurseries and doctors' surgeries and

were audio-recorded at home for one hour twice every three weeks over a period of twelve months. At the beginning of the study their ages ranged from 1;8.22 to 2;0.25 and their MLUs in words from 1.06 to 2.05. At the end of the study, their ages ranged from 2;8.15 to 3;0.10 and their MLUs in words from 2.53 to 3.73.

Speech corpora

All of the audio-recordings were orthographically transcribed in CHAT format according to the conventions of the Child Language Data Exchange System (MacWhinney, 2000), and are now publicly available via the CHILDES website at <http://chilides.psy.cmu.edu/> as the Manchester corpus (Theakston, Lieven, Pine & Rowland, 2001).

For the purposes of the present study, only a subset of the Manchester corpus was analyzed. That is to say, the full set of transcripts was used to identify the developmental point at which each of the children had produced at least two different utterances including each of the morphemes of interest (i.e. third person singular copula BE, third person singular auxiliary BE and third person singular present tense agreement). Provision measures were then derived from this point onwards. This procedure was designed to ensure that all of the data that were analyzed were taken from periods when the children were already using all of the relevant morphemes. It should be noted that since the ATOM only makes predictions about the frequency with which children will provide morphemes once those morphemes are present in their productive lexical inventories, this restriction is necessary if a proper test of the ATOM is to be made. However, applying this restriction meant that one of the children (Ruth) had to be excluded from all of the analyses because she only began to provide instances of third person singular agreement within the last few transcripts, and therefore did not provide enough relevant data to allow a meaningful analysis.

In addition to controlling for lexical knowledge of the relevant morphemes, the length of the corpora on which the provision measures were based was also controlled. Analysis was restricted to a six-month period beginning at the point at which each of the children had produced at least two instances of each of the morphemes of interest since this was the longest period for which data were available for all eleven children.

Analyses of provision

Table 1 presents descriptive statistics for the corpora of the eleven children who were included in the analyses. Each of the corpora described in Table 1 was split into three sub-corpora of equal length (i.e. 3 × 2 month

TABLE 1. *Descriptive statistics for the eleven speech corpora analyzed in the present study*

Participants	Age range	MLU range (in words)	Number of hours
Anne	1;11.4-2;5.4	1.58-2.30	20
Aran	2;5.3-2;10.28	2.80-3.05	17
Becky	2;4.19-2;10.25	2.11-2.43	19
Carl	1;11.15-2;5.13	1.91-3.24	18
Dominic	2;5.8-2;10.16	1.80-2.33	15
Gail	2;1.8-2;7.13	1.82-2.65	19
Joel	2;3.4-2;9.0	2.11-2.31	18
John	2;2.21-2;8.21	1.82-2.56	19
Liz	2;2.9-2;8.14	1.87-2.93	18
Nicole	2;6.11-3;0.10	2.05-2.76	19
Warren	2;0.17-2;6.23	2.15-3.52	19

periods). These subcorpora were then coded for the presence or absence of third person singular copula BE, third person singular auxiliary BE and third person singular present tense in obligatory contexts. A subset of the transcripts was also coded for the presence or absence of copula BE and auxiliary BE with the pronominal subjects *It*, *He* and *I* (i.e. all transcripts from the point at which each child had produced two instances of both first and third person singular forms of copula and auxiliary BE).

Utterances were coded according to the following criteria. First, only fully intelligible utterances were coded; all utterances with unintelligible portions were excluded. Second, only declaratives were coded; all imperatives and interrogatives were ignored. Third, imitations and self-repetitions were excluded, as were fragments of songs, stories and nursery rhymes. Obligatory contexts for third person singular copula BE were defined as clauses with a third person singular subject that required a copula and appeared, according to context, to have present reference. Obligatory contexts for third person singular auxiliary BE were defined as clauses with a third person singular subject, and a main verb marked with progressive *-ing* that appeared to have present reference. Obligatory contexts for third person singular present tense were defined as clauses with a third person singular subject and a main verb that appeared to refer to a state or a habitual event. Instances of all of the above contexts were also coded for subject type (i.e. whether the subject was a pronoun or a lexical NP). Contexts with non-nominative subjects (e.g. *Him coming*, *Her like it*) were included in the analysis. However, contexts with missing subjects (e.g. *Naughty*, *Coming*, *Go there*) were excluded, as were contexts with VP ellipsis (e.g. *Yes he is*, *No I'm not*).

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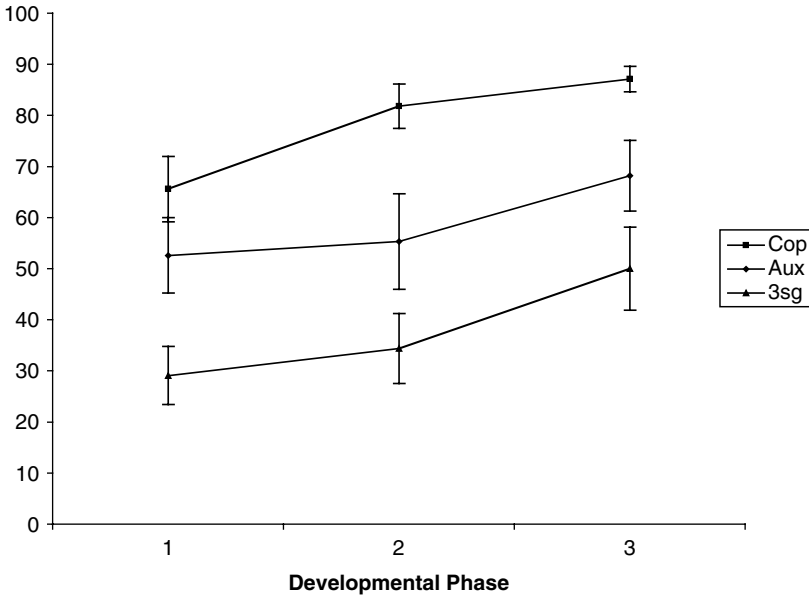


Fig. 1. Mean levels of provision of third person singular copula BE, third person singular auxiliary BE and third person singular present tense.

Coding reliability was assessed by having a second independent researcher re-code sixty-eight one-hour transcripts. The overall level of agreement was a satisfactory 98.6% ($\kappa=0.92$). The coded transcripts were then used to calculate provision measures for each of the morphemes of interest. It should be noted that all of the provision measures used in the present study were based on at least five obligatory contexts (Bedore & Leonard, 2001), though most of the measures were based on a considerably larger number of contexts. For the developmental analysis (see Figure 1), the mean numbers of contexts for third person singular copula BE were $M=197.3$ ($SD=113.0$) during Phase 1; $M=191.6$ ($SD=134.8$) during Phase 2; and $M=207.1$ ($SD=71.4$) during Phase 3. The mean numbers of contexts for auxiliary BE were $M=37.2$ ($SD=15.9$) during Phase 1; $M=51.5$ ($SD=40.8$) during Phase 2; and $M=53.0$ ($SD=43.8$) during Phase 3. The mean numbers of contexts for third person singular present tense were $M=30.7$ ($SD=20.3$) during Phase 1; $M=31.0$ ($SD=24.8$) during Phase 2; and $M=30.8$ ($SD=24.5$) during Phase 3. Details of the number of contexts on which all of the subsequent provision measures are based are provided in the relevant tables.

RESULTS

Figure 1 presents data on the mean percentage provision of each of the three tense-marking morphemes in each of the three developmental phases for the eleven children. It can be seen from Figure 1 that, although the levels of provision of all of the three morphemes increased steadily as a function of developmental phase, there were also substantial differences in the levels of provision of the different morphemes, with the children providing third person singular copula BE at higher rates than third person singular auxiliary BE, and third person singular auxiliary BE at higher rates than the third person singular present tense inflection during all three developmental phases.

These data were entered into a 3×3 analysis of variance with morpheme and developmental phase as within subject variables. The ANOVA revealed a significant main effect of morpheme ($F(2, 20) = 44.31$, $p < 0.001$; partial eta squared = 0.82) and a significant main effect of developmental phase ($F(2, 20) = 22.80$, $p < 0.001$; partial eta squared = 0.70), but no significant interaction between morpheme and developmental phase ($F(4, 40) = 1.07$, $p > 0.30$; partial eta squared = 0.10). Scheffe post hoc analyses revealed significant increases in rate of provision between Phase 1 and Phase 3 ($M = 49.1\%$ versus $M = 68.4\%$, $F = 45.17$, $p < 0.001$), Phase 1 and Phase 2 ($M = 49.1\%$ versus $M = 57.1\%$, $F = 7.79$, $p < 0.05$), and Phase 2 and Phase 3 ($M = 57.1\%$ versus $M = 68.4\%$, $F = 15.45$, $p < 0.01$). They also revealed that the children provided copula BE at significantly higher rates than third person singular present tense ($M = 78.2\%$ versus $M = 37.8\%$, $F = 88.59$, $p < 0.001$), copula BE at significantly higher rates than auxiliary BE ($M = 78.2\%$ versus 58.7% , $F = 20.70$, $p < 0.001$), and auxiliary BE at significantly higher rates than third person singular present tense ($M = 58.7\%$ versus $M = 37.8\%$, $F = 23.64$, $p < 0.001$).

These results show that even after controlling for lexical knowledge of the relevant inflections, there are still systematic differences in the rate at which typically developing children provide third person singular forms of copula BE, third person singular forms of auxiliary BE and the third person singular present tense inflection in obligatory contexts. They thus provide further evidence against the strong form of the ATOM tested by Wilson (2003). On the other hand, they are obviously also consistent with the weaker form of the ATOM advocated by Rice *et al.* (1998), according to which provision rates reflect a complex interaction between the under-specification of Tense and/or Agreement and differences in the properties of the morphemes that express these grammatical features.

Figure 2 presents the data provided in Figure 1 broken down by individual child. It can be seen from Figure 2 that the group means hide considerable variation in the children's provision rates. However, it can also be seen

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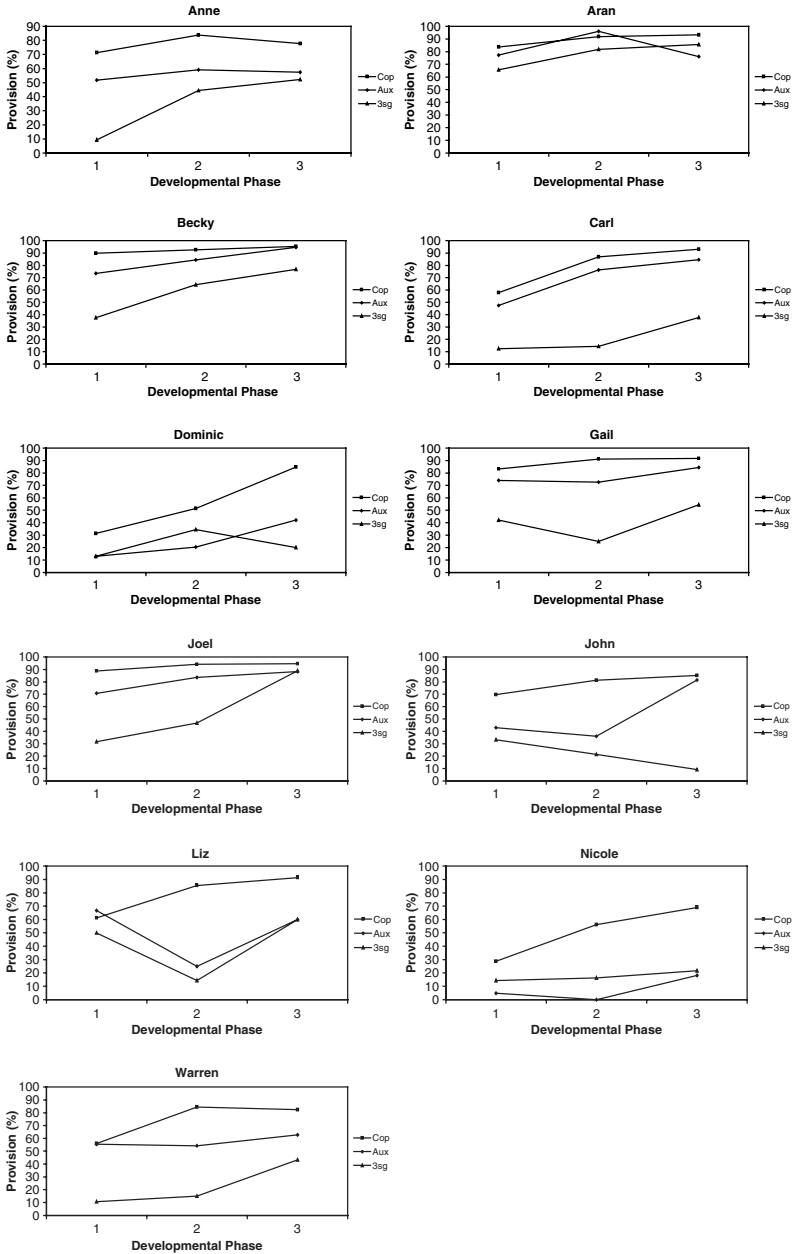


Fig. 2. Individual data on levels of provision of third person singular copula BE, third person singular auxiliary BE and third person singular present tense.

TABLE 2. *Levels of provision of third person singular copula BE, third person singular auxiliary BE, and third person singular present tense*

	Copula % (contexts)	Auxiliary % (contexts)	3sg present % (contexts)	Copula vs. 3sg present	Copula vs. auxiliary	Auxiliary vs. 3sg present
Anne	77.6 (469)	56.1 (157)	30.2 (106)	$p < 0.01$	$p < 0.01$	$p < 0.01$
Aran	88.4 (533)	82.0 (89)	76.4 (89)	$p < 0.01$	n.s.	n.s.
Becky	92.4 (696)	87.1 (140)	58.1 (43)	$p < 0.01$	$p < 0.05$	$p < 0.01$
Carl	78.1 (1284)	76.9 (350)	22.8 (145)	$p < 0.01$	n.s.	$p < 0.01$
Dominic	52.6 (576)	19.7 (127)	23.5 (68)	$p < 0.01$	$p < 0.01$	n.s.
Gail	89.1 (411)	77.8 (81)	40.5 (42)	$p < 0.01$	$p < 0.01$	$p < 0.01$
Joel	92.7 (751)	81.7 (120)	55.8 (52)	$p < 0.01$	$p < 0.01$	$p < 0.01$
John	80.0 (489)	56.1 (66)	21.7 (60)	$p < 0.01$	$p < 0.01$	$p < 0.01$
Liz	77.4 (464)	52.9 (68)	40.0 (20)	$p < 0.01$	$p < 0.01$	n.s.
Nicole	54.4 (217)	7.4 (108)	17.5 (137)	$p < 0.01$	$p < 0.01$	$p < 0.05$
Warren	76.2 (604)	58.5 (188)	25.1 (199)	$p < 0.01$	$p < 0.01$	$p < 0.01$

that there is little evidence of individual variation in the pattern of effects. These data were analyzed by collapsing across the three developmental phases for each child and using chi-squared (and Fisher's exact in cases where one or more of the cells had an expected frequency of less than 5) to test for differences in the level of provision of the different morphemes in each child's corpus. The results of this analysis are presented in Table 2 from which it can be seen that all of the 11 children provided third person singular copula BE significantly more often than third person singular present tense, 9 of the 11 children provided third person singular copula BE significantly more often than third person singular auxiliary BE, and 8 of the 11 children provided third person singular auxiliary BE significantly more often than third person singular present tense (though one child, Liz, did provide third person singular present tense significantly more often than third person singular auxiliary BE).

These results confirm that the children's ability to provide the three tense-marking morphemes is increasing according to different developmental timetables. However, given that all but one of the significant differences found were in the same direction, they fail to replicate Wilson's finding of considerable individual variation in the pattern of differences between morphemes, and suggest that these developmental timetables are relatively fixed.

Figure 3 provides data on the mean percentage provision of third person singular copula BE, third person singular auxiliary BE and third person singular present tense broken down by whether the subject was a pronoun or a lexical NP. It can be seen from Figure 3 that, despite the inclusion of utterances with non-nominative subjects, there were still substantial differences in rate of provision not only as a function of morpheme, but also

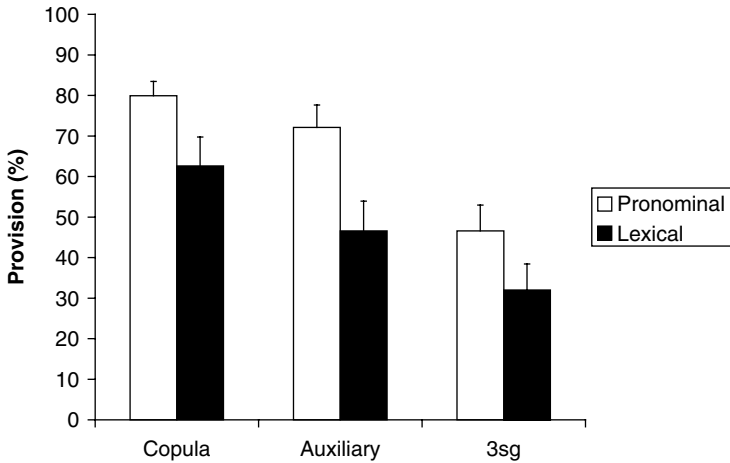


Fig. 3. Mean levels of provision of third person singular copula BE and third person singular auxiliary BE as a function of subject type.

as a function of subject type. These data were entered into a 3×2 analysis of variance with morpheme and subject type as within-subject variables. The ANOVA revealed a significant main effect of morpheme ($F(2, 20) = 33.97$, $p < 0.001$; partial eta squared = 0.77) and a significant main effect of subject type ($F(1, 10) = 38.95$, $p < 0.001$; partial eta squared = 0.80), but no significant interaction between morpheme and subject type ($F(2, 20) = 1.52$, $p > 0.20$; partial eta squared = 0.13). Despite the absence of a significant Morpheme \times Subject Type interaction, Scheffé post hoc analyses were conducted to check that there were significant pronominal/lexical effects for all three morphemes. These analyses revealed a significant pronominal/lexical effect for third person singular copula BE ($M = 79.9$ versus $M = 62.6$, $F = 10.61$, $p < 0.01$), a significant pronominal/lexical effect for third person singular auxiliary BE ($M = 72.1$ versus $M = 46.6$, $F = 23.05$, $p < 0.001$), and a significant pronominal/lexical effect for third person singular present tense ($M = 46.6$ versus $M = 32.0$, $F = 7.57$, $p < 0.05$). These results show that, even when utterances with non-nominative subjects are included in the analysis, children's ability to provide third person singular copula BE, third person singular auxiliary BE and third person singular present tense is dependent not only on the identity of the morpheme itself, but also on the type of subject with which it is to be combined. They are thus consistent with the view that children's levels of provision are boosted by their use of lexically specific constructions such as 'It's + NP', 'He's + V-ing' and 'That + V-s'.

TABLE 3. *Levels of provision of third person singular copula BE, third person singular auxiliary BE, and third person singular present tense as a function of subject type*

	Copula pronominal % (contexts)	Copula lexical % (contexts)	Auxiliary pronominal % (contexts)	Auxiliary lexical % (contexts)	3sg pronominal % (contexts)	3sg lexical % (contexts)
Anne	79.0 (423)*	65.2 (46)	73.8 (65)**	43.5 (92)	41.2 (51)*	20.0 (55)
Aran	88.5 (485)	87.5 (48)	82.3 (62)	81.5 (27)	82.8 (64)*	60.0 (25)
Becky	92.8 (668)	82.1 (28)	92.3 (117)**	60.9 (23)	70.4 (27)*	37.5 (16)
Carl	80.4 (1169)**	54.8 (115)	89.7 (223)**	54.3 (127)	25.5 (102)	16.3 (43)
Dominic	56.7 (517)**	16.9 (59)	40.5 (37)**	11.1 (90)	25.0 (24)	22.7 (44)
Gail	89.1 (396)	86.7 (15)	83.3 (42)	71.8 (39)	77.8 (9)*	30.3 (33)
Joel	93.3 (721)**	76.7 (30)	86.0 (93)*	66.7 (27)	50.0 (40)	75.0 (12)
John	82.1 (448)**	56.1 (41)	77.4 (31)**	37.1 (35)	34.8 (23)	13.5 (37)
Liz	77.8 (437)	70.4 (27)	60.0 (45)	39.1 (23)	33.3 (12)	50.0 (8)
Nicole	62.1 (174)**	23.3 (43)	40.0 (15)**	2.2 (93)	40.9 (22)**	13.0 (115)
Warren	77.0 (543)	68.9 (61)	67.9 (112)	44.7 (76)	30.8 (133)**	13.6 (66)

* pronominal/lexical difference significant at $p < 0.05$, two-tailed.

** pronominal/lexical difference significant at $p < 0.01$, two-tailed.

Table 3 presents the data provided in Figure 3 broken down by individual child. These data were analyzed using chi-squared (and Fisher's exact in cases where one or more of the cells had an expected frequency of less than 5). It can be seen from Table 3 that, in 31 of the 33 relevant comparisons, provision rates were higher for utterances with pronominal than with lexical subjects, and that in 19 of these 31 cases, the difference was statistically significant. These results replicate Wilson's findings, and suggest that, rather than reflecting peculiarities of his coding procedures, the pronominal/lexical effects that he reports are a characteristic feature of children's early use of tense-marking morphemes. They also extend these findings to the third person singular present tense morpheme (since the pronominal/lexical analyses in Wilson's study were restricted to copula and auxiliary BE).

Figure 4 provides data on the mean percentage provision of copula BE and auxiliary BE in contexts with the pronominal subjects *It*, *He* and *I*. It should be noted that these data are based on slightly different sections of each child's corpus than those reported in the previous analyses. This is because, for the purposes of this analysis, contexts were only counted from the point at which each child had produced at least two instances of BOTH the first person singular and third person singular forms of copula BE and auxiliary BE. The use of this criterion also resulted in data from two of the children (John and Nicole) being excluded from the analysis, as these children had still not produced two instances of each of the relevant forms by the end of the study.

It can be seen from Figure 4 that, despite controlling for children's knowledge of the relevant lexical forms, there were still substantial

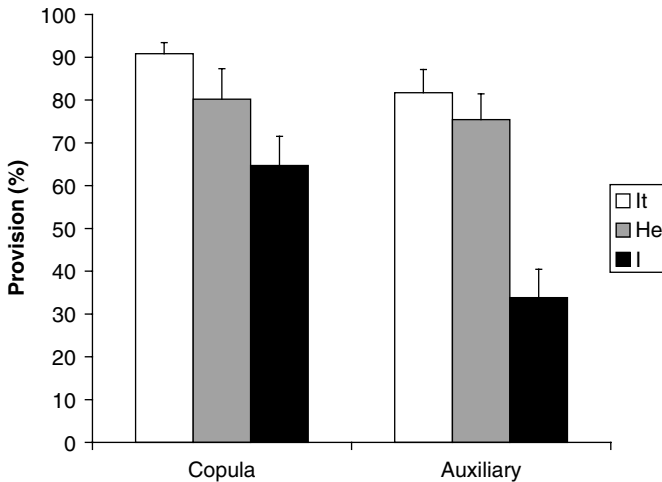


Fig. 4. Mean levels of provision of copula BE and auxiliary BE as a function of whether the subject was *It*, *He* or *I*.

differences in rate of provision not only as a function of morpheme, but also as a function of subject pronoun. These data were entered into a 2×3 analysis of variance with morpheme and subject pronoun as within subject variables. The ANOVA revealed a significant main effect of morpheme ($F(1, 8) = 75.89$, $p < 0.001$; partial eta squared = 0.91) and a significant main effect of subject pronoun ($F(2, 16) = 18.04$, $p < 0.001$; partial eta squared = 0.69). However, they also revealed a significant interaction between morpheme and subject pronoun ($F(2, 16) = 15.72$, $p < 0.001$; partial eta squared = 0.66). Post hoc analysis of this interaction using Scheffe tests revealed that provision scores were significantly higher for copula BE versus auxiliary BE for *It* ($M = 90.8\%$ versus $M = 81.7\%$, $F = 9.41$, $p < 0.05$), and for *I* ($M = 64.7\%$ versus $M = 33.8\%$, $F = 108.31$, $p < 0.001$), but not for *He* ($M = 80.2\%$ versus $M = 75.4\%$, $F = 2.61$, n.s.). They also revealed that for copula BE provision scores were significantly higher for *It* versus *I* ($M = 90.8\%$ versus $M = 64.7\%$, $F = 8.17$, $p < 0.05$), but not for *It* versus *He* ($M = 90.8\%$ versus $M = 80.2\%$, $F = 1.34$, n.s.), or for *He* versus *I* ($M = 80.2\%$ versus $M = 64.7\%$, $F = 2.89$, n.s.), and that, for auxiliary BE, provision scores were significantly higher for *It* versus *I* ($M = 81.7\%$ versus $M = 33.8\%$, $F = 27.51$, $p < 0.001$) and for *He* versus *I* ($M = 75.4\%$ versus $M = 33.8\%$, $F = 20.79$, $p < 0.01$), but not for *It* versus *He* ($M = 81.7\%$ versus $M = 75.4\%$, $F = 0.47$, n.s.).

These results show that, even after controlling for differences in lexical knowledge of the relevant verb forms the children's ability to produce both

TABLE 4. *Levels of provision of copula BE and auxiliary BE with the pronominal subject It, He and I*

	<i>It</i> % (contexts)	<i>He</i> % (contexts)	<i>I</i> % (contexts)	<i>It</i> vs. <i>I</i>	<i>It</i> vs. <i>He</i>	<i>He</i> vs. <i>I</i>
<i>Copula BE</i>						
Anne	90.1 (91)	90.0 (20)	87.0 (23)	n.s.	n.s.	n.s.
Aran	97.1 (34)	50.0 (6)	82.4 (17)	n.s.	$p < 0.01$	n.s.
Becky	98.4 (189)	91.7 (24)	82.4 (51)	$p < 0.01$	n.s.	n.s.
Carl	90.6 (413)	94.6 (56)	41.7 (24)	$p < 0.01$	n.s.	$p < 0.01$
Dominic	81.8 (88)	42.9 (7)	47.1 (17)	$p < 0.01$	$p < 0.05$	n.s.
Gail	96.7 (92)	100 (10)	57.1 (7)	$p < 0.01$	n.s.	n.s.
Joel	99.4 (179)	95.2 (62)	89.4 (66)	$p < 0.01$	n.s.	n.s.
Liz	77.0 (135)	90.9 (11)	55.3 (38)	$p < 0.01$	n.s.	$p < 0.05$
Warren	86.0 (43)	66.7 (6)	40.0 (5)	$p < 0.05$	n.s.	n.s.
<i>Auxiliary BE</i>						
Anne	75.0 (16)	80.0 (20)	42.1 (38)	$p < 0.05$	n.s.	$p < 0.01$
Aran	75.0 (8)	54.5 (11)	44.4 (45)	n.s.	n.s.	n.s.
Becky	97.5 (40)	87.7 (65)	61.9 (134)	$p < 0.01$	n.s.	$p < 0.01$
Carl	97.1 (68)	87.9 (132)	20.8 (101)	$p < 0.01$	$p < 0.05$	$p < 0.01$
Dominic	50.0 (6)	38.5 (13)	30.9 (94)	n.s.	n.s.	n.s.
Gail	91.7 (12)	92.9 (14)	17.1 (41)	$p < 0.01$	n.s.	$p < 0.01$
Joel	100 (14)	89.1 (55)	60.0 (80)	$p < 0.01$	n.s.	$p < 0.01$
Liz	76.9 (13)	75.0 (20)	24.9 (257)	$p < 0.01$	n.s.	$p < 0.01$
Warren	72.0 (25)	73.3 (15)	2.4 (42)	$p < 0.01$	n.s.	$p < 0.01$

copula and auxiliary BE is dependent not only on the type of subject with which they are to be combined (i.e. whether it is lexical or pronominal), but also on the identity of the pronominal subject and/or the form of copula or auxiliary BE that is required. They thus provide particularly strong evidence for the view that children's early knowledge of tense-marking morphemes is embedded in lexically specific constructions such as 'It's + NP' and 'He's V-ing'.

Table 4 presents the data provided in Figure 4 broken down by individual child. These data were analyzed using chi-squared (and Fisher's exact in cases where one or more of the cells had an expected frequency of less than 5). It can be seen from Table 4 that all of the 9 children show at least 1 significant between-pronoun effect for one of the two morphemes and most of the children (6 out of 9) show 3 or more significant between-pronoun effects out of a possible 6. These results replicate Wilson's findings, and suggest that, rather than reflecting differences in lexical knowledge, the between-pronoun differences that he reports are a characteristic feature of children's early use of tense-marking morphemes. However, they also suggest that the pattern of between-pronoun differences is relatively consistent across children, with all of the children providing both copula BE and auxiliary BE at higher rates with *It* than with *I*, all of the children

providing auxiliary BE at higher rates with *He* than with *I*, and all but 2 of the children providing copula BE at higher rates with *He* than with *I*.

When taken together the results reported above are highly consistent with those reported by Wilson, despite controlling for a number of possible objections to Wilson's analysis. However, they also suggest that Wilson's failure to control for differences in lexical knowledge may have led him to overestimate the amount of individual variation between the children in his study. These results provide further evidence against the strong form of the ATOM tested by Wilson (2003). Moreover, although the overall pattern of between-morpheme differences is consistent with the weaker version of the ATOM advocated by Rice *et al.* (1998), the pattern of between-subject and between-pronoun effects suggests that children's ability to provide tense-marking morphemes is much more lexically specific than the ATOM would predict. These findings are difficult to reconcile with the idea that children have adult-like knowledge of tense-marking morphemes, and are consistent with the view that children's underlying knowledge of the relevant morphemes is developing gradually, and is initially boosted by their use of lexically specific constructions.

DISCUSSION

The aim of the present study was to test the ATOM as an account of the pattern of tense-marking provision in early child English by replicating the results of Wilson (2003) while controlling for some potential problems with Wilson's analysis. This was done, first, by comparing children's provision rates for third person singular present tense and third person singular forms of copula BE and auxiliary BE, after controlling for lexical knowledge of the relevant morphemes; second, by comparing children's provision rates for third person singular copula BE and third person singular auxiliary BE in contexts with lexical and pronominal subjects (including non-nominative subjects); and third, by comparing children's provision rates for copula BE and auxiliary BE with the third person singular pronominal subjects *It* and *He* and the first person singular subject *I*, after controlling for lexical knowledge of the relevant copula and auxiliary verb forms.

The results revealed significant differences in the rate at which the three different morphemes were provided (though there was much less individual variation in the pattern of differences than in Wilson's study); significant differences in the rate at which all of the three morphemes were provided with pronominal and lexical subjects; and significant differences in the rate at which copula BE and auxiliary BE were provided with the third person singular subject pronouns *It* and *He* and the first person singular subject pronoun *I*.

These results have a number of important implications for our understanding of the development of tense marking. First, they replicate Wilson's finding of significant differences in the rate at which the typically developing children provided copula BE, auxiliary BE and third person singular present tense. These results suggest that the children's ability to provide the three tense-marking morphemes was increasing according to different developmental timetables. However, in contrast to Wilson's results, there was very little evidence of individual variation in the pattern of effects. One reason for this difference in the results of the two studies is that, in the present study, an attempt was made to create a level playing field for the three morphemes of interest by restricting the principal analyses to third person singular present tense contexts, and only computing provision measures from the point at which the children had been observed to use all of the relevant morphemes in their speech. This approach had the effect of screening out individual variation that was due to differences in the rate at which children produced third person singular and first person singular copula and auxiliary contexts (which, as we have seen, tend to have different provision rates associated with them), and screening out variation that was due to differences in lexical knowledge of the relevant morphemes (i.e. differences in the point at which the children began to use the relevant morphemes in their speech). This raises the possibility that Wilson's failure to control for these factors may have led him to overestimate the amount of individual variation between the children in his study. Indeed, the fact that when the appropriate controls are made, the pattern of effects turns out to be quite consistent across children, suggests that it may be possible to provide a relatively general explanation of differences in the rate at which children master the different morphemes provided that one analyses the data at the appropriate level (e.g. by distinguishing between different forms of copula BE and auxiliary BE rather than collapsing them together into composite measures). For example, one possible explanation of the children's higher rates of provision for third person singular copula BE is that constructions including this morpheme are not only much more frequent in the input than constructions including either of the other two morphemes,¹ they are also inherently less complex. Thus, in contrast to constructions

[1] Analysis of the relative frequency of third person singular copula BE, third person singular auxiliary BE and third person singular present tense in the input of each of the eleven children in the present study revealed that third person singular copula BE was between eight and nine times more frequent on average than both third person singular auxiliary BE and third person singular present tense, which occurred with approximately the same frequency in the input. It is therefore possible to explain children's higher levels of provision of third person singular copula BE in terms of the higher frequency of third person singular copula BE in the input. However, the children's higher levels of provision of third person singular auxiliary BE than third person singular present tense cannot be explained in this way.

including third person singular auxiliary BE, they do not require the child to include the progressive *-ing* suffix, and, in contrast to constructions including the third singular present tense morpheme, they do not require the child to generalize across different lexical forms.

Second, the results of the present study replicate Wilson's finding of significant differences in the rate at which the typically developing children provided tense-marking morphemes with pronominal versus lexical subjects. Note that, although the between-morpheme differences in provision rates documented in the present study count against the strong version of the ATOM tested by Wilson (2003), the lack of variation in the pattern of effects across children could be seen as consistent with the weaker version of the ATOM advocated by Rice *et al.* (1998). An important feature of the current results is therefore that, despite the stringent controls applied in the present study, they still provide strong support for the claim that the pattern of tense-marking provision in young children's speech is actually rather lexically specific. Thus, there were not only systematic differences in the children's ability to provide the different tense-marking morphemes, but also systematic differences in their ability to provide all three of these morphemes with pronominal and lexical subjects. These results are difficult to reconcile with the claim that young children have adult-like knowledge of tense-marking morphemes. However, they are consistent with the constructivist view that children's knowledge of tense marking is initially not only specific to particular morphemes, but also specific to the constructions in which these morphemes occur (e.g. 'It's+NP', 'He's+V-ing' and 'That+V-s').

Third, the results of the present study replicate Wilson's finding of significant differences in the rate at which the typically developing children provided tense-marking morphemes with different pronominal subjects. Thus, there were not only systematic differences in the children's ability to provide all three tense-marking morphemes with pronominal and lexical subjects, but also systematic differences in their ability to provide copula BE and auxiliary BE with the third person singular pronominal subjects *It* and *He* and the first person singular pronominal subject *I*. This last finding is particularly important since it is possible to argue that pronominal/lexical effects on morpheme provision may reflect some relatively general difference between pronominal and lexical subjects. For example, the advantage for contexts with pronominal subjects could reflect the fact that children are more likely to omit pronominal subjects than lexical subjects from their utterances when Agreement is missing from the underlying representation of the sentence (which would have the effect of boosting the provision rate for contexts with overt pronominal subjects). Differences in the provision rates associated with different pronominal subjects cannot be explained in this way and are hence very difficult to explain within

the ATOM. Indeed, Wilson (2003) takes the presence of between-pronoun effects in his data as particularly strong evidence for the view that children's early knowledge of tense marking is embedded in particular lexically specific constructions such as 'That's+NP' and 'He's+V-ing'. Whether or not one accepts this particular interpretation of the data, what is clear from the results of the present study is that the kind of lexically specific patterning identified by Wilson is a real phenomenon, rather than an artifact of Wilson's coding procedures. The implication is that all accounts of the acquisition of tense marking need to provide an explanation of why such patterning occurs – rather than simply assuming that it is a by-product of more general differences between pronominal and lexical subjects or of gaps in children's lexical knowledge.

To conclude, the aim of the present study was to test the ATOM as an account of the patterning of tense-marking provision by replicating Wilson's (2003) results on a different group of English-speaking children while controlling for some potential problems with Wilson's analysis. Despite the stringent controls applied in the present study, the results are remarkably similar to those reported by Wilson (2003). When taken as a whole these results are difficult to reconcile with either the strong interpretation of the ATOM tested by Wilson (2003) or the weaker interpretation of the ATOM advocated by Rice *et al.* (1998), and provide strong support for Wilson's constructivist interpretation of the data. However, they also illustrate the need to develop a more process-oriented account of the way in which children acquire tense-marking morphemes that both explains how children's knowledge of these morphemes becomes progressively more abstract over time, and makes clear and testable predictions about the way in which patterns of provision will change as the abstractness of children's knowledge increases.

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