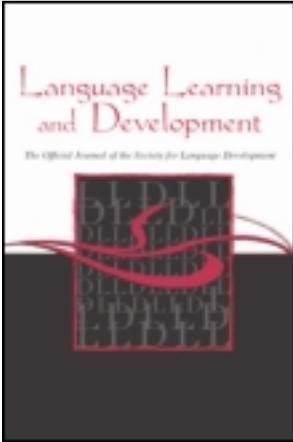


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### Not All Children Agree: Acquisition of Agreement When the Input Is Variable

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# Not All Children Agree: Acquisition of Agreement When the Input Is Variable

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In this paper we investigate the effect of variable input on the acquisition of grammar. More specifically, we examine the acquisition of the third person singular marker –s on the auxiliary *do* in comprehension and production in two groups of children who are exposed to similar varieties of English but that differ with respect to adult production of agreement on the auxiliary. In the first variety, the input to children for agreement on the auxiliary is consistent as the marker is always produced when there is a third person singular subject. In the second variety, however, there is a variable input for agreement marking on the auxiliary *do*: within and across speakers, agreement marking is sometimes present (e.g., *He doesn't like venison*) and sometimes absent (e.g., *He don't like venison*) with third person singular subjects. In other words, while both groups of children are exposed to an input where the third person singular marker is always present on the *main verb* (when it agrees with a third person singular subject), the input to the two groups of children differs in the context of agreement on the auxiliary *do*. The results of the present study show that while the two groups of children differ from each other in their own production of agreement marking on the auxiliary, a finding we attribute to the input type they are exposed to, they do not differ in their (in)ability to associate the marker to a third person singular subject in comprehension.

## INTRODUCTION

Language acquisition research has been dedicated to describing children's linguistic knowledge at different stages of development and also to examining how it is that children come to acquire that knowledge given the input to which they are exposed. To address the latter question, an extensive amount of work has focused on how input frequency affects acquisition. This work has revealed, contrary to what we might expect, that what is most frequent in the input, is not *always* what is acquired earliest (Anderssen & Westergaard, 2010; Klecha, Jalbert, Munn, & Schmitt, 2008; Lidz, Waxman, & Freedman, 2003), and that frequency cannot always predict the form that children will overregularize to (Marcus, 2000). Studies have shown that overall token frequency may not be an adequate measure for determining the impact of linguistic input on acquisition; instead, when calculating frequency we may need to focus on a variety of factors, such as type

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frequency (in addition to token frequency) (Bybee, 2007; Marcus, Brinkmann, Clahsen, Wiese, & Pinker, 1995), frequency of only subsets of the input data (e.g., that provide unambiguous data for parameter setting) (Legate & Yang, 2002; Pearl & Lidz, 2009; Yang & Legate, 2007), and/or frequencies in child-directed speech versus adult-directed speech (Cameron-Faulkner, Lieven, & Tomasello, 2003; Gleitman, Gleitman, Landau, & Wanner, 1988).

In the present paper we propose another factor should be taken into consideration when examining the effect of input on acquisition, that is, the role of *input consistency*. In particular, we compare how consistent input versus variable input (i.e., labovian-type variation in the input) affects the acquisition process. We believe that the results of such a comparison will contribute to our understanding of the nature of language acquisition in children more generally.

Most acquisition research has paid little attention to the fact that much of the linguistic data that children are exposed to are subject to labovian-type variation (Labov, 1969). Labovian variation, also known as sociolinguistic variation, involves the use of alternative morphological forms in the same linguistic environment, both within individual speakers and across groups of speakers, to express the same meaning. The use of the variant forms is determined probabilistically by both internal (i.e., linguistic constraints) and by external factors (i.e., extra-linguistic constraints). Linguistic factors can include grammatical constraints, such as whether the variable form occurs only in the context of negation, while the extra-linguistic factors include social and stylistic constraints, such as gender, social class, and speech style. Importantly, these factors only predict how frequently one variant is produced relative to another variant and not whether a particular variant is always produced or not by the speaker (i.e., the distribution is not categorical, as, e.g., with the English plural allomorphs [-s], [-z], [-ɪz]). If we take this fact about the variable nature of the input into consideration, the acquisition problem becomes much harder for linguists to study and understand but also more realistic.

Ultimately, children exposed to a consistent input for a particular form become adults who are also consistent in their production, and children exposed to a variable input become adults who produce the form(s) variably, with adult-like linguistic and extra-linguistic constraints governing the variability and with adult-like frequency in their usage of the variant forms (Andersen, 1990). However, recent work has shown that acquisition of variable rules takes time and that children, although they may show variable production in their own speech early on, often do not show complete adult-like knowledge of all of the constraints governing the distribution of the variant forms until 6 or 7 years of age (Labov, 1989; Miller, 2007; Roberts, 1994; Smith, Durham, & Fortune, 2007). This suggests that variability (within and across speakers), even though probabilistically determined, may initially add ambiguity in the input for making certain grammatical generalizations, especially if the learner does not yet have an adult-like knowledge of the variable rules.

While few studies have examined the effect of variable input on the acquisition of grammar, recent work has examined acquisition of inconsistent input. An example of inconsistent input would be that spoken by a nonnative speaker of a language to their child. Inconsistent input is different from variable input because in the latter, the variation among the variable forms is probabilistically determined. On the other hand, Hudson Kam and Newport (2009) describe inconsistent input as having unpredictable patterns. Their work on inconsistent input has shown two important findings. First, learners exposed to inconsistent input tend to overregularize and surpass their inconsistent models (Singleton & Newport, 2004). Second, children exposed to an inconsistent input involving an omission of a form overregularize to zero (i.e., consistently omit the form in their own production) (Hudson Kam & Newport, 2005, 2009).

In order to examine the effect of inconsistent input on language acquisition, Hudson Kam and Newport (2009) taught children an artificial language where the level of determiner usage was manipulated across groups. Children were presented with an inconsistent input involving the omission of the determiner (i.e., 60% of the time novel nouns occurred with a novel determiner/40% of the time the novel determiner was omitted) versus an inconsistent input with two or more overt novel determiners and no omissions. When one of the variant forms was zero (i.e., omission), children showed a tendency to overregularize to zero (i.e., omit the determiner) in their own production (i.e., four out of five children who behaved systematically in the study omitted the determiner in their own production), even though zero was less frequent in the input than the overt determiner. On the other hand, when the inconsistent input only involved different overt forms of the determiner (and no omissions), children overregularized to the most frequent overt form. Their findings suggest that children initially overregularize inconsistent input, although we cannot rule out that these children might have eventually learned the inconsistencies with more exposure to the input. In addition, their results show that an inconsistent input involving a zero form, even when zero is less frequent in the input, results in an initial overregularization to zero.

There is now some evidence indicating that the tendency to overregularize to zero that has been found for inconsistent input also extends to naturalistic settings involving variable input (Johnson, 2005; Miller, 2007; Miller & Schmitt, 2009, 2010). In particular, Miller and Schmitt (2009, 2010) show that 4–5-year-old children exposed to a variable input for plural morphology (i.e., the plural marker is sometimes produced and sometimes omitted by adult speakers) initially do not associate the plural marker to “more than one” in comprehension.

While inconsistent input and variable input may be different in nature, we propose that they may have the same initial effect on acquisition, at least until children are adult-like in their knowledge of the variable rules. In other words, we propose that variable input may initially appear inconsistent to the learner.

Wilson and Henry (1998) argue that any theory of language acquisition must account for the fact that the input into the emerging linguistic system is variable, even within a monolingual context, and that a key part of the language acquisition device must enable it to cope with this variability. With this in mind, in the present paper we present experimental data that compare acquisition of agreement on auxiliary *do* in the contexts of variable versus consistent input with the goal of understanding whether variable input affects language acquisition in children. In this paper, we are not asking whether or not children can acquire variable rules. Rather, we are asking a different question: Is the acquisition of grammatical morphology affected when that morphology is produced variably in the input? The goal of this paper is to test the predictions of Hudson Kam and Newport (2005, 2009) for the acquisition of inconsistent input but in a naturalistic setting and with an input type (i.e., variable input) that is much more typical of what we find in child language acquisition.

This paper is organized as follows: First, in order to better understand the input that children are exposed to, we discuss the variable distribution of agreement marking on *do* in adult speech and then present spontaneous speech data from five adult speakers living in the same local area as the child participants tested in our study. Next, we outline previous work on children’s acquisition of auxiliary *do/does* followed by an experimental study that examines both production and comprehension. Finally, we end the paper with a discussion on how the acquisition of variable input fits within broader issues, particularly what we think our findings say about language acquisition in general.

VARIABLE PRODUCTION OF AGREEMENT ON *DO*

English is a language with a so-called weak subject-verb agreement system. Apart from the forms of the copula *be*, the only overt marker of subject-verb agreement is the third person singular affix *-s*. For all other subjects, there is no overt agreement on the verb. This marker shows up either on the verb itself or on the auxiliary *do*. This is illustrated in (1) and (2).

- (1) a. The duck swims.  
b. The ducks swim.
- (2) a. Does the duck swim?  
b. The duck doesn't swim.  
c. Do the ducks swim?  
d. The ducks don't swim.

With the exception of agreement marking, auxiliary *do* patterns with English modals (e.g., *will* and *can*) in almost all other ways. Both modals and auxiliary *do* precede *not* (or *n't*) in negative sentences (3), move to a position before the subject to form interrogatives (4), express emphasis in declaratives (5), are used in tag questions (6), and are found in constructions involving ellipsis (7).

- (3) a. He doesn't/ They don't live here.      Negation  
b. He/They can't live here.
- (4) a. (Where) does he/ do they live?      Interrogatives  
b. (Where) can she/ they live?
- (5) a. He does/ they do live here!      Do-insertion  
b. He/ They can live here!
- (6) a. He lives here, doesn't he?      Tag Questions  
b. They live here, don't they?  
c. He/They can live here, can't he/they?
- (7) a. He does too/ They do too.      Ellipsis  
b. He/They can too.

The examples above illustrate that *do* patterns with the modals *can* and *will* in most ways yet unlike *can* and *will*, *do* agrees with the subject. Minimally, in acquisition, the learner must determine that the auxiliary *do* carries agreement inflection while the modals *can* and *will* do not. Radford (1992) suggests that the occurrence of nonagreeing *don't* in the input to children (e.g., *She don't live here*) may initially cause children to miscategorize *do* as a nonagreeing modal. We will come back to this point in the next section.

In several varieties of English, the third person singular marker has a variable behavior. For example, it has been reported that African American English (AAE) speakers often, but not always, omit *-s* on the main verb and on the auxiliary, as shown in (8) (Green, 2002; Rickford, 1999), and that White working-class English speakers sometimes lack agreement on *do* when it contracts with negation, as in (9), but for the most part do not allow forms such as those shown in (8) (Blanton, 1974; Cheshire, 1982; Dillard, 1985; Feagin, 1979; Gramley & Patzold, 1992; Oetting & McDonald, 2001; Wolfram & Schilling-Estes, 1998; Wolfram & Christian, 1976).

- (8) a. The teacher think the students be playing chess.  
 b. She do too!
- (9) He don't live here.

While variable production of agreement is pervasive in many dialects of English, it is for the most part unattested in White middle-class speech. In this paper, we focus only on the speech of White working-class and White middle-class English speakers and not on the speech of AAE-speakers. This ensures that the only difference between the two varieties, with respect to agreement marking, is with agreement marking on *do*, and not on the main verb, as neither White working-class nor White middle-class speakers omit *-s* on the main verb.

If we compare White-working class speech to White middle-class speech (henceforth WC and MC), we find that, as noted above, WC speakers generally show variable production of agreement on *do* while MC speakers do not. This means that the input for agreement marking on *do* to WC children is variable while it is consistent for MC children. It is an example of labovian variation (Labov, 1994), as discussed earlier. However, variation in WC speech does not occur in all linguistic contexts. Instead, it is limited just to *do* when it contacts with negation. This is illustrated in (10)–(14) below.

- |                                    |                        |
|------------------------------------|------------------------|
| (10) a. He doesn't live here.      | Negation               |
| b. He don't live here.             |                        |
| (11) a. Does he live here?         | Interrogatives         |
| b. *Do he live here?               |                        |
| c. Doesn't he live here?           |                        |
| d. Don't he live here?             |                        |
| (12) a. He does live here!         | Do-insertion           |
| b. *He do live here!               |                        |
| (13) a. He lives here, doesn't he? | Negative Tag Questions |
| b. He lives here, don't he?        |                        |
| c. *He doesn't live here, do he?   |                        |
| (14) a. He does too.               | Ellipsis               |
| b. *He do too.                     |                        |
| c. He don't either.                |                        |

The examples in (10)–(14) illustrate that production of agreement on *do* is only variable when *do* contracts with negation. In all other contexts, adult speakers produce *does* with 3.SG subjects and as a result, in these latter contexts, WC children are presented with consistent evidence for agreement marking on the auxiliary. Can this seemingly small difference in the input to WC and MC children cause differences in acquisition of agreement on the auxiliary?

At this point it is important to further point out that the input is not as clean as thus far presented, as many adult speakers, regardless of whether they use nonagreeing *don't* or not, will sometimes in casual speech omit the auxiliary altogether in interrogatives, as illustrated in (15)<sup>1</sup> (Fitzpatrick, 2006; Oetting & McDonald, 2001).

<sup>1</sup> Input like that shown in (15) may have potential implications for studies reporting that young typically developing children and SLI children omit *do* in their own speech and that children also rate omissions of *do* as grammatical (see Paradis, Rice, Crago, & Marquis, 2008; Rice, Hoffman, & Wexler, 2009).

- (15) a. (Does) he like to hunt?  
 b. Where (does) she wanna eat?  
 c. What (does) he want for Christmas?

The examples in (15) illustrate that the input for agreement on *do* may be even weaker for children than might have been expected because when the auxiliary is omitted, there is no evidence for agreement on *do*, or on the main verb. In other words, interrogative constructions, like those above where interrogative *do* is omitted, may potentially be uninformative for acquiring agreement on *do*.

In order to estimate how often the input to WC children lacks agreement on *do*, we collected production data from five working-class adult speakers living in the same local area as the children who participated in the experiment presented in this paper. Social status was determined by the educational background and current employment of the adult participants. Educational level varied from completion of 11th grade to completion of an associate's degree at a community college and current employment included: unemployed, factory worker, nurse's assistant, and nurse. Participants were interviewed on two separate occasions for one hour each time by a research assistant who grew up and lived in the same local area as the participants. The research assistant was also working-class, and both he and all five participants used other nonstandard forms in their own speech, such as negative concord, *ain't*, and object pronouns in place of other pronouns (e.g., *Give her them candies, Him and I are good friends*). Conversations were recorded and transcribed, and later all tokens of present tense *do* produced by participants were coded for agreement marking or omission. Overall, there were 181 tokens of present tense *do* produced. Of the 181 tokens, only 29 tokens (16%) had third person singular subjects. Table 1 illustrates the variability of agreement on the auxiliary for each subject.

Table 1 shows that overall participants produced *do* more often with 1.SG and 2.SG subjects. Focusing just on 3.SG subjects, of all the 3.SG tokens produced (total = 29), *do* occurred without agreement (e.g., *My uncle don't drive truck no more*) 16 times and with agreement (e.g., *My uncle doesn't drive truck anymore, Does your uncle drive truck?*) 13 times, which suggests that overall there may be slightly more 3.SG tokens without agreement in the input than with agreement. However, the differences appear to be minimal, and moreover, the only place where agreement was missing was when *do* contracted with negation. In questions *do* was omitted 23% of the time (e.g., *What he [wədi] want for Christmas?*), which makes these constructions potentially uninformative for determining whether the auxiliary carries agreement or not. However *do* was present on 76% of questions (123/161) and always agreed with the subject.

TABLE 1  
 Production of "do/does" by Adult Speakers

	<i>do/don't</i>		<i>does/doesn't</i>	
	%	N	%	N
1SG subject	100%	(64/64)	–	–
2SG subject	100%	(79/79)	–	–
3SG subject	55%	(16/29)	45%	(13/29)
3PL subject	100%	4/4	–	–

*Note:* The percentage of 55% for 3.SG subjects represents *do* only when it is contracted with negation.

It is important to note that all participants omitted *do* some of the time and also showed variable production of nonagreeing *don't*. Although the data set is limited in size these findings suggest that the input for agreement on *do* to WC children is variable and that overall *do* lacks agreement about half of the time with 3.SG subjects.<sup>2</sup> Taken together with previous works (Kortmann & Szmrecsanyi, 2009; Wolfram & Schilling-Estes, 1998), these findings indicate that the input to WC and MC children with respect to agreement marking on *do* is different: WC children receive a variable input for agreement marking on *do* while MC children receive a consistent input. When WC adult speakers produce nonagreeing *don't* in the input to children, there is no evidence that the auxiliary carries agreement, as the form of the auxiliary would be the same for all subject noun phrases (e.g. *I/he/she/we/they don't know how to tune a guitar*).

### ACQUISITION BACKGROUND

Most acquisition research on agreement has examined production on the main verb and not on the auxiliary *do*. Research that has looked at the auxiliary *do* has reported that children are generally adult-like in their production of agreement in interrogative constructions by 3 years of age (Guasti & Rizzi, 2004); however, work that has focused on working-class children has reported that 4–6-year-olds sometimes omit the auxiliary *do* in production, resulting in utterances like *How you get up here?* (Oetting & McDonald, 2001).

In comprehension, there has been no work, as far as we know, that has examined the 3.SG marker on auxiliary *do*. Nevertheless, there is a substantial amount of work on children's use of the 3.SG marker on the main verb. These studies have indicated that in production, 3–4-year-old English-speaking children seldom make agreement errors on the main verb (Hattori, 2003; Maratsos & Kuczaj, 1978; Santelmann, Berk, Austin, Somashekar, & Lust, 2002; Theakston, Lieven, & Tomasello, 2003), but that the same aged children often have difficulty using 3.SG -s on the verb in comprehension tasks (Beyer & Hudson Kam, 2009; Johnson & de Villiers, & Seymour, 2005; Leonard, Miller, & Owen, 2000). Yet, older children (ages 5–7) are more sensitive to it (Beyer & Hudson Kam; Johnson & de Villiers, 2005). This research, therefore, suggests that there may be a production-comprehension asymmetry in the acquisition of the third person singular -s between 3 and 4 years of age; however, no work has shown this asymmetry to be true in individual children.

Radford (1992) notes that children sometimes produce nonadult forms like (16a), which he suggests may be related to nonstandard uses of nonagreeing *don't* in the speech of adults to their children (16b).

- (16) a. How do he go? Do it have a windmill? (Richard 36 months, taken from Radford 1992)  
 b. Grandpa don't have a boat up at the lake.

<sup>2</sup> One potential problem with the spontaneous speech data presented here is that it only included adult-directed speech. It is possible that parents use more or less nonstandard, local variants when talking to their children than when talking to other adults. This raises the possibility of an input that looks very different from what is presented here. While we cannot exclude this possibility, the differences between adult-directed and child-directed speech with respect to the use of labovian type variation is not completely understood. It has been shown that parents sometimes use more local, nonstandard variants when talking to their own children than when talking to other adults. However, the opposite pattern has also been reported (Smith et al., 2007). (We thank an anonymous referee for encouraging us to examine this issue.)

Radford provides an example whereupon hearing her caregiver produce an utterance with nonagreeing *don't*: *She don't live up this street anymore*, a 3-year-old child immediately responds with the nonadult construction, *Yes, she do!* While this is only anecdotal evidence, it suggests that children may extend nonagreeing *don't* to other linguistic contexts. Radford proposes that because *do* patterns with nonagreeing modals in almost every way, except that *do* requires agreement marking, parents' use of nonagreeing *don't* may initially cause children to miscategorize *do* as a modal-like auxiliary. This proposal is consistent with the idea that variable input involving a zero form will result in overregularization to zero. In other words, if the child has overregularized to zero for agreement marking on *do* because of the variable input she is exposed to, then initially she will not produce agreement on any form of the auxiliary *do*. As such, her treatment of auxiliary *do* is similar to that of nonagreeing modals.

Radford's prediction, however, is at odds with two recent proposals that link the use of nonagreeing *don't* to the root infinitive (RI) stage. Guasti and Rizzi (2004) attribute the occurrence of utterances such as (16b) but not (16a) in child language to a misset parameter involving how agreement is spelled out. A DP that has overtly moved to Spec-TP or higher is expected to trigger fuller agreement than one that is below that position at Spell-Out. On the other hand, Schütze (2010) proposes that Infl is underspecified in child language and that in (16b) *do* surfaces to support the contracted clitic/affix *n't*. Since there is no clitic in (16a), sentences such as (16a) do not arise. In other words, contrary to Radford, both proposals predict that sentences like (16a) will not be found in child production.

The focus of Guasti and Rizzi's paper was not to examine the effect of variable input on acquisition and, for that reason, the assumption was that children did not hear nonagreeing *don't* in their input. However, recently Schütze (2010) pointed out that one of the children in Guasti and Rizzi's analysis, Sarah, was exposed to variable production of nonagreeing *don't*. Schütze reports that nonagreeing *don't* was used 27% (38/140) of the time in the input to Sarah and agreeing *doesn't* was used 73% (102/140) of the time. Interestingly, Guasti and Rizzi's data show that while Sarah sometimes produces nonagreeing *don't* in declarative sentences, like her caregivers and the other children who were exposed to consistent input, she almost never produced nonagreeing *do* in interrogatives (like 16a), a finding that appears to run contrary to Radford's proposal. However, a closer look at Sarah's production data indicates that production of the auxiliary *do* is strikingly different for her than for the other children. In particular, while it is true that Sarah almost never produces nonagreeing *do* in interrogatives, she shows a significant delay in her first production of interrogative *do*. Table 2, adapted from Guasti and Rizzi (2004), shows the first occurrence of children's use of *do* and *does* in yes/no and wh-questions.

Table 2 illustrates that Sarah lagged behind the other children in her first production of interrogative *do* by 11 months or more and in her first production of interrogative *does* by

TABLE 2  
First Occurrence of Interrogative "do" and "does"

	<i>Sarah</i>	<i>Adam</i>	<i>Nina</i>	<i>Peter</i>	<i>Ross</i>
INT do -3.SG	3;10	2;9	2;3	2;3	2;6
INT does +3.SG	3;6	2;9	2;2	2;4	2;8

Note: This table is adapted from Guasti and Rizzi (2004).

8 months or more. It is possible that Sarah's late production of interrogative *do/does* is related to the variable input she received and represents an avoidance of using a form she is not sure about. Elicited production tasks, as the one presented below, may prove more useful in probing children's knowledge of agreement on auxiliary *do*.

Based on previous research, there are two predictions that we can make about children's acquisition of agreement on auxiliary *do*: (i) Overregularization to zero (Radford, 1992): Children exposed to an input with nonagreeing *don't* (e.g., *She don't live up this street*) will initially miscategorize *do* as a modal-like auxiliary and produce nonagreeing *do* in interrogative constructions (e.g., *Do she live up this street?*) and ignore agreement marking in comprehension. (ii) Spell-Out Hypothesis<sup>3</sup> (Guasti & Rizzi, 2004): While children may produce negative *do* without agreement, they will never produce interrogative *do* without agreement. In other words, for interrogative *do* there should be no differences found between children exposed to variable input and those exposed to consistent input.

### PRODUCTION: ELICITATION TASK

The experimental study consisted of two experimental tasks, one that measured production and the other that measured comprehension of *do/does* in the same children. Both tasks were carried out the same day and children were first tested on production and then on comprehension. We tested both working-class and middle-class children under the assumption that the former would be exposed to nonagreeing *don't* in their input.

#### Method

##### *Participants*

There were 72 participants (40 children + 32 adults) in the study. Twenty-four were White middle-class English-speaking children (MC) (3;7–5;4: Mean 4;4), and 16 were White working-class English-speaking children (WC) (3;11–5;7, Mean 4;5). Both groups of children attended preschools in the midwestern region of the United States. Estimates of the children's social class level were based on the profession of the child's parents and by the school that the child attended. Middle-class children attended a private tuition-based preschool and their parents' occupations included college professors, doctors, teachers, or business-persons. Working-class children attended Head Start and parent occupations included store clerks, factory workers, waiters, or unemployed. In addition, 20 undergraduate students from the same local area served as the adult control group for the middle-class children, and 12 working-class adults from the same local area served as controls for the working-class children.

##### *Stimuli and Procedure*

The goal of the elicitation task was to determine whether variable use of nonagreeing *don't* in the input to children causes them to produce nonagreeing *do* in interrogatives, as predicted by

<sup>3</sup> This term was used by Schütze (2010) to describe Guasti and Rizzi's (2004) proposal.

Radford (1992). Children were introduced to a puppet and prompted to ask the puppet questions about whether he or one of his family members carried out certain types of activities (e.g., read books, write with glitter glue). The goal was to elicit “yes-no” questions with auxiliaries that agreed with either a third person singular subject as in (17a) or a second person singular subject as in (17b).

- (17) a. Does your dad write with glitter glue?      DOES TARGET  
 b. Do you write with glitter glue?                  DO CONTROL

The stimulus set consisted of two conditions: the Target DOES Condition (third person singular) and the Control DO Condition (second person singular). There were four trials in each condition.

Children were introduced to a puppet and were told that the puppet only liked to speak to children and not to adults. Children were instructed to help the experimenter by asking the puppet some questions. The experimenter spoke the experimental prompts to the child off to the side in a lowered voice so as to make believe that the puppet could not hear what the experimenter wanted to ask. The idea was to make the task more felicitous to children. In other words, if the puppet could hear what the experimenter was asking, it would be strange for the child to then repeat the question to the puppet. We found that this procedure made the task more natural.

Experimenter: Look. This is Zach (the puppet) and this is glitter glue.

(In a lowered voice) Ask Zach if he writes with glitter glue.

Child: Do you write with glitter glue?

Experimenter: Very good. Now ask Zach if his dad writes with glitter glue (spoken with a lowered voice).

Child: Does your dad write with glitter glue?

The experimental trial in the Control DO Condition was always presented before its matching trial in the Target DOES Condition. It is possible that this ordering might make children who allow nonagreeing *do* with 3.SG subjects more likely to produce it. Child responses were coded for production of the auxiliary *do* and production of agreement marking. Adults were tested in the same way as children. All experimental prompts are shown in Table 3.

TABLE 3  
 Elicitation Task: Experimental Prompts

<i>Control DO Condition</i>	<i>Target DOES Condition</i>
1 Ask Zack if he writes with glitter glue.	1 Ask Zack if his dad writes with glitter glue.
2 Ask Mary if she eats oranges.	2 Ask Mary if her mom eats oranges.
3 Ask Nicholas if he plays with toy dinosaurs.	3 Ask Nicholas if his dad plays with toy dinosaurs.
4 Ask Lisa if she reads books.	4 Ask Lisa if her dad reads books.

## Results

Adult participants behaved as expected, producing questions, as in (18a) and (19a) below, in both the control and target conditions 100% of the time. Child participants showed similar performance on the control items: Both working-class and middle-class children produced adult-like questions with *do* (as in 18a) more than 92% of the time. In addition, there were two other types of questions produced by children in the control condition. These are shown in (18b) and (18c). Only three children produced these nonadult forms. One middle-class child behaved differently by consistently inserting the auxiliary “are” instead of *do*, as shown in (18b), and the other two children (one working-class and one middle-class) omitted the auxiliary in three out of the four trials, as shown in (18c). Note, however, that (18c), while adult-like in casual speech, was not produced by any of our adult participants. Most likely this was due to the formality of the experimental task.

- (18) a. Do you write with glitter glue? Agreeing *do*  
 b. Are you write with glitter glue? Different Auxiliary  
 c. You write with glitter glue? Missing Auxiliary

In the Target DOES Condition there was much more variation in child responses. Child responses were of four different types as shown in (19) below.

- (19) a. Does your dad write with glitter glue? Agreeing *does*  
 b. Do your dad writes with glitter glue? Agreement on Main Verb  
 c. Do your dad write with glitter glue? Non-agreeing *do*  
 d. Is your dad write with glitter glue? Different Auxiliary

(19a) is adult-like and has agreement on the auxiliary *do*. In (19b) agreement marking is on the main verb and not on the auxiliary and in (19c) there is no agreement marking at all. The response type (19d), which has the auxiliary *be* instead of *do*, was only produced by one child who was the same middle-class child that produced second person singular questions like that in (18b) above. Responses such as (19d) were coded as “Other.” Table 4 shows the percentage of response types per group.

The number of adult-like responses (i.e., responses with agreeing *does* and agreeing *do*) was entered into a mixed design ANOVA with condition: (DO x DOES) as a within subjects variable and child group: (WC vs. MC) as a between subjects variable. The results showed a main effect for condition ( $F(1,37) = 32.124, p < .01$ ) and a main effect for child group ( $F(1,37) = 5.925,$

TABLE 4  
Elicitation Task: Percentage of Response Types

	Target DOES						Control DO			
	Agreeing does		Agr on V		Nonagreeing do		Agreeing do		Other	
	%	N	%	N	%	N	%	N	%	N
WC	42.18	(27/64)	18.75	(12/64)	39.06	(25/64)	95.31	(61/64)	4.68	(3/64)
MC	72.91	(70/96)	17.70	(17/96)	5.20	(5/96)	92.70	(89/96)	7.29	(7/96)
Adults	100%	(128/128)	–	–	–	–	100%	(128/128)	–	–

Note: “Other” responses for the Target DOES Condition were not included because there were so few of them.

$p < .01$ ). There was also a significant interaction of group  $\times$  condition ( $F(1,37) = 6.605$ ,  $p < .01$ ). The significant interaction is driven by the nonadult performance of the WC children in the Target DOES Condition. Given the significant interaction, we next examined whether working-class children produced less agreement marking on the auxiliary than middle-class children, as this was predicted if variable input affects acquisition. To this end, we compared the proportion of times children produced the 3.SG marker on the auxiliary in the DOES Target Condition. The results showed that middle-class children produced significantly more agreement marking than working-class children ( $t(1,37) = 2.736$ ,  $p < .009$ ).

A closer look at the data shows a bimodal distribution. Children either systematically (i.e., in all four trials) produced adult-like questions in the Target DOES Condition or they systematically produced nonadult-like questions, like (19b) and (19c). In particular, 62.5% (10/16) WC children and 25% (6/24) MC children systematically produced these two types of nonadult-like questions. The children who produced nonadult-like questions in the Target DOES Condition generally produced both types of nonadult-like responses. In other words, these children sometimes placed agreement on the main verb, as in (19b), and sometimes produced questions with no agreement whatsoever, as in (19c), with (19c) being much more common in WC children (see Table 4).

## Discussion

In the Elicitation task we observed that while working-class and middle-class children behaved the same in the control condition, where they were prompted to ask questions with 2.SG subjects, they differed in their production of 3.SG agreement marking on interrogative *do*. Middle-class children produced adult-like questions 73% of the time while working-class children only did so 42% of the time, a finding that is consistent with Radford's proposal that children exposed to an input with nonagreeing *don't* initially miscategorize *do* as a modal-like auxiliary and produce nonagreeing interrogative *do*. The finding for working-class children runs contrary to Guasti and Rizzi's (2004) Spell-out hypothesis, which disallows nonagreeing interrogative *do* in child language.

One alternative account of the differences found between WC and MC children in the Elicitation task is to propose that WC children, because of the variable nature of the input for agreement on *do*, have learned the variability and have extended it across contexts. In other words, these children have learned that agreement marking on *do* is variably produced but have not yet learned that it is only variably produced on *do* when it contracts with negation. This would predict that children would sometimes produce agreement on interrogative *do* and sometimes omit it. However, we do not find this type of variability in children's production in the Elicitation task. In other words, WC children did not produce agreement variably on interrogative *do*. Instead, children either consistently produced interrogative *do* with agreement or they produced it without agreement. This suggests that the variable production of nonagreeing *don't* in the input to WC children initially causes them to overregularize to zero across all contexts where *do* is used, suggesting that they initially miscategorize *do* as a nonagreeing modal.

It is interesting to note that both WC and MC children produced nonadult-like questions where agreement was placed on the main verb instead of on the auxiliary about 19% of the time. Forms of inflection misplacement, as those shown in (20), have also been reported in previous work (Radford, 1992; Santelmann et al., 2002; Santelmann, Berk, & Lust, 2000; Stromswold, 1990).

- (20) a. Bugs Bunny's touch a carrot (age 2;03, Santelmann et al., 2002)  
 b. It's breaks. (age 3;02, Stromswold, 1990)  
 c. Do Bugs Bunny touches a carrot? (age 3;11, Santelmann et al., 2002)

In these cases, we again find that interrogative *do* does not carry agreement; however, it is not clear exactly why the inflection has been misplaced.<sup>4</sup> We leave this question to future work.

## COMPREHENSION: PICTURE MATCHING TASK

The elicitation task showed that middle-class children were more adult-like than working-class children in their production of 3.SG -s on the auxiliary *do* but not in their overall production of the auxiliary (i.e., omission of the auxiliary was rare in both groups and all children produced inversion correctly) and not in their production of questions containing 2.SG subjects in the control condition. The following Picture Matching task asks whether production of the 3.SG marker by our 3;7–5;7-year-old children means that they can use it in comprehension. Given the production results, we might predict that middle-class children will be able to use *does* in comprehension while working-class children will be less likely to. This would provide further evidence that input variability affects acquisition and would be consistent with recent work by Johnson (2005) and Johnson et al. (2005), who found that 5-year-old AAE-speaking children were unable to use 3.SG -s on the main verb in comprehension, while Mainstream English-speaking children of the same age showed better performance. Johnson attributes this finding to the variable production of 3.SG -s on main verbs in adult AAE speech. On the other hand, de Villiers and Johnson (2007) propose, within a minimalist framework (Chomsky, 1995), that agreement marking is difficult for 3–4-year-old children to use in comprehension because it is associated with an uninterpretable feature that is not visible for semantic interpretation. They propose that because agreement information disappears after agreement is checked and before meaning is computed (at the level of Logical Form), its meaning might be a fragile cue to number features and, as a result, not available to ordinary processing. Hence, they predict that both groups of children, regardless of input type, will have difficulty in comprehension, at least until they reach 5 years of age. The present study tests 3-, 4-, and 5-year-old children to determine whether children do indeed have difficulty using agreement in comprehension, even when it occurs on the auxiliary *do* and not just on the main verb, and also whether variable input affects children's ability to use 3.sg -s in comprehension.

## Method

### *Stimuli and Procedure*

The purpose of the Picture Matching task (PMT) was to determine whether children could use the 3.SG marker on interrogative *do* in order to determine number on the subject. The format

<sup>4</sup> A reviewer suggested that the experimental prompt which contains agreement marking on the main verb (e.g., Ask Zach if his dad writes with glitter glue) may have primed children to produce questions with agreement marking on the main verb and not on the auxiliary (i.e., utterances like (19b)).

of the PMT is modeled very closely after Johnson et al. (2005) and Johnson (2005), where the target stimuli are designed to mask plurality on the noun so that the only indicator of number was agreement marking on the auxiliary. This decision was made for comparison purposes. Our goal was to determine not only whether WC and MC children perform differently from each other but also whether 3.SG *-s* on the auxiliary *do*, rather than just on the main verb, is also difficult for children to use in comprehension. Consider the examples in (21).

- (21) a. Where do the ducks swim?      Target DO Condition  
 b. Where does the duck swim?      Target DOES Condition

Notice that in (21a) the plural marker */-s/* on the noun “ducks” is masked by the word initial */s/* on the main verb “swim.” For this reason, in our task participants must rely solely on the auxiliary (i.e., *do* vs. *does*) to determine subject number.

A within subjects design was used. There were four trials in the Target DO condition, four trials in the Target DOES condition, and four control trials (two Control DO trials and two Control DOES trials). Unlike Johnson et al. (2005) and Johnson (2005), the present study tested children’s comprehension of agreement on *do* and not on the main verb and we also included control sentences that were similar to target sentences except that the nominal plural marker was not masked. Examples of the control sentences are shown in (22) below.

- (22) a. Where do the birds live?      Control DO Condition  
 b. Where does the bird live?      Control DOES Condition

In the control sentences in (22a) and (22b), participants can use agreement on the auxiliary and/or the presence or absence of the nominal plural marker to assign number to the subject noun phrase. In other words, if children perform well on the control sentences in (22), but not on the target sentences in (21), we will have evidence that agreement marking is difficult for children to use in comprehension. This addition to the experiment is essential for interpreting the results. Because Johnson (2005) and Johnson et al. (2005) did not include this type of control condition, we cannot know for sure whether poor performance was due to agreement marking or just general difficulty with the task procedure. In order to ensure that participants could not use information in the control sentences to help them in their interpretation of the target sentences, controls were presented last. Importantly, previous research has shown that English-speaking children can associate the plural marker to “more than one” by 3 years of age (Kouider, Halberda, Wood, & Carey, 2006; Leonard et al., 2000; Munn, Miller, & Schmitt, 2006).

The experimenter read the experimental question and children answered verbally or by pointing to one of the two pictures. A sample experimental trial is shown in Figure 1. All experimental sentences are shown in Table 5. The presentation of experimental sentences was counterbalanced. For half of the experimental stories a question from the Target DOES condition (23a) was read first, and for the other half a question from the Target DO condition (23b) was read first. Presentation of pictures was not counterbalanced, pictures of singleton sets were always placed on the right, and pictures of plural sets were always placed on the left. This decision was made so that children did not have the additional task of tracking where the plural and singular sets were placed throughout the experiment.

Experimenter: “Look! What are these? (child says, “ducks”). Yes. And look they all swim in water. Look! These ducks swim in a lake (experimenter points to ducks in the lake) And look! This duck swims in a swimming pool (experimenter points to the duck in the pool and then removes her hand from the display).”

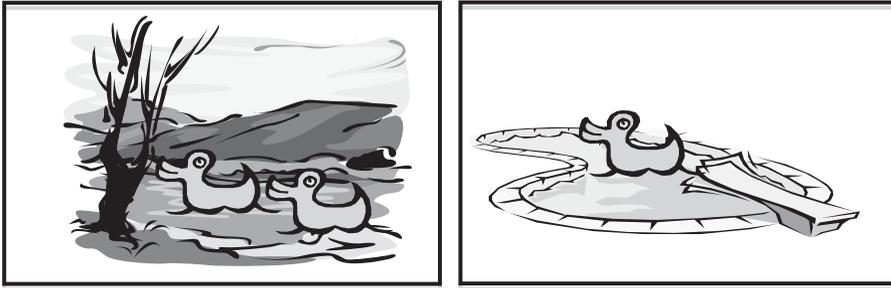


FIGURE 1 Picture Matching Task Sample Experimental Display.

TABLE 5  
Picture Matching Task. Experimental Sentences

<i>Target Sentences</i>	
<i>DO</i>	<i>DOES</i>
What do the rabbits sell?	What does the rabbit sell?
What do the cats see?	What does the cat see?
Where do the ducks swim?	Where does the duck swim?
Where do the cats sleep?	Where does the cat sleep?
<i>Control Sentences</i>	
What do the dogs eat?	What does the dog eat?
Where do the birds live?	Where does the bird live?

- (23) a. Where does the duck swim? (child responds) Good!  
b. Where do the ducks swim? (child responds) Good!

In order to make the task more natural for children, experimental prompts were not prerecorded and played to the children, as in Johnson et al. (2005); instead, sentences were spoken to children by an experimenter. This decision was made because we have found previously in our own work that playing prerecorded sentences to 3-year-old children has caused them some difficulty. Because Johnson et al. found that 3- and 4-year-old children but not older children performed poorly in their task, this measure safeguards against poor performance due to task procedure.

In the Target DO Condition only, the experimenter was trained to omit the nominal plural marker. The experimenter was recorded during testing and later the stimuli in the Target DO Condition were carefully checked by adult listeners to insure that plurality on the nouns was disguised and that the sentences sounded natural. A subset of the experimental sentences in the Target DO Condition was rated by a group of undergraduate students. Our goal was not only to make sure that the nominal plural marker was disguised but also to ensure that trials for WC and MC children were the same. This rating is important if we find that WC and MC children behave differently from each other in the Target DO Condition. Moreover, sentences in the Target DOES Condition and in the control conditions were not rated because no alterations to the experimental sentences had to be made by the experimenter.

To create the stimuli for the rating task, we compiled a set of 28 randomly selected sentences (14 spoken to WC children and 14 to MC children) that were recorded during the experiment and then presented them to 12 undergraduate students who were directed to “listen to each sentence and decide in which of the sentences the speaker produced the plural marker on the noun and in which of the sentences she did not.” Only a subset of the sentences was included to ensure that participants would not become bored but instead pay careful attention throughout the duration of the task. A t-test was used to determine whether participants rated sentences spoken to either the working-class or middle-class children as having more nominal plural marking. Our assumption is that this should not occur because the nominal plural marker was omitted in all of the experimental prompts in the Target DO Condition. The results confirm that there were no differences in the rating of experimental sentences that were spoken to working-class children vs. those that were spoken to middle-class children ( $t(1,11) = -.248, p = .809$ ).

## Results

For the Target DOES and Control DOES Conditions the target response was to choose the picture with a single character (e.g., the duck in the swimming pool). However, for the Target DO and Control DO Conditions there were two possible target responses: the picture with the plural set of characters (e.g., ducks in the pond) or both pictures (e.g., ducks in the water). However, choosing only the picture with a single character in the Target DO and Control DO Conditions was considered nontarget-like. We should note that only 13% of responses involved children pointing to both pictures (i.e., MC children chose both pictures 16% of the time, and WC children did so 4% of the time).

The results showed that both middle-class and working-class adults performed as expected in the task. Both groups pointed to the singular picture in the Target DOES and Control DOES Conditions and the plural picture in the Target DO and Control DO Conditions 100% of the time. On the hand, children showed more variation in their responses. The percentage of adult-like responses for children in both control and target conditions is shown in Figure 2.

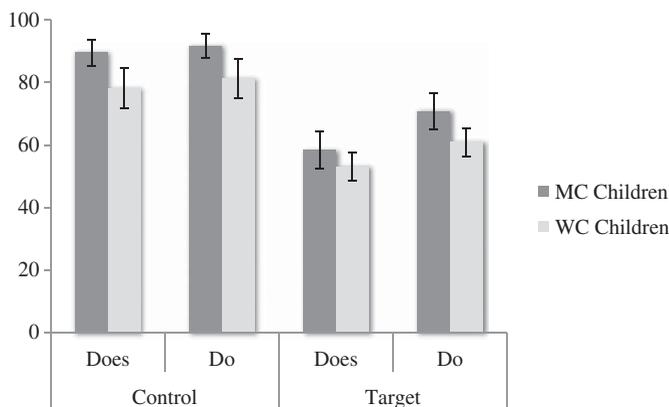


FIGURE 2 Percentage of Adult-like Responses in the Picture Matching Task.

Two mixed design ANOVAs were conducted; the dependent variable for each was the proportion of adult-like responses. The first ANOVA was for the DOES Conditions and the second for the DO Conditions, both with agreement marking (target x control) as a within-subjects variable and child group (WC x MC) as a between-subjects variable. The results showed a main effect of control versus target in both the DOES condition ( $F(1,38) = 23.237, p < .01$ ) and the DO condition ( $F(1,38) = 5.961, p < .01$ ). There was also a main effect for child group in both the DOES Condition ( $F(1,38) = 4.056, p < .05$ ) and the DO Condition ( $F(1,38) = 4.193, p < .05$ ). There were no significant interactions between child group and source of agreement marking (target vs. control) in the analysis of either the DO ( $F(1,38) = .122, p = .729$ ) or the DOES ( $F(1,38) = .112, p = .739$ ) trials. These results indicate that while MC children were more target-like across all conditions in the experiment, both groups of children behaved the same in that their performance was significantly better in the control conditions than in the target conditions.

Because this was a forced-choice task, we next compared children's behavior to chance performance (i.e., 2/4 trials). The results show that WC and MC children were above chance on both control conditions (WC Control DO ( $t(1,15) = 5.000, p < .001$ ); WC Control DOES ( $t(1,15) = 4.392, p < .001$ ); MC Control DO ( $t(1,23) = 10.724, p < .001$ ); MC Control DOES ( $t(1,23) = 9.349, p < .001$ )) and also on the Target DO condition (WC Target DO ( $t(1,15) = 2.406, p < .05$ ); MC Target DO ( $t(1,23) = 3.615, p < .001$ )). However, both groups were at chance in the Target DOES condition (WC Target DOES ( $t(1,15) = .696, p = .497$ ); MC Target DOES ( $t(1,23) = 1.399, p = .175$ )). It is possible that children were above chance in the Target DO Condition because of the way we coded correct responses (i.e., in the Target DO Condition choosing the plural picture or both pictures was considered target-like, although adults never chose both pictures). To determine whether this was the case, we excluded from the analysis children who chose both pictures in any of the trials in the Target DO Condition (MC children chose both pictures 16% of the time, and WC children did so 4% of the time). After excluding this data, the results showed that neither WC nor MC children performed above chance on the Target DO Condition (WC: ( $t(1,12) = 1.389, p = .190$ ); MC: ( $t(1,16) = .416, p = .683$ )). These findings are consistent with those reported for 3–4-year-olds in Johnson et al. (2005), who only considered pointing to the plural picture, but not both pictures, as a correct response in the third person plural condition.

## Discussion

Unlike the production task, the comprehension task does not provide any evidence that input variability affects acquisition. While it is true that overall there were differences in MC versus WC child performance, this difference was not limited to just the third person singular marker, but rather MC children were also more adult-like in the control conditions, suggesting that overall (in both the control and target conditions) WC children had more difficulty with the task. This finding brings into question the results in Johnson (2005), that AAE-speaking children have more difficulty than MAE-speaking children in their comprehension of the third person singular marker, as Johnson's study lacked a control condition. If the PMT in the present paper would have lacked a control condition, it may have also appeared as if middle-class children outperformed working-class children on comprehension of 3.SG -s.

The results of the Picture Matching task establish that the 3.SG -s is difficult for children to use in comprehension, regardless of input type, as both working-class and middle-class children

TABLE 6  
Proportion of Production and Comprehension of “does” by Child Participants

	<i>Prod = Comp</i>		<i>Prod-Comp Asymmetry</i>	<i>Comp-Prod Asymmetry</i>
	(Syst. PROD; Syst. COMP)	(No PROD; No COMP)	(Syst. PROD; Chance COMP)	(No PROD; Syst. COMP)
WC	0	43.75 (7/16)	43.75 (7/16)	12.5 (2/16)
MC	25 (6/24)	4.16 (1/24)	62.5 (15/24)	8.3 (2/24)
TOTAL	35 (14/40)		55 (22/40)	10 (4/40)

performed above chance in the control conditions but only at chance in the Target DOES condition. This finding is consistent with de Villiers and Johnson (2005), who predict that agreement, regardless of its form, should be difficult for children to use in comprehension. However, work on languages with rich agreement systems, such as Spanish, might provide stronger evidence for their proposal. For example, recent work by Pérez-Leroux (2005) also showed that Dominican Spanish-speaking children were unable to use agreement in comprehension (but see Miller & Schmitt, 2009, and Childers, Echols, & Tomasello, 2001, for different results with Chilean Spanish-speaking children, and Brandt-Kobe & Höhle, 2010, for different results in German).

Finally, taken together, the two experimental tasks in this paper show a production-comprehension asymmetry, as many children were more adult-like in production than in comprehension. While this finding is consistent with a variety of previous studies on agreement marking (Johnson et al., 2005; Leonard et al., 2000; Pérez-Leroux, 2005), as far as we know this asymmetry has never been shown before in individual children. In Table 6, if children consistently produced adult-like questions in the Elicitation task (i.e., in 3 or 4 of 4 trials) but were at or below chance in comprehension of the auxiliary in the PMT, they were considered to show a production-comprehension asymmetry.

A production-comprehension asymmetry may seem counterintuitive, as we generally assume that if a child produces a form, he or she is able to use it in comprehension. However, production-comprehension asymmetries have been found in a variety of recent studies (Hendriks & Koster, 2010; Hurewitz, Browne-Schmidt, Thorpe, Gleitman, & Trueswell, 2000; Trueswell & Gleitman, 2004). Hendriks and Koster (2010) provide an overview of the most common explanations that have been put forth to account for this type of asymmetry in child language acquisition, some of which attribute the asymmetry to differences in parsing strategies, differences in pragmatic knowledge, cognitive limitations in children, or simply as artifacts of experimental design (see Hendriks & Koster, 2010, for details). While we also find a production-comprehension asymmetry in the present study, the data collected in this paper is insufficient to determine which of these accounts may explain our data. We leave this question to future work.

## GENERAL DISCUSSION

Roberts (1994) argues that “a complete acquisitional model demands the inclusion of all forms of language, those which are variable as well as those which are categorical in nature” (Roberts, 1994, p. 5). The present study attempted to take a step in this direction by examining

English-speaking children's acquisition of agreement marking on auxiliary *do* in the context of variable input versus consistent input. We believe that research on the acquisition of labovian-type variation provides a new and important context for investigating how language is acquired more generally. By ignoring input variability and frequency, we increase the risk for analyses that are both uninformative and circular. If it takes longer to learn a particular piece of morphology, must we conclude that it is simply due to linguistic complexity? Moreover, by examining the effect of variable input in different linguistic contexts (e.g., plural morphology, agreement morphology), we can determine whether differences in input always affect language acquisition in the same way.

The study presented in this paper shows three important findings about the nature of language acquisition in children: (i) children exposed to a variable input involving a zero form initially overregularize to zero, (ii) children overregularize across linguistic contexts and not just in the context where the form is variable in the adult grammar, and (iii) production of a form does not mean that children can use it in comprehension.

The Elicitation task suggests that variable input initially appears inconsistent to learners as the results are similar to those reported by Hudson Kam and Newport (2009) on inconsistent input. These results support Radford's (1992) proposal that nonagreeing *don't* in the input causes children to initially miscategorize *do* as a modal-like auxiliary (i.e., children overregularize to zero) and extend the use of nonagreeing *do* to other linguistic contexts (e.g., nonnegative interrogatives). WC children's production of nonagreeing interrogative *do* in the Elicitation task, taken together with past research on the acquisition of variable input and inconsistent input (Hudson Kam & Newport, 2009; Johnson, 2005; Miller, 2007; Miller & Schmitt, 2009), provides support for the proposal that variable input involving a zero form initially causes children to overregularize to zero.

One question that arises is why frequency alone cannot account for the results of the Elicitation task. In the present study it might be argued that because *do/don't* is the most frequent form of the auxiliary in the input, more frequent than *does/doesn't* (i.e., *do/don't* occurs with all subjects except 3.SG: 1.SG, 2.SG, 3.PL, 1.PL), when nonagreeing *don't* is produced variably in the input (i.e., adults also produce it with 3.SG subjects some of the time), the frequency of *do/don't* increases for WC children, causing them to produce nonagreeing, nonnegative interrogative *do*. However, the logic of this argument seems to fail because *do/don't* is more frequent in the input to both MC and WC children (i.e., because *do/don't* occurs with all subjects except 3.SG). In other words, the use of nonagreeing *don't* in the input to WC children, but not MC children, does not change the fact that *do/don't* is the most frequent form of the auxiliary to both groups. If frequency alone is responsible for the production results, then both groups of children should produce nonagreeing *do* in interrogatives. This is not what we find. Instead, it appears that it is the variable production of nonagreeing *don't* in the input to WC children that initially causes WC children to miscategorize *do* as a modal-like auxiliary. While past work has already indicated that input frequency affects acquisition, the results of the Elicitation task suggest that variable input also plays an important role.

We believe that Yang's (2002) Variational Model of language acquisition can best represent the results of the Elicitation task. Yang's model views language acquisition as a probabilistic competition process among hypotheses about the emerging grammar within the confines of UG, and we believe that the model can take both input frequency and input consistency into account. Schematically, learning goes as follows:

- For an input sentence, *s*, the child:
- i with probability  $P_i$  selects a grammar  $G_i$ ,
  - ii analyzes *s* with  $G_i$ ,
  - iii if successful, rewards  $G_i$  by increasing  $P_i$ , otherwise punishes  $G_i$  by decreasing  $P_i$ .

The model gradually eliminates any hypothesis that is only compatible with a portion of the input data.

Minimally, children must determine whether the auxiliary *do* agrees with the subject or not. To do this, we propose that children take into account the co-occurrence of the auxiliary *do* with each of the subjects on all tokens of *do*, regardless of the construction in which *do* is produced (i.e., interrogatives, negatives, declaratives). Perceptual studies show that children are sensitive to the grammatical properties of 3.SG –s on main verbs by 19 months of age, in other words, that –s occurs with 3.SG subjects (Soderstrom, 2002). This suggests that children may be equipped early on to use this information in acquisition of agreement marking on the auxiliary *do*.

Under Yang's model, because the input for agreement marking on the auxiliary is variably produced in the input to WC children, but not to MC children, WC children are receiving evidence both *for* and *against* agreement marking on *do*. As such, the model predicts that WC children will take longer to converge on the target grammar, as they will be exposed to an input that is consistent with two alternative hypotheses: H1: auxiliary *do* carries person/number versus H2: auxiliary *do* does not carry person/number. Table 7 illustrates the input to WC children. When nonagreeing *don't* is produced, it provides evidence for H2, as the form of the auxiliary does not change with respect to the subject.

As children are exposed to more input, we propose that they will ultimately learn the linguistic and extra-linguistic constraints governing the variation of nonagreeing *don't* (e.g., that it occurs variably but only when *do* contracts with negation) and eventually stop overregularizing nonagreeing *don't* to other linguistic contexts. In other words, they will eventually settle on H1.

The results of the comprehension task, on the other hand, do not negate the hypothesis that input variability affects acquisition, as both groups of children performed at chance in comprehension. This finding corroborates previous work by de Villiers and Johnson (2007) that children have difficulty using agreement marking in comprehension and that adults and older children are using metalinguistic knowledge to complete the task successfully. It is interesting to note that Beyer and Hudson Kam (2009) show in an eye-tracking study that 6-year-old children are sensitive to the 3.SG marker on the main verb. These children are much older than those tested in the present study, and as such, their sensitivity to 3.SG –s is not surprising. Nevertheless, their study highlights a potentially important problem related to differences found between on-line and off-line tasks and we plan in our future work to address whether input variability affects children's behavior in on-line measures of comprehension of 3.SG –s.

In conclusion, we emphasize the importance of understanding the effect of variable input on language acquisition and suggest that it has the potential for shedding light on the nature

TABLE 7  
Input to WC Children for Agreement on "do"

I do/ <b>don't</b>	We do/ <b>don't</b>
You do/ <b>don't</b>	You (guys) do/ <b>don't</b>
He/she/it does/doesn't/ <b>don't</b>	They do/ <b>don't</b>

of language learning more generally. A review of the abundant work in sociolinguistics will illustrate the enormity of such a research agenda. What is the interaction between the acquisition of variable rules and the acquisition of the target grammar, as both are being acquired at the same time in development (see Johnson, 2005; Miller, 2007; Miller & Schmitt, 2010)? Does variable input in adult speech always affect acquisition of grammatical forms in the same way (e.g., variability constrained by morphological factors vs. variability constrained by phonological factors) (Smith et al., 2007)? Does the number of alternative variants or the type of variants (zero form + overt forms vs. two different overt forms) matter? What role does frequency of the variant forms play in the acquisition process? The answer to these questions will not only inform the sociolinguist who is interested in how variable rules are acquired but also, more crucially, will allow us determine in a naturalistic setting how input consistency affects acquisition of the target grammar. The present paper indicates that variable input involving a zero form affects the initial grammar that children construct, a finding that highlights the importance of taking into account variable input in language acquisition research.

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