Chapter 2 in

The central topic of this volume is language competence across populations. The population of interest here is children with specific language impairment (SLI), a condition conventionally defined as one in which children seem to have the necessary developmental precursors to support language acquisition but nevertheless show language delays. This condition is sometimes described as "unexpected and unexplained variation" in language acquisition. This chapter focuses on the nature of variation within the language system, the ways in which affected children do and do not vary from unaffected children, the ways in which children with SLI are similar to and different from children with Williams syndrome (WMS), and the interpretation of a possible grammatical marker as indicative of either a general language delay or a selective delay in addition to the general delay. At the most general levels, the chapter takes up the issues of variation within elements of language, developmental variation as children move toward the adult linguistic system, variation in onset mechanisms versus asynchronous elements within the linguistic system, and variation across different clinical populations of children with language impairments.

The adult grammar, comprised of the underlying architecture and principles of clausal structure, is relatively intolerant of variations across individuals. It is the common knowledge of the structural principles of clauses that allows language users to convey messages of intended meanings from one person to another. Certain properties are obligatory, and if the
affected children, within a developmental perspective. This is not a full research review of the available literature, or an attempt to evaluate the outcomes vis-à-vis alternative theoretical accounts of language impairment. It is an initial sketch of an overarching model of language delays in the context of individual and group differences, and in the context of natural partition lines within the linguistic system, drawing on an extensive empirical data base collected over time from the same children. Such an attempt has value for investigators interested in how the condition of SLI may be related to other conditions of language impairment, which is a topic largely overlooked in the available studies of children with language impairment. According to the premise of this chapter, comparisons of language impairments across clinical populations can be revealing of the ways in which the underlying linguistic system can be selectively robust or weak. The attempt is also relevant for investigators interested in the way in which elements of the linguistic system come “online” in children, whether in the relatively rapid acquisition of a well-synchronized system in typically developing children or in the more protracted and less synchronized system of children with language impairments.

The sequence of topics is as follows: The chapter begins with an examination of the notions of variation that are evident in the previous literature, and two kinds of variation across children that are identifiable and relevant here (i.e., normative variation in the form of a bell-shaped distribution of individual differences, and variation that shows a bimodal distribution of individual differences, in which children can be clearly distinguished as low or high in performance levels). An integrative model of language delay is described via a train analogy, which differentiates a general delay of language acquisition, versus a selective delay, where an element of the grammar lags behind the other elements of language acquisition. This model is referred to as a delay-within-delay model to capture the fact that there are two possible senses of delay, one general and a second more specific. This is followed by a summary of evidence of variation in the timing mechanisms for the acquisition of grammatical tense marking in young affected English-speaking children as compared to control groups. Concurrent with the manifestations of individual variation in grammatical tense marking, other morphology shows invariance in performance levels, suggesting that protracted acquisition is not a general property of morphology per se. Evidence from various lexical indices is then reported, which shows that children’s lexical acquisition displays individual and group variations during this same time period that are unlike those of grammatical tense marking. Growth trajectories of morphosyntactic and morphophonological components of tense marking differ, supporting the assumption that these two elements of the grammar have different properties. This conclusion is supported further by a series of analyses to examine predictors of growth,
which show similarity for tense marking indices, but differences from the morphophonological index. Cross-clinical comparisons between children with SLI and children with WMS provide another way to examine the relation of grammatical tense marking, general language delay, and lexical acquisition, revealing further the ways in which these factors vary and covary across children. Two methodological notes highlight measurement issues, showing, on the one hand, the relative stability of mean length of utterance (MLU) as a developmental measure during the age range of 3–8 years, and on the other hand, the need to focus on percentage correct in obligatory contexts as a morphological index that can reveal variations in knowledge of the obligatory properties of tense marking.

The final section lays out some implications for models of language acquisition, specific and nonspecific delay, and the distinction between a general delay outcome of language acquisition versus a delay-within-delay outcome. The delay-within-delay model places the grammatical tense marker in the more general context of two possible relations: as a marker of a general delay or as a marker of a delay-within-delay (and not necessarily the only possible such marker). The grammatical tense marker as a marker of a delay-within-delay outcomes, it is concluded, reflects relatively specific elements of morphosyntax that can be dissociated from lexical acquisition in children's language acquisition, although the technical details across languages remain to be worked out.

SOME BACKGROUND REMARKS

The Assumption of Uniform Robustness

Much of the normative literature on children's acquisition has focused on the ways in which children are invariant, in the observation that all normal children acquire language effortlessly, and seem to follow the same timing mechanisms and the same general sequence of acquisition. An important advantage of this assumption is that it emphasizes the relatively invariant properties of language acquisition across a wide range of environmental circumstances, and thereby brings some helpful constraints to the empirical generalizations that must be captured by a given theory.

This assumption is most cogently expressed by Pinker (1984, p. 29): "In general, language acquisition is a stubbornly robust process; from what we can tell there is virtually no way to prevent it from happening short of raising a child in a barrel." Although there were advantages to this perspective, it did not meet the test of empirical validity. There were, in fact, children who did not acquire language effortlessly, even though they were reared according to conventional childrearing practices.

The Updated Assumption of Variable Robustness

By the early 1990s, there was widespread recognition that otherwise apparently normal children (reared in normal circumstances) can have language impairments. The existence of the condition of SLI was, of course, known before then to students of language impairments and in the field of speech pathology. The advent of modern genetics helped shift attention from the ways in which individuals are uniformly robust to the ways in which individuals are variably robust in language acquisition, and broadened the scientific interest in affected children beyond the scope of practitioners who provided clinical services. Investigations of possible sources of genetic etiology are intrinsically focused on individual differences (i.e., ways in which affected individuals can be identified as different from unaffected individuals). As is apparent from the evidence summarized later, one of the most interesting aspects of the emerging evidence of variable robustness is that the loci of individual differences across children can be seen in relatively invariant properties of morphosyntax, the very elements of clausal structure that are essential to the formulation of grammatical sentences. As it turns out, then, the updated assumption of variable robustness applies to elements of language as well as individual differences.

KINDS OF VARIATION ACROSS CHILDREN

Normative Variation

Understanding of children's development is greatly influenced by the concept of normative variation. This is typically referenced to age expectations. Imagine, for example, a group of 5-year-old children. If they are administered a conventional test of language acquisition, such as the lexical comprehension test, the Peabody Picture Vocabulary Test–Revised (Dunn & Dunn, 1981), the collection of obtained scores will be distributed as the well-known bell-shaped curve, as is shown in Fig. 2.1. This curve has some remarkably robust psychometric properties that allow for the prediction of the distribution of individual scores as a function of the group mean and variances from the mean. The conventional definition of language impairments has been cast in terms of the distance of an individual's score from the expected group mean, given the observed variance within the group. This is usually in the neighborhood of one to two standard deviations below the mean, roughly in the bottom 5th–15th percentile, indicated by a line at the lower tail of the distribution in Fig. 2.1. Conventionally, the condition of SLI involves the further exclusionary criteria of documented performance within or above normal range on assessments of nonverbal intelli-
gence, with the caveat that the precise criteria for exclusionary criteria are subject to current discussions and debate (Tager-Flusberg & Cooper, 1990).

A Grammatical Marker

The bell-shaped curve, however, is not applicable to all elements of language acquisition. Compare, for example, the same 5-year-old children in their knowledge of morphosyntax, such as their use of copular and auxiliary forms of BE. The expected distribution of percentage correct in obligatory contexts would show a different pattern, one of a markedly skewed distribution with most of the children at adultlike levels of performance and only a few children showing lower levels of accuracy, as shown in Fig. 2.2.

Thus, there are two different ways in which children with SLI could show unexpected variation when compared to other children of the same age. One variation would be evident as a lower relative level of performance on a measure of language acquisition that shows variation across children of a given age, where variation is continuously distributed in the form of a bell-shaped curve. The second possible variation would be a low level of performance on a property of the grammar where variation across individuals is not expected.

The notion of a clinical marker has been useful in the medical literature, when referring to a symptom that is diagnostic of a particular medical condition. The idea of a marker for language impairment has appeared in the recent literature in investigations of the etiology of language impairments, and the need to be able to identify affected individuals for the purpose of studying possible inherited contributions to the condition. Note that a distribution such as that in Fig. 2.2, where low performance is clearly differentiated from high performance, would be felicitous for the identification of a clinical marker of language impairment, in effect a grammatical marker of language impairment.

Variation in Onset Timing

A long-standing differentiation in the literature on language impairments is the distinction between a language delay and a language deviance (Lee, 1966; Leonard, 1972; Menyuk, 1964; Morehead & Ingram, 1973). A language delay means that children could be delayed in the onset of their language system, which sometimes (but not always) takes on the related meaning that they remain similar to younger children for a protracted period of time, and may or may not ever reach mastery levels. Such children are sometimes referred to as “late talkers,” when the language delay is the only apparent developmental delay. The likelihood that they would “outgrow” such a delay, and when such a jump would be expected, remains a matter of ongoing investigation and some controversy in the literature (cf. Thal & Kitch, 1996).

In contrast, children with language impairments could show a delayed onset, and a linguistic system that is “deviant” or unlike that of younger children. This possibility (originally proposed by Menyuk, 1964) was, follow-

Note the subtle difference in meaning between a grammatical marker, which refers to a grammatical symptom of language impairment, and marking a grammatical feature, as in tense marking, which refers to the computational processes involved in morphosyntax.
ing the available linguistic models, first thought of in rather general terms of rather pervasive differences in possible grammars for affected children.\footnote{Recently Leonard (1996) proposed a five-way set of distinctions: (a) \textit{delay}, consisting of a late start; (b) \textit{plateau}, showing leveling off before mastery levels are achieved; (c) \textit{profile difference}, in which the difference in performance between two morphemes, such as -s for plurals and third-person singular present tense, may be greater for children with impairments than for unaffected children; (d) \textit{abnormal frequency of error}, in which a greater number of errors of a given type, such as that of pronoun case, are seen for affected children; and (e) \textit{qualitative difference}, such as phonological processes evident in affected children unlike those of unaffected children (a category that Leonard noted is highly unlikely). The delay-within-delay model presented here places the delay distinctions within a framework of linguistic domains, and a delay-within-delay that plays out differently across different linguistic elements and different measurements.}

Investigations of language impaired children often employ a three-group design in order to evaluate delay versus deviance interpretations, involving two crucial group comparisons: one in which the affected group of children is compared to a control group based on chronological age, where differences between affected and control children would reveal areas of language delay; and a second in which the affected group of children is compared to a control group based on linguistic equivalencies (often on the basis of mean length of utterance), where differences between affected and control children would reveal areas of linguistic differences not accounted for by a younger level of mean length of utterance, for example.

In light of the evidence summarized later, an elaborated version of the delay notion is proposed, in a model that recognizes possible late activation mechanisms of two sorts: one more global and another more localized within certain elements of the grammar, referred to as a delay-within-delay model. This model recognizes different rates of development within the elements of the linguistic system.

A train metaphor illustrates the general notions, shown in Fig. 2.3. The expected emergence of language early in a child's development can be thought of as a train, where the "language train" early on shows clear organizational composition of lexical, syntactic, morphological, and computational elements, perhaps roughly analogous to the alignment of cars, wheels, connections between cars, engine, drive shafts, and so on, of the train example. These elements are constrained to follow a developmental trajectory, perhaps roughly analogous to the tracks of the train that constrain the route of forward motion.

For most children, the train begins to move (i.e., departs the station) at an expected time, roughly when the child is between age 12 and 24 months, and then moves forward in an expected rate and trajectory of acquisition, as indicated in Panel A of Fig. 2.3. In contrast, for other children, the start-up of language acquisition may be delayed, as in Panel B. That is to say that the train may not leave the station at the expected time, although the train is configured in the same way as the train in Panel A. Such a delayed start could follow the same trajectory and speed (rate of acquisition) as that of typically developing children, and could possibly remain behind the train of Panel A by a steady distance throughout the language acquisition period, or, for unknown reasons, may eventually speed up to catch Train A at a later time, thereby reducing the gap generated by a different start-up time. This scenario corresponds to the conventional sense of a language delay. A third possibility is that a late-starting language system also has a localized difference in linguistic elements, as shown in the train of Panel C, where perhaps coupling or computational relations between elements are not the same as the expected alignments. Such a language system could start late, and perhaps some elements might eventually catch up to those of unaffected children, or perhaps some elements remain delayed relative to that of the rest of the language system. Whether or not they are ever fully integrated into the language system would be an important matter to determine.

The point of the train metaphor is to distinguish between individual differences between children in general onset timing for language acquisition and individual differences attributable to a selective delay within the linguistic system, a delay-within-delay, even though there are inherent constraints and configurational properties of the language system that are intact for both kinds of individual difference. Within this view, a grammatical marker could be part of a general delay (Panel B), or part of a selective de-
lay in addition to the general delay (Panel C). Refer to Panel C as a delay-within-delay model, for a second delay in excess of the initial delay in onset of the general language system. Another possibility is that, in principle, a grammatical marker could be the only area of delayed onset (i.e., that most of the components of the language system emerge at the expected time and proceed in the expected acquisition trajectory but there is a selective and single area of delay in certain areas of the grammatical system). Such youngsters under current clinical practices would not necessarily be regarded as having a language impairment.

Under the delay-within-delay model, individual differences in language acquisition would entail possible differences in timing of acquisition mechanisms, and possible differences in the relative robustness of elements of the linguistic system. Conversely, to the extent that in some children’s growth elements of the linguistic system are selectively delayed relative to other elements, evidence of individual differences would be relevant to models of the structure and principles of language.

**GRAMMATICAL TENSE MARKING IN CHILDREN AGES 3 TO 8 YEARS**

In this section, generalizations will be laid out drawn from the available evidence. The generalizations are indicated in italicized font.

Children with SLI start using grammatical tense markers at a later age, and show slower acquisition, although the change in acquisition over time follows an upward path toward the adult grammar that is not different from normal controls. This conclusion is based on data reported in Fig. 2.4 (from M. L. Rice, Wexler, & Hershberger, 1998). This figure represents the outcomes of a longitudinal study comprised of three groups of children: A group identified as SLI who were age 5 years, on average, at the outset, and who met criteria as having receptive as well as expressive language delays, and no apparent other developmental impairments. They also passed a phonological screening. There were two control groups, one of equivalent chronological age (labeled as “5N,” for “5-year-old normal group”), and the second, younger group of equivalent language development (indexed by their mean length of utterances). The language control group was, on average, 2 years younger than the SLI group of children at the outset (hence labeled “3N”). The children were followed for 7 times of measurement, at 6-month intervals, encompassing the full age range of 3 to 8 years. Figure 2.4 plots the children’s performance on a “composite tense” measure, which is an arithmetic mean of their percentage use in obligatory contexts of a target set of morphemes thought to require grammatical tense marking (i.e., third person singular -s, regular past tense -ed, be copula and auxiliary in statements and questions, and Do auxiliary in questions). The data are from spontaneous utterances and elicitation probes. Detailed analyses found no difference in methods of measurement (spontaneous vs. probes) and the same general outcomes held for each individual measure, so the summary index is representative of the individual data components.

It is clear from the figure that at the first time of measurement the affected children at age 5 years, as indexed by their group mean, were performing below the language control group who were 2 years younger at the outset. Furthermore, this group difference held throughout the entire longitudinal period of study (see M. L. Rice et al., 1998, for detailed analyses). Thus, even though the younger children were still acquiring this area of grammar in the period from 3.0 to 4.6, their performance exceeded that of the older affected group. In terms of the train metaphor, the affected group follows the train in Panel C, the delay-within-delay model (i.e., in this part of the grammar, the affected group of children is slow getting started, and seems to show a delay beyond what would be expected for their general language level). At the same time, children of the same age level are functioning at adult-like levels. Growth curve analyses found that for both the SLI and 3N groups, the path of upward improvement was described by linear and quadratic components in the equation, and further examined the following possible predictors of the children’s growth on the composite tense variable: mother’s education, nonverbal intelligence, receptive vocabulary, and mean length of utterance. Growth in this area is not predicted by
mother's education, nonverbal intelligence, or receptive vocabulary, and is weakly predicted by the children's mean length of utterance at the outset, suggesting that the grammatical marker is relatively independent of the sorts of differences in a child's home environment associated with differences in mothers' education levels, and of the child's levels of nonverbal intelligence (within the broad range of "normal" or above) and the child's understanding of vocabulary. That is to say that the part of the "train" devoted to tense marking is to some interesting extent separable from other parts (i.e., receptive vocabulary, nonverbal intelligence, and even mean length of utterance). Detailed analyses of the children's utterances found that overt errors of sentence formulation, or morphological forms, were rare, and almost all the errors consisted of omissions of the target forms, thereby suggesting that even the affected children knew about basic rules of sentence formulation, even as they were likely to omit obligatory elements of the grammar. This observation, in combination with the fact that the growth curve is the same for the affected children as the younger control children (although offset at lower levels of performance, and a probable later time of emergence), suggests that the two groups' language acquisition does not differ in fundamental ways (i.e., that the "train" is probably configured in a similar way, and follows the same tracks forward).

One possibility is that the production data shown in Fig. 2.4 indicate a problem that the affected children might have in formulating the production of utterances, perhaps in a memory buffer that is crucial for morphemes such as those involved in grammatical tense, instead of an underlying grammatical weakness (cf. Bishop, 1994). In order to evaluate this possibility, a grammaticality judgment task was developed that paralleled the production tasks. In this task, children were asked to judge sentences that included tense markers, such as *He drinks milk and *He is hiding and sentences in which tense markers were omitted, such as *He eat toast and *He running away. These contrasts were labeled as an optional infinitive (OI) grammar, following Wexler's terminology for the phenomenon of grammatical tense markers being absent in children's utterances (cf. Wexler, chap. 1 in this volume), under the interpretation that a child who judged sentences with omitted tense markers as acceptable was operating according to the representations of an OI grammar. The responses were summarized as A' (referred to as "A' prime"), an index that controls for children's greater likelihood of saying "yes" than "no." This index can be interpreted as mathematically similar to the percentage correct in a two-alternative forced choice task (i.e., as if a child was asked "which is grammatically acceptable?" and given both choices simultaneously). Figure 25 reports the A' means for the groups' performance on the grammaticality judgment task, which was first administered when the affected children were age 6 years (and the younger controls were age 4 years; cf. M. L. Rice, Wexler, &

Redmond, 1999). The general pattern of outcomes is the same for the judgment data, which did not require children to produce forms, as for the production data. This is to say that the affected children performed below that of the younger language control group (as well as below that of the age control group) at each of the five times of measurement; growth change over time was very similar for the affected and younger language control group (growth curve analyses yielded linear and quadratic components of the equation for both groups); and the same outcomes as for the production data were found in the analyses of predictor relations (i.e., neither mother's education, the children's receptive vocabulary nor the children's nonverbal intelligence levels predicted growth on the judgment tasks), but there was a small effect for MLU. The findings for judgment, therefore, also are consistent with the delay-within-delay train of Panel C, and support the interpretation that the source of the grammatical marker is to be found in underlying grammatical representations.

Young children show individual variation in grammatical tense marking that disappears by age 5, as they mature at the level of the adult grammar. The previous section considered variation evident in groups of children of different ages, and in a comparison of children with SLI with age or language equivalent groups of children. The reported group means indicate the central tendency (i.e., the average score calculated across the members of the group). Here the variation in performance of children within the groups is examined. This is reported in Fig. 2.6 for the composite tense scores for the SLI group and the younger language-equivalent control group (note that for the unaffected age control group the children show little variation; i.e., all are at high levels, across the ages sampled, so that group is not included in the figure). The box plot depicts the full range of scores of the children in the
group, shown by the end of the “whiskers” at each end of the colored boxes; the scores that fall in the 25th to 75th percentile of the group, shown by the filled in boxes; and the median values for the group, shown by the lines in the middle of the boxes. The age-related trends are obvious. The same group of children (i.e., the 3N group) shows more variation in performance levels across the children when they are young, and as they age the variation across children disappears as they uniformly adopt the obligatory properties of the adult grammar. This same generalization holds for the children with SLI as well, although the variability is greater within this group throughout. In other words, among the children who at the outset met the criteria for diagnosis as “receptive/expressive SLI,” there was a wider range of performance levels. This seems to be attributable to two slightly different outcomes: One is differential rates of growth, such that some children follow steeper slopes to high levels of performance than do other children in the group, and, second, some children show a less consistent upward trajectory of change as they waffle around a midlevel plateau of optional use (between ages 5 and 6 years) before moving upward to the final level of performance. At the same time, even though there are individual differences, the overall trajectory is clearly upward for all the affected children. Figure 2.7 shows that a very similar pattern of individual differences within groups is apparent for performance on the OI grammaticality judgment tasks.

At age 5 years, variation in levels of grammatical tense marking within a group of SLI children is likely to be in a range below the variation expected in unaffected children. Given the fact that, during the early childhood period, children who are typically developing show variation in their progress toward the obligatory properties of tense marking, even at the same age levels, it is very important not to confuse the ordinary variation across children with the variation that may be indicative of a language impairment (i.e., the likelihood of a protracted period of language acquisition of either a general delay in language acquisition or a delay-within-delay outcome). It is very important to show that the performance levels of affected children are in fact likely to be below those of their age group (i.e., to show that, at the same age level, the affected children cluster at the bottom end of performance, whereas the unaffected children cluster at the top end of performance as depicted in Fig. 2.2).

The distribution of performance levels of two groups of 5-year-old children, one group of 37 children identified as expressive/receptive SLI and a control group of the same age (cf. M. L. Rice & Wexler, 1996), is depicted in Fig. 2.8, which reports their performance on a composite tense marking score (collapsed across regular third person singular -s, past tense, Be and Do). It is obvious that the affected children, with the exception of one child, cluster at the bottom end of the performance levels, and the control children, with the exception of one child, cluster at the top end. One way to describe the outcomes is to note that 97% of the affected children score below 80% (sometimes referred to as the sensitivity index of the level of detection of the true cases of affectedness) and 98% of the control children score above that level (the specificity index of the level of identification of the true cases of nonaffectedness).

More extensive data collection was recently carried out for the development of a standardized test version of the experimental grammatical marker tasks, involving 393 children between ages 3;0 and 6;11 whose language skills were considered normally developing (with a broad definition of normal including children diagnosed with attention deficit disorders) and 444 children between the ages of 3;0 and 8;11 who had a diagnosed language disorder (which included a mixture of children with expressive-only
language impairments as well as the expressive/receptive criteria used in the experimental studies reported earlier. In this broad sampling, for children ages 4:6 to 4:11, the sensitivity of the composite tense marking index at a level of 80% was .94 and specificity was .82; at 5:0 to 5:5, sensitivity was .90 and specificity was .80; and at 5:6 to 5:11, sensitivity was .90 and specificity was .90 (cf. M. L. Rice & Wexler, 2001).

NONVARIATION IN THE ACQUISITION OF MORPHOLOGY

Under some models of specific language impairment, such as the low phonetic salience account (Leonard, Eyer, Bedore, & Grela, 1997), it is predicted that morphemes that share phonological properties, such as -s affixes, would be likely to be jointly affected by a grammatical delay. A test case for this prediction is the level of performance of the regular plural -s, which shares phonological properties with third person singular -s. Figure 2.9 reports the levels of performance on the percentage correct use of regular plural -s in spontaneous speech samples for the SN, 3N, and SLI children of the longitudinal study, which shows that throughout this period of time all three groups of children, including the affected children, perform at high levels of percentage correct in obligatory contexts. This constitutes further evidence of the ways in which the language acquisition system of children with SLI is robust and similar to that of unaffected children, and works against a model that posits that -s omissions for the third person singular affix are attributable to the phonological properties shared with regular plural -s. It is still possible that there may have been a delay in the onset of plural marking for the affected children at an age period earlier than that of the study, which has been resolved by the time the children are, on average, 60 months old. It would be interesting to know, in the event that such an early delay exists, if the extent of the delay was part of a general language delay, consistent with expectations indexed to MLU, or if it showed a selective delay as well. It remains for studies of young children with SLI to investigate this possibility.

LEXICAL ACQUISITION AS AN AREA OF GENERAL, NOT SPECIFIC, DELAY

A number of analyses have been carried out on the lexical acquisition of the participants in the longitudinal study to determine if there were differences between the SLI group and the younger control group. If such differences were observed, then it would suggest that a grammatical marker would be joined by a lexical marker in the selective delay of language. If no such differences appear, then it would be consistent with a model of general delay of lexical elements of language acquisition (i.e., that the levels of acquisition of the children with SLI were quite similar to that of younger children, of equivalent levels of MLU).

A number of different lexical variables show the same general outcomes: the SLI group performs at levels very similar to that of the unaffected younger control children. The number of different word roots (collapsed across all form classes) in children’s spontaneous language samples are reported
in Fig. 2.10, from samples at the first time of measurement, when the affected children were age 5 years, for the three participating groups; the number of different lexical verb types in Fig. 2.11 is reported for the first time of measurement and again at the second time of measurement, 6 months later, for the SLI and 3N groups; the number of verb tokens (total lexical verb use) is reported in Fig. 2.12 for the first and second time of measurement for the SLI and 3N groups; Fig. 2.13 reports on the percentage of general all-purpose (GAP) verbs in the children’s spontaneous samples at the first and second times of measurement, where GAP verbs are defined as the small set of lexical verbs used more than the average number of times (the previous four variables are reported in M. L. Rice, Tweed, & Higheagle, 2000); and Fig. 2.14 reports the raw scores on the Peabody Picture Vocabulary Test—Revised (Dunn & Dunn, 1981) at each age level for the four times of annual testing for the 3N and SLI groups (K. J. Rice, M. L. Rice, & Redmond, 2000).

Statistical analyses reveal that for each of these variables the children with SLI do not differ in level of performance from the younger control group. The conclusion is that the affected children’s acquisition of lexical items shows a general delay, which remains parallel to the language acquisition of a group of children about 2 years younger than the affected group of children. This generalization is complicated somewhat by the fact that on tasks of word learning in naturalistic circumstances, children with SLI per-
form less accurately than younger language control children (cf. M. L. Rice, Buhr, & Nemeth, 1990). A reduced capacity to learn new words quickly, relative to the younger control children, may be a major factor in the SLI group’s general language delay, although the details of the process, and associated limitations, are not yet worked out, and there are mixed outcomes in the literature. What is highly relevant here is that, in the lexicon, the level of understood vocabulary items and the diversity of use of vocabulary items in spontaneous utterances follows a general delay pattern for the children with SLI.

MEAN LENGTH OF UTTERANCE AS A PART OF A GENERAL DELAY

Since the work of Brown (1973), the mean length of spontaneous utterances of children has served as a conventional general descriptor of young children’s language acquisition. In his investigation of three children at the beginning stages of language acquisition, Brown suggested that around the level of 4.0, MLU may become less stable, and therefore less reliable for interpretation. In the intervening years since Brown (1973), other studies document that MLU is highly associated with age below and above the 4.0 level (cf. Conant, 1987; Scarborough, Rescorla, Tager-Flusberg, & Fowler, 1991).

Because MLU is used as a matching variable in studies of children with SLI and as a diagnostic criterion for identification of affected children, measurement stability and validity are important attributes. Gavin and Siles (1996) reported high levels of test-retest reliability for MLU derived from spontaneous speech samples of unaffected children between 31 and 46 months, for sample sizes of 175 or more complete and intelligible utterances. On the other hand, based on their literature review, Plante, Swisher, Kiernan, and Restrepo (1993) challenged the use of MLU as a matching variable for English-speaking children. Elsewhere, Bol (chap. 10 in this volume) challenges the validity of the MLU index. It is therefore of interest to examine the developmental trajectory of MLU values in the children studied in the longitudinal study described here. In seven times of assessment, the levels of MLU were calculated from the spontaneous utterances of the children in the SLI and the 3N groups. They are reported in Fig. 2.15, where it can be seen that the MLU levels show a strong association with age in the form of steady upward progression (although the within-group variation stays fairly constant, unlike the restricted variation at upper ages that is evident for the obligatory morphemes). Furthermore, as is evident from the figure, the levels of MLU of the SLI and 3N groups stay very similar throughout the period of investigation. Statistical tests show that the two groups are equivalent in their levels of performance, at each age level. Such outcomes are strong indicators of stable and valid measurement properties of the MLU index, which in the case of the data reported here are based on sample sizes of more than 175 complete and intelligible utterances, with careful attention to consistency of scoring criteria.

Once again, the MLU outcomes are consistent with a general delay of language acquisition for the affected group, one in which it must be assumed that the affected children continue to follow the same underlying acquisition mechanisms of children 2 years younger, over a period of 3 years’ observation, in the kinds of language growth indexed by the MLU. Detailed
analyses of the children's utterances reveal relatively rare and apparently
unsystematic occasional errors of word order or other sentential errors.
The children are not "off the track," but instead seem to lag behind their
normal peers in their ability to increase the length of their utterances.

LINGUISTIC DIFFERENCES IN SELECTIVE
VERSUS GENERAL DELAYS

The way in which affected children fall behind their younger controls is in
the consistency with which they mark grammatical tense in obligatory con-
texts. They occasionally use the target morphemes in contexts where use is
required, and in doing so they demonstrate that they know a great deal
about the phonological representations of given morphemes, and the con-
texts in which use is required. This distinction is apparent when alternative
methods of evaluating grammatical acquisition are examined (see K. J. Rice,
M. L. Rice, & Redmond, 2000, for a more complete report of the outcomes
described later).

The index of productive syntax (IPSYN: Scarborough, 1990) is a morpho-
logy measurement system for children's spontaneous utterances, in which a
child's use of target morphemes, such as those included in the grammatical
tense marker, are scored as "0" if there is no use of the morpheme, "1" if the
morpheme appears once, and "2" if the morpheme appears more than
once. The total score is highly associated with age, and has proven to be a
helpful summative measure for general morphological development. Figure
2.16 reports the outcomes of an IPSYN analysis for the three groups of the
longitudinal study at the first time of measurement. The dependent mea-
sure is the verb phrase subscale, which includes prepositions, verbal parti-
cles (such as "put the hat on"), and modals, as well as the tense marking
morphemes included in the grammatical marker assessed in Figs. 2.4-2.8.
As is clear from the box plots in the figure, the affected group does not dif-
er from the younger control group in their level of performance on verbal
morphology indexed by the IPSYN, an impression supported by statistical
analyses that found no significant difference between the two groups. This
is taken to mean that the affected youngsters do not differ from the younger
control group in their occasional use of morphology, and/or that the
broadly defined cluster of morphemes included in the verb phrase subscale
includes morphemes that are not part of the selective grammatical delay as
well as morphemes that are part of the selective delay, a mixture that could
obscure the underlying grammatical marker.

Another index is sometimes used to describe children's grammatical de-
velopment, the Developmental Sentence Scoring (DSS) scale (Lee, 1974). Un-
der this system, each utterance is given a total score based on accumulated

FIG. 2.16. Distribution of verb phrase scores.

FIG. 2.17. Distribution of DSS scores.
from younger children. Two elements are essential in the measurement system: items that tap into tense marking in the morphosyntax, and an estimate of the likelihood of use in obligatory contexts (i.e., occasional use of a few instances will not capture the optionality dimension of the selective delay of the grammatical marker).

**TIMING OF ACQUISITION**
**FOR MORPHOSYNTACTIC AND MORPHOPHONOLOGICAL COMPONENTS OF TENSE MARKING**

The studies of the grammatical marker summarized thus far have focused on the morphosyntactic properties (i.e., the children's use of the target forms in obligatory clausal contexts) and follow-up detailed analyses of errors to determine if there were overt errors of usage. Another important element of morphology is the morphophonological learning that allows a youngster to acquire the phonological forms of a given morpheme. The contrast between regular and irregular English past tense forms allows for consideration of the two dimensions. For a given irregular past tense form, such as "ran," a youngster could produce a bare stem form of the lexical verb in an obligatory context (i.e., "run"), suggesting that the morphosyntactic requirement of past tense was not honored; or a youngster could produce the expected past tense form, "ran," showing that the child had two items in his lexicon (i.e., "run" and "ran"), and the past tense context required "ran"; or a youngster could produce the regular morphology instead of the irregular form (i.e., "runned"), showing that the child understood that past tense must be indicated but by the erroneous choice of the -ed affix, indicating that the child had not yet completed the morphophonological learning of the irregular stem exceptional phonological patterns.

The outcomes of the longitudinal study are illustrated by performance of the SLI group of children, reported in Fig. 2.18, from M. L. Rice, Wexler, Marquis, and Hershberger (2000). This figure shows three indices of past tense acquisition over time: The top line is the percentage correct on the regular past tense probe items, such as "walked"; the bottom line is the percentage correct on the irregular past tense probe items, such as "caught"; and the middle line is a measure of finiteness, which credited an overregularization of the regular -ed morpheme as an attempt at marking past tense. In these data, children's responses almost always fell into one of three categories: an unmarked bare stem form of the target verb (which appeared for both regular and irregular past tense forms), the correct adult form, or an overregularized irregular verb. The bare stem responses were interpreted as lacking tense marking, and the overregularized verbs were interpreted as having tense marking that did not follow the adult morphophonological patterns.

Inspection of Fig. 2.18 reveals that responses sharing the property of tense marking, regardless of morphophonological accuracy, align over time, whereas the dimension of morphophonological accuracy trails at a lower level of performance, for the elicitation task, during this period of acquisition. In other words, the likelihood of "walked" and "caught" is similar, whereas "walked" and "caught" are less well associated. The performance of the 3N and 5N groups also follow this pattern.

Growth curve analyses helped further clarify the similarities and differences across measures. Recall that growth curve analyses for composite tense marking, reported earlier, found linear and quadratic components of the predictor equation and, among the predictors, mother's education, the child's nonverbal intelligence, and the child's receptive vocabulary were all nonsignificant, with MLU as the only predictor (and a relatively weak one at that). Growth curve analyses revealed the same set of outcomes for the finite past tense measure (i.e., the index that credits overregularized forms of irregular past tense). In contrast, the outcomes for the percentage correct irregular past tense, which required morphophonological accuracy, yielded linear growth only for both the SLI and 3N groups, and found that the children's initial levels of nonverbal intelligence and receptive vocabulary predicted subsequent growth, in addition to MLU.

The outcomes add further evidence to the generalization that not all elements of the linguistic system are in synchrony in children's acquisition trajectories. In this case, elements of morphophonology for past tense marking are learned at a rate different from that of the obligatory properties of
past tense marking. This example of dissociation of surface phonology from morphosyntax is complementary to the earlier example of the same phonology yielding different patterns of acquisition for different morphological functions (i.e., regular plural -s versus third person singular -s).

Interestingly, the SLI group performs below the younger language control group on the percentage finite (i.e., morphosyntactic) measure throughout the period of study, but on the percentage correct irregular past, the morphophonological measure, the affected group performs at a level equivalent to the younger control group. In other words, the general delay holds for the morphophonological elements, whereas the additional selective delay holds for the tense-marking elements.

A COMPARISON OF SLI CHILDREN AND WMS CHILDREN RELATIVE TO MLU EXPECTATIONS

Children with Williams syndrome (WMS) offer an informative contrast to children with SLI, for the purpose of examining the possible lines of dissociation across elements of grammar. Roughly speaking, the two clinical groups can be thought of as mirror conditions relative to language abilities (i.e., children with SLI seem to have the general developmental prerequisites available for language acquisition and nonetheless show language impairments, whereas children with WMS seem to have cognitive limitations that would preclude grammatical strengths; see the descriptions of WMS provided by Levy, chap. 14; Mervis & Robinson, chap. 9; Clahsen & Temple, chap. 13 in this volume, for more detail). M. L. Rice, Mervis, Klein, and K. J. Rice (1999) carried out an investigation of the spontaneous utterances of a sample of 29 children with WMS (M = 7.7 years) who were at equivalent levels of MLU to the sample of 37 5-year-old children with SLI and 40 3-year-old MLU-equivalent children studied by M. L. Rice, Wexler, and Cleave (1995). There were an additional 45 children in the 5-year-old age-control group. See Fig. 2.19 for the box plots of MLU levels within groups, which show that the MLU levels were equivalent for the SLI, 3N and WMS groups, and somewhat higher for the 5N group. The children's spontaneous utterances were coded for percentage correct of the following morphemes: regular past tense -ed, third person singular -s, be copula and auxiliaries, plural -s, and the prepositions in and on. The past tense, third person singular -s and be forms were considered to share the function of grammatical tense marking, whereas the plural -s and prepositions were considered to serve nontense marking functions.

The children's performance is illustrated in Fig. 2.20 for the percentage correct use of be copula and auxiliary forms in obligatory contexts in spontaneous utterances. Although the MLU levels are equivalent for the SLI, 3N, and WMS groups, there are striking differences in levels of performance: a mean of 91% for the WMS group, 70% for the 3N group, and 47% for the SLI group (and 96% for the 5N group). Statistical analyses found that the WMS group level exceeded that of the other two MLU matched groups and was equivalent to the 5N group; the SLI group was lower than each of the comparison groups. Similar findings held for the other morphemes in the tense marking set, whereas the groups did not differ in their performance on plural -s or the prepositions.
These outcomes suggest that in the domain of grammatical tense marking, it is possible for children to be selectively advanced, relative to general language acquisition indices such as MLU, as well as for children to be selectively delayed in this domain. In some important ways, the tense marking element of children’s emerging linguistic systems can be relatively discrete, allowing tense marking to be either relatively poorly developed or relatively strongly developed.

IMPLICATIONS FOR MODELS OF LANGUAGE ACQUISITION AND SPECIFIC AND NONSPECIFIC DELAY

The delay-within-delay model sketched here, and longitudinal evidence of variation across children and across elements of language and change over time during the 3- to 8-year-old age period, places the grammatical tense marker of SLI in the broader picture of general delays of language acquisition. This context may prove to be helpful in evaluating the diversity of characterizations that appear in the literature with regard to children with SLI (e.g., whether or not they have impairments in lexical acquisition, or lexical components of the grammar, or general principles of clause construction). If affected children are compared to their age mates, or to the adult grammar on any given dimension of language, then the conclusion could be that they have an impairment in a particular dimension of language acquisition. Although this is an important observation, it is valuable to sort out whether or not an observed difference is part of a general language delay, in which the linguistic system of a given youngster is globally like that of a younger child, in effect, a general immaturity of language growth, which probably included a late onset as well as a generally off-set (i.e., lower, as in the growth curves of the figures reported here) level of performance relative to age expectations. Note that differentiation of a delay versus delay-within-delay requires recognition of the expected variation within normal children as they move from a child to an adult language system (i.e., a delay should not be confused with variation in acquisition evident in unaffected children).

Low performance on a grammatical tense marker could be diagnostic of a general language delay, or of a selective language delay-within-delay. In order to differentiate these two possibilities, it is necessary to collect further information about the child’s general language status, on measures of lexical development, mean length of utterance, and other elements of the emerging grammar. It is possible that children with other conditions, such as autism or Down syndrome, will show a selective delay in grammatical tense marking relative to their general levels of language acquisition, even if those general levels of acquisition are quite depressed relative to age expectations for emergence and mastery over time. Roberts, M. L. Rice, and Tager-Flusberg (2000) reported that in a sample of 51 children with autism, omission of tense marking was evident in their responses to an elicitation probe, in the form of bare stem responses for third person singular present tense -s and past tense forms. The children were subgrouped according to their levels of performance on the Peabody Picture Vocabulary Test—Revised (PPVT–R). The children’s performance was closely associated to their performance on the PPVT–R (which was generally parallel to their performance on nonverbal intelligence testing), although even the highest group had performance below age expectations (see Tager-Flusberg, chap. 12 in this volume, for further discussion of autism).

Miller (1996) argued that children with Down syndrome show selective difficulty with grammatical acquisition, relative to their cognitive levels. It could well be the case, although it is as yet untested, that children with Down syndrome would show selective difficulty with tense marking as part of a grammatical deficit. The point of these observations is to note several possibilities. One possibility is that there is overlap in the clinical groupings of SLI and autism, a generalization that may have some clinical validity but would have the interpretive limitation that it would not capture the observations from children with Down syndrome, if they prove to have difficulties in tense marking relative to their MLU levels, or the observations of relative sparing of tense marking in children with WMS. The second possibility is that tense marking can be a marker of a general language delay, such that, relative to age expectations, limitations in tense marking can be consistent with a general level of language delay and concomitant with other elements of language acquisition (e.g., vocabulary development and nonverbal intelligence), which could be the case for children with autism. The third possibility is that a grammatical tense marker can be part of a selective language delay-within-delay, either without general cognitive deficits (as in SLI) or in addition to general cognitive deficits (as in Down syndrome). If there is a possible disconnect in the synchronicity of cognitive and language development (as indicated in the WMS and SLI children), then the disconnect could also be evident in relative levels of cognitive and language development in the case of Down syndrome.

With regard to the synchronization of elements of the linguistic system as children grow, it is obvious from the evidence reported here that there are some important natural partition lines between the lexical system, grossly defined in terms of how many words children know (what can be regarded as semantic/conceptual knowledge under some models) and the morphosyntactic system, comprised of nonsemantic elements of clause structure with associated computational principles and processes. Performance in the lexical system does not predict performance in the grammatical
tense marking elements of the morphosyntactic system (i.e., early lexical growth does not predict individual growth curve outcomes for tense marking for either affected or unaffected children). Furthermore, children at equivalent levels of lexical development and equivalent levels of MLU can differ in levels of morphosyntactic development.

The empirical outcomes reported here that indicate a partition between growth in the lexical and morphosyntactic systems are consistent with adult linguistic theoretical distinctions between the lexicon, on the one hand, and the grammar (including morphosyntax), on the other hand. These distinctions are described in more detail in Waxler’s chapter (chap. 1 in this volume). The outcomes reported here support the generalization that a relatively discrete morphosyntactic system emerges in children, and some children show selective delays in the system that exceed the delays that can be evident in lexical development. In the theoretical model guiding the investigation reported here, that of the extended optional infinitive (EOI) model (cf. Waxler, chap. 1 in this volume, for more explication), the tense marking system is regarded as central to the morphosyntactic delay, in the form of an underspecified tense marker, a locus of impairment that captures the systematic relation that exists across the multiple morphemes that mark tense in English, and the fact that the selective delay is not evident in affixation processes in general or in sentence structure in phonological structure, or in general principles of clausal structure, and the fact that patterns of overt errors of sentence structure unrelated to tense/agreement are rare. At the same time, other elements of morphophonological learning, such as mastery of the irregular past tense morphology, seem to be part of a general language delay (i.e., the morphophonological learning mechanisms of the SLI group of children reported here is equivalent to that of younger language controls). Although the EOI model captures a wide range of empirical observations (one of the criteria of a scientifically useful model), it does not entail the assumption that grammatical tense marking is the only possible symptom of a delay-within-delay acquisition outcome. Other such clinical markers may exist, and may ultimately yield to further investigation.

At the level of etiology, the delay-within-delay model suggests that there may be different etiological factors at work in the global language delay than in an area of specific delay, such as grammatical tense marking. Certain critical cognitive/neuro/genetic/social factors are operative at the time of language emergence. Returning to the train metaphor, there is a need to get the train to leave the station on time. Although the expected time of emergence is one of the strongest assumptions of what is known about language acquisition, the underlying trigger for onset is unknown. A complete account of language delays in children ultimately must specify what is involved in activating the language system. For many, if not most, children with language delays, the onset is delayed and, as the condition of SLI makes clear, factors outside the linguistic system per se are not likely to be sole causal agents.

There may well be maturational mechanisms specific to the linguistic system. Elsewhere, a maturational component of the selective delay evident in the grammatical tense marker has been advocated by M. L. Rice and Waxler (1996). The delay-within-delay model suggests that a two-phase maturational process may be implicated, one for onset and a second for grammatical tense marking (or any other marker found to lag behind the global language acquisition trajectory). Investigations to date strongly suggest that it is the obligatory property of tense marking in English that is implicated in the selective delay, an empirical observation that remains to be more fully explicated theoretically.

The studies reported here are carried out with English-speaking children. Much work remains to be done to determine whether a delay-within-delay is evident, or detectable, across multiple languages. The empirical challenges are many, given the need to have relatively robust measures of global language acquisition in order to be able to estimate the variation evident in given linguistic domains across unaffected children of given ages, developmental indices that are not available for all languages. At the same time, the variations across languages are essential for clarification of the ways in which language delays can be manifested, whether the delays seem to be restricted to delays in language (as in the condition of SLI) or are associated with other conditions, such as autism, WMS, or Down syndrome. Central to the crosslinguistic comparison are the ways in which the lexical and morphosyntactic requirements of a given language interact with a child’s language acquisition propensities. The contributors to this volume add significantly to the knowledge base in these matters. Ultimately, this is all a part of a collective movement toward a better understanding of the ways in which children have inherent differences in aptitude for language acquisition, and the ways in which the linguistic system is designed to unfold as children mature.

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